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The Role of Joint Training in Inter-organizational Collaboration in Emergency Management

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In loving memory of my dear brothers, Habib and Ali

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Ensieh Roud

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Abstract

Emergency management involves the joint deployment of individual resources and external assistance to support organizations' and authorities' addressing of critical or dangerous situations through effective emergency responses that aim to save lives, the environment, and economic values. In emergencies and under extraordinary circumstances, responding organizations must quickly and appropriately gather and share information, make decisions, and coordinate with other organizations. Such responses can largely depend on effective inter-organizational collaboration (IC), which is often described in terms of the management of limited or inaccurate information and the allocation of limited resources.

Extensive research on various contexts has identified IC as a key success factor in emergency management but has also recognized several challenges when instituting IC. The relevant literature has determined numerous key elements to overcome the challenges and improve IC, such as collaborative learning, improvisation capability, communications skills and decision-making procedures, the skills of leaders, a dedication to success, inclusiveness, trust-building, and acquiring collective identity. A review of the extant IC and emergency training literature points to a need for empirical studies highlighting how training activities can contribute to these elements and consequently improve IC. This thesis intends to broaden the theoretical understanding of the role of joint training in improving IC in emergency management by answering the following overarching research question: *How can joint training improve inter-organizational collaboration in emergency management?*

To address the overarching research question, a case study of the Arctic Sea region is conducted to investigate three elements the literature has identified as potentially improving IC: trust, collaborative learning, and improvisation capability. Emergency response operations are challenging in general, and particularly so in the Arctic Sea region, where there are limited available resources, vast distances, fast-

changing weather conditions, and technical limitations on equipment functionality in cold climates. Due to the complex environment in which they occur, maritime emergencies in the Arctic can be more demanding to manage than terrestrial emergencies. Therefore, in the Arctic, IC can be even more crucial. The need for a collaborative response and the scale and characteristics of the Arctic Sea region make it an appropriate case in which to explore the role of joint training in improving IC.

The thesis presents four research articles to answer the overarching research question. Articles 1 and 2 are explorative studies that focus on trust development and collaborative learning from joint training. Article 3 addresses the findings derived from these two empirical studies and concerns joint training outcomes. It features a quantitative analysis of collaboration, trust, and collaborative learning outcomes. In light of the findings from Articles 1, 2, and 3, the importance of improvisation in emergency management and the capability of acting creatively and successfully under pressure are recognized. Finally, Article 4, as an explorative study, focuses on the improvement of improvisation capability from joint training.

This thesis contributes to the IC and training literature in several ways. First, it explores the role of joint training and provides empirical evidence from a multinational context to improve IC. Second, it investigates IC in highly specialized organizations (i.e., emergency organizations) characterized by internal hierarchies and levels of expertise. Third, it considers the role of joint training in trust development, collaborative learning enhancement, and improvisation capability improvement. Fourth, it provides insight into the interrelations between these elements when IC is improved. Fifth, the concept of familiarity unexpectedly appeared after the analysis and discussion of the findings as an outcome of joint training that may improve IC. Further studies could explore the concept of familiarity and measure the extent to which this factor influences IC.

The thesis concludes that trust, collaborative learning, and improvisation capability are important elements in the process of improving IC in emergency

management. Moreover, the thesis proposes that the contributions of joint training to these critical elements for improving IC can be categorized in terms of *socializing* and *flexibility*, two general approaches that are perceived to enrich IC. The empirical evidence from this thesis can be relevant for other organizations that exhibit characteristics whose central dimensions are similar to the context of the emergency response in the Arctic Sea region, such as hierarchical command structure, and operation in an environment with a low frequency of predatory emergencies. The findings might also be informative in other large-scale, inter-organizational contexts with high risk, vulnerability, uncertainty, and time pressure, e.g., large-scale IT and construction projects. However, this assertion is conditional, as this thesis only examines a single case. Further single and comparative case studies are needed to provide empirical support for or refute this assertion. Although more research is needed, this thesis addresses IC issues that are valuable for society, academics, and emergency organizations.

Structure of Thesis

This thesis consists of two parts:

Part I: This part includes the introduction and background to the research problem and questions, followed by an account for the choice of research design and methodology used during this Ph.D. project. The findings generated from each article are presented and discussed. The limitations, and possible areas for future research are also considered. This part concludes with the contributions and conclusions of the thesis.

Part II: This part includes four separate journal articles prepared under this research topic. Articles 1, 2, and 4 are empirical studies exploring IC in emergency management. Article 3 is a quantitative study that validates the findings of Articles 1 and 2.

List of Publications

Appended Articles:

Article 1:

Roud, E., & Gausdal, A. H. (2019). Trust and emergency management: Experiences from the Arctic Sea region. *Journal of Trust Research*, *9*(2), 203–225.

Article 2:

Roud, E., & Schmied, J. (2020). Emergency collaboration exercises and learning: Experiences from the Arctic. In *Crisis and Emergency Management in the Arctic* (pp. 180–211). Routledge.

Article 3:

Roud, E., Gausdal, A. H., Asgary, A., & Carlstrøm, E. (2020). Outcome of collaborative emergency exercises: Differences between full-scale and tabletop exercises. *Journal of Contingencies and Crisis Management*. https://doi.org/10.1111/1468-5973.12339

Article 4:

Roud, E (2020). Collective improvisation in emergency response. *Safety Science*, *135*, 105104.

List of Tables and Figures

Abbreviations list

CG: Coast guard

CLU: Collaboration, learning, and usefulness

CLUT: Collaboration, learning, usefulness, and trust

EPPR: Emergency prevention, preparedness, and response

FE: Functional exercise

FSE: Full-scale exercise

IC: Inter-organizational collaboration

JRCC: Joint rescue coordination center

P: Proposition

SOP: Standard operating procedures

TTE: Tabletop exercise

Contents

PART I

1. Introduction

Emergency management involves the joint deployment of individual resources and external assistance to support organizations' and authorities' addressing of critical or dangerous situations with effective responses that aim to save lives, the environment, and economic values (Brennan & Krohmer, 2006). It is typically viewed as a process composed of different phases (Chen et al., 2008; McAllister, 1995; McLoughlin, 1985), such as prevention, preparedness, response, recovery, and evaluation (Boin & McConnell, 2007). This thesis focuses on the importance of training activities in the preparedness phase and their effects on effective emergency response. Effective emergency response consists of five areas: collaboration among the involved organization(s) to maximize overall capacity; the accurate, timely assessment of the emergency; planning based on prior evaluations; implementation of the emergency response and specific interventions; and each emergency organization's monitoring and evaluation of interventions to ensure that plans are regularly reviewed, exercised, and modified to maximize impact (World Health Organization, 2005).

1.1 Background

During non-emergency incidents, the distinct and tailored roles and procedures of separate organizations do not have any critical functions to perform. In contrast, emergencies present novel and unexpected events that are only occasionally contained within set geographical, administrative, or physical boundaries (Ansell et al., 2010; Ödlund, 2010).

The dynamic situation in emergencies often requires emergency organizations to deviate from the established organizational structures and management principles to address a novel context as well as new tasks (Andreassen & Borch, 2020). In line with this aspect and based on emergency response principles, the emergency response may require inter-organizational collaboration (IC); frequently, a single organization cannot respond on its own due to rapid changes in the environment, a lack of

experience, the scope of the task, and scarce resources (Kapucu & Garayev, 2011). Thus, organizations such as police departments, paramedic services, and rescue agencies may be involved in an emergency response. Depending on the scale of the emergency, local authorities, government departments, military forces, and various businesses from different nations may also be engaged (Scholtens, 2008).

In general, IC is seen as an interactive problem-solving technique directed towards a specific object involving autonomous organizations (Stohl & Walker, 2002). IC is considered both more advantageous and more valuable than taking individual initiatives (Berlin & Carlstrøm, 2008) because a coordinated, collective effort by several organizations is more effective than individual organizations' independent actions. Organizational individualism is increasingly seen as an inadequate response to the growth in *task scope* (Mulroy & Shay, 1998), which is the degree to which an emergency requires a more comprehensive set of rescue resources. IC in emergency responses also avoids the problem of omission, whereby activities that are the central objectives of more than one organization are not performed (Vangen & Huxham, 2003). The omission may occur when an activity does not fall under the remit of any organization or when each organization assumes another is performing the activity. IC may also prevent divergence, through which various organizations' actions become diffused across a range of activities rather than directed toward fulfilling common goals (Berlin & Carlstrøm, 2015). Each of these cases underscores the positive role of IC in responding to emergencies.

In emergencies and under extraordinary circumstances, responding organizations must quickly and appropriately gather and share information, make decisions, and coordinate with other organizations. Such responses can greatly depend on effective IC, which is often described in terms of the management of limited or inaccurate information and the allocation of limited resources. The embedded interdependency of actors with different primary tasks, education, laws, and

organizational structures may hamper these responses (Boin & Bynander, 2015; Chen et al., 2008).

Ineffective IC in response to an emergency may affect emergency management organizations' ability to deal with adverse consequences, which in turn makes it more difficult for them to impose order and meet social expectations (Boin & Bynander, 2015). Several incident reports have highlighted this problem (Accident Investigation Board Norway, 2011; Borch & Schmied, 2016; Norwegian Official Report, 1981, 1991, 2012). Moreover, poor IC may negatively affect resilience, flexibility, and efficiency in response to emergencies (Kapucu, 2008). Overall, it can be argued that an effective IC is a prerequisite for effective emergency response (Corbacioglu & Kapucu, 2006).

Scholars have identified several challenges to effective IC in emergency management: the use of different terminology and non-uniform information platforms (Comfort, 2002), structural differences and a lack of clarity regarding whom to contact for particular information (Ödlund, 2010; Salmon et al., 2011; Lalonde, 2010; Comfort, 2002; Thompson, 2010), and the involved organizations' different methods of sorting data (Ödlund, 2010; Tierney & Bevc, 2007).

The evaluation reports of several large-scale emergencies, such as the 9/11 attacks, Hurricane Katrina, the California wildfires, and 22/7 Utøya, indicate that IC improvement in the preparedness phase would have reduced the destructive effects of these emergencies. Although extensive research in various contexts has identified IC challenges and highlighted them as a critical factor in effective emergency response (Stachowski et al., 2009; Pramanik, 2015), researchers have only minimally addressed how the preparedness phase may improve IC in emergency management. However, studies have shown that the difficulties encountered in IC are minimized through training, an essential part of the preparedness phase (Andreassen et al., 2018; Kheiri Pileh Roud et al., 2016; Schmied et al., 2017; Eyerman & Strom, 2008; Kapucu, 2008; Ödlund, 2010), which is thus of particular interest here.

Training is defined as the systematic acquisition of knowledge, skills, and attitudes to develop the competencies necessary for effective performance in work environments (Salas et al., 2006). In this thesis, *training* refers to emergency management training. *Joint training* refers to activities in which more than one organization is involved in developing specialized knowledge, skills, and attitudes to achieve effective IC, particularly via collaborative exercises (Salas et al., 2006). The collaborative exercises in this study are considered as an important part of joint training. A *collaborative exercise* is a tool for strengthening collaboration between individuals and between organizations (Rutty & Rutty, 2012). In collaborative exercises, different organizations meet to integrate for the purpose of improving IC and the joint handling of emergencies (Berlin & Carlstrøm, 2015). While exercises are vital tools in all high-risk contexts, the infrequency of incidents makes such practice particularly important in emergency management.

Training is an essential part of the preparedness phase because it enables personnel to learn and rehearse emergency operations and procedures in a safe environment compared to actual emergency operations (Sinclair et al., 2012). As major incidents are rare but can be consequential, 't Hart and Sundelius (2013) have suggested that “training is a pivotal substitute for personal experience and collective memory” (p. 456). In line with this idea, scholars have argued that more attention should be paid to joint training to achieve an effective IC in emergency response (Borodzicz et al., 2002; Lagadec, 1997).

Emergency response organizations may have limited experience working together, thus necessitating joint training to minimize IC challenges and ensure that emergency responses are handled more effectively (Borodzicz et al., 2002; Boing & Lagadec, 2000). Emergency management joint training is intended to develop the capacity of individuals and organizations to respond to the new and atypical demands emergencies present. It also aims to normalize performing particular tasks or applying specific skills (McEntire & Myers, 2004).

1.2 Research problem

The relevant literature has identified numerous elements that improve IC, such as collaborative learning, improvisation capability, communications skills and decision-making procedures, the skills of leaders, a dedication to success, inclusiveness, trust-building, and acquiring collective identity (Bharosa et al., 2009; Glow et al., 2013; Greer, 2017; Olson et al., 2011). A review of the extant IC and emergency training literature points to a need for empirical studies highlighting how training activities can contribute to these elements and consequently improve IC (Drupsteen & Guldenmund, 2014). Therefore, the research problem is as follows: *Although several elements have been identified to improve IC, there is a lack of knowledge on the role of "joint training" in improving IC in emergency management.*

In this thesis, joint training is considered an independent variable that may improve IC in emergency management. After introducing some previously identified elements for improving IC, the author argues that emergency personnel can perceive joint training as improving IC in emergency management.

1.3 Elements for improving inter-organizational collaboration

This thesis intends to broaden the theoretical understanding of the role of joint training in IC in emergency management. To that end, the thesis investigates three elements identified in the literature that improve IC: trust, collaborative learning, and improvisation capability. In the following sections, each element is introduced and discussed in terms of how it may improve IC.

1.3.1 Trust

Trust is one of the keys to strengthening IC (Mathieu et al., 2001) because increased trust bolsters inter-organizational performance, communication, and cooperation (Foulquier & Caron, 2010; Gausdal et al., 2016; Mishra, 1996; Virrantaus et al., 2009; Zucker, 1986). Prior research on IC has examined trust at various levels, with the majority of studies focusing on either the individual level (Child & Möllering, 2003; Jap

& Anderson, 2003) or the organizational level (Das & Teng, 2001; Poppo et al., 2008). However, this thesis follows Schilke and Cook's (2013) theory in analyzing trust at both the individual and the organizational levels, leading to a cross-level development of trust in IC.

Several scholars have highlighted the significance of trust in emergency management (e.g., Kapucu et al., 2010; Lundberg & Asplund, 2011; Mishra, 1996). Kapucu (2006) has argued that relationships developed before the emergency response (i.e., through frequent collaboration) serve to develop trust and weaken cross-organizational boundaries, consequently bringing organizations together. Accordingly, one can argue that a well-functioning IC in emergency response is based on a basic trust level among the organizations involved (Curnin et al., 2015).

Others have contended that effective collaboration between organizations and previous experiences depends on trust in an organization's action (Zaheer et al., 1998). At the same time, some have determined that effective collaboration among organizations also depends on trust in individual performance within the organizations (McGuire, 2006). Here, one must be mindful that organizations may be trusted due to their formal role and status and because of the people who work within the individual organizations.

Joint training may contribute to developing trust at both the organizational level and the personal level by enabling people from different emergency organizations to meet outside of an actual emergency, become familiar with each other, and improve their understanding of each other's organizations. In this way, joint training enables people to develop trust on personal and institutional levels (Andersson et al., 2014).

1.3.2 Collaborative learning

Learning is a process of imitation and emulation through which specific knowledge, skills, and attitudes are acquired (Salas & Cannon-Bowers, 2001). It is also described as processes that take place at different levels, in which learners may be individuals,

groups, whole organizations, or inter-organizational networks (Tynjälä, 2008). Learning through joint training is inherently situated in social contexts, which means that it occurs through legitimate peripheral participation processes (Sommer & Njå, 2012).

Crossan, Lane, and White (1999) have developed a framework to illustrate learning processes and how learning evolves and is incorporated within organizations. Before their seminal contribution, the learning literature had neglected to integrate prior research at different levels of analysis (Glynn, 1996; Huber, 1991; Kim, 1998; Nicolini et al., 2000). Crossan and colleagues' (1999) proposed framework incorporates a cross-level view of learning and consists of different learning processes—*intuiting, interpreting, integrating,* and *institutionalizing*—that occur within an organization. This thesis follows the cross-level view of learning and aims to apply it at the inter-organizational level. Hence, the term *collaborative learning* is central, as it refers to learning about the structure, interests, capabilities, and limitations of other organizations as well as to assessing lessons learned to improve future collaborations.

Joint training is important for collaborative learning and helps resolve challenging problems (Jones & Macpherson, 2006), such as providing organizations with a platform for the exchange, transformation, and creation of knowledge. Collaborative learning through participation in joint training can also enable organizations to bridge personal and organizational relationships across organizational boundaries and various fields of expertise (Andersson et al., 2014). Joint training may also allow individuals and organizations to learn how to acquire the abilities needed for a collaborative emergency response.

1.3.3 Improvisation capability

In emergencies, the involvement of several organizations with increased interdependence and uncertainty about the impact of the actions performed increases the complexity of the operation (Bigley & Roberts, 2001; Wolbers et al., 2018).

Complexity is defined as a system in which components act in myriad ways, thus resulting in something greater than the sum of its parts (Coskun & Aubrecht, 2011; Holland, 2014). In other words, the input cannot determine the output. For example, while the output of complicated systems, such as an analog watch with its myriad cogs, can be determined from its initial condition, the output of systems essential to humans—e.g., markets and their varieties of buyers and sellers, who are organized into groups participating in mutual funds, and economies with hierarchies of workers, departments, firms, and industries—cannot be determined (Holland, 2014). Thus, emergency operations with many components, increased levels of communication, and the engagement of several organizations are considered complex.

To deal with the interdependence and complications of an emergency, emergency organizations follow *standard operating procedures* (SOP), which are predetermined steps or procedures to be followed in an emergency. However, given the task complexity and scope, the SOP may not be suitable or appropriate in some emergencies. *Task complexity* is defined as the number of components and the ties between them that can provide alternative routes toward a particular goal (Campbell, 1988; Hærem et al., 2015). Because existing plans and emergency response procedures might not always be applicable, organizations and emergency personnel may have to improvise. In these situations, improvisation may be considered as a new solution to managing and organizing, as incorporating untrained units into an ongoing operation, and as a response strategy demanding revised routines or organizational structures (Andreassen & Borch, 2020).

Overall, an emergency response's increased complexity calls for flexibility and improvisational capability with greater freedom from pre-established procedures and strategies. In such situations, improvisation capability becomes crucial because collaborative emergency responses require organizations to demonstrate situation-driven and problem-solving behavior (Mendonça & Al Wallace, 2007; Webb, 2004). This thesis defines *improvisation capability* as the organization's capacity to act

spontaneously to respond to problems or opportunities in a novel way. However, a capacity to improvise goes beyond ad hoc activity, which does not include practiced or patterned behavior (Helfat & Winter, 2011). Winter (2003) has distinguished improvisation—a capability—from ad hoc problem solving, arguing that ad hoc problem solving is neither routine nor highly patterned, while improvisation depends on a "foundation of patterned and practiced performance, a fund of micro-patterns that are recombined and sequenced in creative ways" (p. 993).

Practitioners and researchers have recognized the importance of improvisation in emergency management (e.g., Frykmer et al., 2018; Kendra & Wachtendorf, 2007; Mendonça, 2007; Mendonça, 2001; Webb & Chevreau, 2006). The capability of acting creatively and successfully under pressure is a hallmark of competent emergency organizations. Indeed, as demonstrated by responses to many emergencies, such as the 2001 World Trade Center attack and the hurricanes of 2004-2005 in the United States, the capability to improvise remains crucial to the success of IC in emergency response in cases that involve several organizations (Mileti, 1999). According to Tierney (2003), if an event does not require improvisation, it is probably not an emergency. Emergency organizations aim to minimize the need for improvisation and focus on the standardization of response (Kendra & Wachtendorf, 2007; Mendonça, 2007). Independent of the debate about whether to standardize or improvise, this thesis regards improvisation capability as a significant feature of successful emergency response. In light of the literature, this thesis suggests that joint training may enhance improvisation capability and, consequently, improve IC in emergency management.

1.4 Research questions

The following overarching research question has been formulated:

> *How can joint training improve inter-organizational collaboration in emergency management?*

Four research questions based on the explanation in Section 1.3 are formulated to answer the overarching research question. These questions are addressed in the articles in Part II. The explanation of trust and collaborative learning in Sections 1.3.1–2, which concern a small part of the available research on these topics that this author reviewed, strongly indicates that trust and collaborative learning play an important role in mitigating IC problems. Based on this information, the first and second research questions of this thesis were formulated:

> RQ1: What is the role of trust in improving inter-organizational collaboration, and how is such trust developed across emergency management phases in general and from joint training in particular?
>
> RQ2: How might joint training contribute to collaborative learning in emergency management?

The crucial roles of trust and collaborative learning are explored in Articles 1 and 2. Additional attention must also be paid to whether trust and collaborative learning outcomes developed through joint training are perceived to be useful in improving IC in emergency management. Some have suggested that joint training may produce limited usefulness in actual emergency response (Borell & Eriksson, 2013a; Kristiansen et al., 2017). Some researchers, however, have disagreed with the reasons for the limited usefulness of joint training, citing, for instance, a lack of sufficient attention paid to variation (Borell & Eriksson, 2013; Perry, 2004) and a failure to prioritize the strategic learning aspects of joint training (Berlin & Carlstrøm, 2015). This debate prompted the development of the third research question, which focuses on joint training outcomes by investigating the collaboration, trust, and collaborative learning outcomes of joint training. The third research question is as follows:

> RQ3: *To what degree are trust development and collaborative learning useful for inter- organizational collaboration in emergency management?*

The explanation in Section 1.3.3 suggests that joint training may improve improvisation capability and, consequently, improve IC in emergency management. Thus, the fourth and final research question of this thesis is the following:

> RQ4: *How can joint training improve improvisation capability to improve IC in emergency management?*

1.5 Articles 1-4

As previously noted, this thesis consists of four articles that investigate trust, collaborative learning, and improvisation capability. These articles and their status are presented in Table 1. However, the research questions explored in each article are slightly different from the research questions mentioned above because the minor changes to the research questions enabled the discussion of variables at both the article level and the thesis level. For example, the term "collaborative exercises" is used in some articles; however, the term "joint training" is used at the thesis level despite a terminology difference. The minor changes are also a sign of the learning process involved in writing this thesis.

Table 1. Overview of the articles

#	Title	Research question	Authors	Full article references	Status and index
1	Trust and Emergency Management: Experiences from the Arctic Sea Region	What is the role of trust in collaborative emergency response, and how is it developed across emergency management phases?	Ensieh Roud; Anne Haugen Gausdal	Roud, E., & Gausdal, A. H. (2019). Trust and emergency management: Experiences from the Arctic Sea region. *Journal of Trust Research*, *9*(2), 203–225.	Published NSD level 1
2	Emergency Collaboration Exercises and Learning: Experiences from the Arctic	How can the inter-organizational learning process occur as a result of emergency collaboration exercises within a complex environment?	Ensieh Roud; Johannes Schmied	Roud, E., & Schmied, J. (2020). Emergency collaboration exercises and learning: Experiences from the Arctic. In *Crisis and Emergency Management in the Arctic* (pp. 180–211). Routledge.	Published NSD level 2
3	Outcome of Collaborative Emergency Exercises: Differences Between Full-scale and Tabletop Exercises	To what degree does joint training contribute to useful learning and trust-building in collaborative emergency response?	Ensieh Roud; Anne Haugen Gausdal; Eric Carlstrøm; Ali Asgary	Roud, E., Gausdal, A. H., Asgary, A., & Carlstrøm, E. (2020). The outcome of collaborative emergency exercises: Differences between full-scale and tabletop exercises. *Journal of Contingencies and Crisis Management*. https://doi.org/10.1111/1468-5973.12339	Published NSD level 1
4	Collective Improvisation in Emergency Response	How can joint training improve the collective improvisation capability in an emergency response?	Ensieh Roud	Roud, E (2020). Collective improvisation in emergency response. *Safety Science*, *135*, 105104.	Published NSD level 2

2. Theory

This chapter describes the main theoretical concepts used in the thesis, which are inspired by several disciplines. It begins with an introduction to emergency management, its phases, and joint emergency training. It then presents the concept of IC and explains its importance in emergency management. The concepts of trust, collaborative learning, and improvisation capability are also discussed.

2.1 Introduction to emergency management

To date, there is no consensus in the literature on the definition of emergency management. Two often-cited publications in the field are Perrow (1984) and Weick (1988). In 1984, Charles Perrow published the book *Normal Accident*, in which he argues that accidents are inevitable in certain types of high-risk systems (Le Coze, 2015). This book seeks to explain how complex, tightly coupled technological systems can lead to accidents. Furthermore, he argues that organizations can create technological systems that may have catastrophic effects on ecosystems. Organizations cannot prevent or mitigate these incidents and their consequences once the technological system is operational (Perrow, 2011). In response, Weick (1988) has argued that Perrow's (1984) perception of emergency management is too narrow, as he describes emergency management as a solution to problems that are already in the process of emerging rather than emphasizing the importance of preventing triggering events. Weick (1988) reasons that if managers were to consider an emergency a situation composed of numerous triggering events—rather than a single major problem already running its course—they could probably initiate mitigation efforts earlier, limiting or reducing the overall negative outcome of the event. Several other scholars have also challenged Perrow's contention (e.g., Bierly III & Spender, 1995; LaPorte & Consolini, 1991; Pinch, 1991; Rochlin et al., 1987; Wynne, 1988).

This thesis shares Weick's perspective, focusing on training part preparedness to limit the negative consequences of an emergency event. In recent decades, many

societies have developed countermeasures and procedures to avoid or mitigate the influence of human-induced or natural catastrophes, building on technological growth and their experience. However, the probability and impact of different emergency situations and the corresponding countermeasures have changed over time and will continue to do so. Hence, the discipline of emergency management must be continuously modified and improved. Despite an increase in emergency-related theoretical research—and as that of Lalonde and Roux-Dufort (2013)—knowledge in the field of emergencies remains limited.

2.1.1 Definitions of "emergency" and "emergency management"

The broad use of the term "emergency" makes it difficult to agree on a universal definition (Wang et al., 2016). Most definitions convey the potential of a destructive outcome of future events owing to decisions taken at a particular stage in the sequence of events. This thesis applies Vogt's (2012) definition of an emergency: "a situation that is threatening to a large number of people or to significant economic and ecological infrastructures and which requires the assistance of national or international organizations and/or authorities to diminish or prevent its impact" (p. 29).

Similarly, numerous definitions of "emergency management" exist. Unlike other, more structured disciplines, emergency management has expanded and contracted in response to events, government desires, and leadership styles. Three definitions are presented here, and the working definition for this thesis is given below. Haddow, Bullock, and Coppola (2013) have defined emergency management as a discipline dealing with risk and risk avoidance. Risk concerns an extensive range of issues and an equally diverse set of players. The Federal Emergency Management Agency (FEMA) of the United States, part of the Department of Homeland Security, has defined emergency management as "the managerial function charged with creating the framework within which communities reduce vulnerability to hazards and cope with disasters" (Blanchard, 2007, p. 4). In other words, emergency management protects communities by coordinating and integrating all activities necessary to build, sustain,

and improve the capability to mitigate against, prepare for, respond to, and recover from threatened or actual natural emergencies, acts of terrorism, and other man-made emergencies (Blanchard, 2007). According to McEntire (2007), emergency management means "the preparation for and the coordination of all emergency functions, other than functions for which military forces or other federal agencies are primarily responsible, to prevent, minimize, and repair injury and damage resulting from disasters" (p. 258). The following definition by Vogt (2012) combines the explanations above and is used in this thesis: "Emergency management is the managerial function which arranges countermeasures and coordinates involved organizations and/or units to prevent, mitigate, respond to, recover from, or prepare for a disaster and therefore reduce the overall vulnerability of communities and infrastructures to known and unknown threats" (p. 30).

Emergency management is typically viewed as a process that involves different phases (Chen et al., 2008; McAllister, 1995; McLoughlin, 1985). Boin and McConnell (2007) have proposed five phases: prevention, preparedness, response, recovery, and evaluation. This model is one of the most widely accepted in the emergency research community (Boin & McConnell, 2007). "Prevention" includes any activity that aims to reduce the risks by minimizing either their probability or the consequences that would result should an adverse event occur. Prevention involves, for example, land-use planning, setting up restrictions of different kinds, constructing safe buildings, and establishing safety zones. "Preparedness" concerns measures taken to develop the operational capability required should an adverse event occur. Specifically, it refers to actions taken before impact, including planning, training, and exercises; setting up communication systems; and acquiring resources. Emergency planners construct plans to lessen the effects of hazards and emergencies in this realm (Kapucu, 2008). "Response" refers to actions taken during the initial impact of an emergency incident, including saving lives and preventing further damage to the environment and property (McLoughlin, 1985). It may also involve different processes, such as coordination and control (Nilsson, 2010). "Recovery" refers to the measures taken in the shorter term to

restore the vital functions of the affected society to a minimum level, as well as those activities that, over the longer term, aim to return the situation to normal. Finally, "evaluation" allows the actors to make adjustments to practices and policies, ensuring better performance in future emergency situations (Mushkatel & Weschler, 1985). In practice, these phases are closely related and not always clearly distinguishable (Uhr, 2009). However, they may be used as approximations when discussing different aspects of emergency management. This thesis focuses on joint training as part of preparedness and its possible effect on IC.

2.2 Inter-organizational collaboration

Emergency response operations are challenging in general, and particularly so in some cases, as in the Arctic, where there are limited available resources, vast distances, fast-changing weather conditions, and technical limitations on equipment functionality in cold climates (Andreassen et al., 2018; Sydnes et al., 2017). Therefore, the efforts of several organizations may be needed to respond to emergencies, meaning that IC becomes more critical in the Arctic region. Such emergency response operations involve a wide range of physical and human resources provided by civilian and public actors and military organizations. They may include vessels, helicopters, airplanes, and satellite imagery coordinated through various communication platforms (Sydnes et al., 2017; Andreassen et al., 2018). Consequently, an effective emergency response depends partly upon all participating organizations working cooperatively to mediate IC (Landgren & Nulden, 2007; Mayer-Schönberger, 2002).

Due to some conceptual overlap, the terms *collaboration* and *coordination* have been used interchangeably in theory and practice. The concept of *coordination* refers to the configuration of resources and information among actors, focusing on communication and decision-making processes (Comfort, 2007). According to Gray (1989), *collaboration* is a type of inter-organizational relationship in which organizations make efforts toward a shared goal. Several researchers have described collaboration as a process that includes various activities, such as information-sharing,

policy changes, and development within and across sectors of varying levels of complexity (Mitchell et al., 2015; O'Leary et al., 2015; O'Leary & Vij, 2012). Collaboration is particularly important in collaborative emergency response, as has been shown in studies of Hurricane Katrina (2005), the World Trade Center attacks (1993 and 2001), and the Indian Ocean tsunami (2004; Butts et al., 2012; Comfort, 2007; Raju & Becker, 2013). The use of integrated and interdependent collaborations as a form of inter-organizational model allows public and private organizations to work together and create a solution to a problem that is larger than what a single organization could handle (Conlan, 2010; Ferejohn, 1997; Tierney et al., 2002). For this thesis, the concept of *collaboration* is chosen, as the establishment of interactions between emergency organizations does not necessarily center on specific coordination issues (Strandh, 2015).

Several studies have identified the need for collaboration to harmonize activities among involved organizations (Conlan, 2010; Ferejohn, 1997; Tierney et al., 2002). For instance, it is typical in IC to harmonize activities among organizations to complement their capabilities and help them improvise and adapt to the unforeseen changes in the external environment affected by an emergency (Pramanik, 2015). Therefore, as an analytical concept, collaboration is understood as an interactive problem-solving technique directed toward a specific object and involving autonomous organizations (Stohl & Walker, 2002). This definition was particularly relevant for studying the joint training in emergency management in general and exercises in particular, as it can be linked to collaboration challenges regarding relations, interactions, and negotiations between independent organizations. It recognizes different motives and goals across organizations working on a shared problem.

Collaboration has become a significant organizational trend over the last three decades (Axelsson & Axelsson, 2006). Theories of collaboration are relevant across multiple sectors in relation to sharing knowledge and perspectives and delivering resources (Mayhew, 2012). The concepts of inter-organizational, interprofessional,

and multiorganizational collaboration are used in the emergency management literature to describe how actors come together and how emergency response work is organized (Bryson et al., 2006, 2015). These concepts primarily refer to different degrees of interaction. Numerous studies (e.g., Edwards & Kinti, 2013; Kerosuo, 2008; Nicolini et al., 2012) have highlighted IC's potential for enabling specialized and defragmented organizations to meet objectives that cross organizational boundaries. Unexpected changes occur when organizations are required to provide new services and assume new structures, functions, or leadership that differ from their traditional ones. Under such circumstances, collaboration across organizational borders contributes to aligning interdependencies; synthesizing critical functions; and pooling resources, information, and capabilities to cope with the radical changes in the environment (Butts et al., 2012; Drabek & McEntire, 2003; Wachtendorf, 2004).

The emergency management literature has typically viewed IC as a necessity and a solution to a wide range of problems associated with emergency management (Rantatalo, 2012). Because of the uncontrollable and consequential nature of emergencies that affect masses of people and require the involvement of various sectors, organizations, and stakeholders, IC plays an important role in achieving ultimately successful results (Kapucu, 2008; Kapucu & Garayev, 2011; Pramanik, 2015). Different entities must collaborate to increase response effectiveness and reduce casualties. IC becomes a more challenging task for organizations to address when several organizations and coordinating bodies must make decisions (Raiffa, 2007).

2.2.1 Inter-organizational collaboration challenges

Although emergency organizations have a long tradition of working together, scholars have repeatedly pointed out that collaboration is not a simple process (Bryson et al., 2006), particularly the establishment of collaboration in time-dependent environments such as those in emergency responses (Berlin & Carlstrøm, 2011; Kapucu, 2008). Shared technologies for communication have been implemented in response to an increased demand for collaborative actions (Sanders, 2014). In addition to

challenges in communication technology and time and space sensitivity, research has highlighted the organizational and social dimensions of the collaborative process (Allen et al., 2014). Rather than technology being the primary obstacle to information-sharing, Allen et al. (2014) have found that communication challenges are related to the use of internal codes, the management of information overload, and identifying what can (and should) be legally shared across organizations. Both the information itself and how the information is negotiated and interpreted across organizations guide the inter-organizational efforts in the response (Wolbers & Boersma, 2013).

As mentioned in the Introduction, research and incident reports have clarified that collaboration is key to effective emergency response, but it remains a challenge for emergency organizations. Plausible explanations for difficulties in accomplishing inter-organizational tasks include a lack of experience with collaborative work (Charman, 2014), the involved organizations' familiarity with the tasks to be performed but not the environments in which incidents occur (Danielsson, 2016), or varying levels of familiarity with tools and procedures in joint responses (Militello et al., 2007). However, Crichton, Ramsay, and Kelly (2009) have argued that learning outside of one's own domain is particularly vital (after real-life responses and exercises) to increase preparedness for future collaborative responses. Furthermore, Uhr (2009) has found that normative ideals for coordination and interpersonal trust influenced the managing of interdependencies to achieve an overall goal. Establishing trust and relationships has been identified as particularly critical in emergency organizations, in which decisions, prioritizations, and actions concern urgent circumstances (Curnin et al., 2015; Uhr, 2009).

Previous collaborative experience (real life and training), among other factors, has been found to facilitate IC in emergency response (Greer, 2017; Kapucu & Garayev, 2011). Thus, joint training may function as a comprehensive mechanism contributing to IC improvement (Kapucu & Garayev, 2011). The benefits of improving IC may include better decision-making due to advice and information obtained from colleagues and

an enhanced capacity for collective action by dispreading units and reducing inflexibility and cultural distractions (Hocevar et al., 2006).

The concept of *collaboration capacity* resonates in the work of numerous academics and practitioners (Bradach & Eccles, 1989; Gray, 1989; Hocevar et al., 2006; Huxham, 1996). This concept is understood as capturing the capacity needed for collective actions by including a wide range of specific knowledge, skills and resources, and joint efforts related to an issue (Foster-Fishman et al., 2001). These capacities cover both quantitative measures, such as equipment, vehicles, and radio, and qualitative measures, such as the skills and competencies required to collaborate. However, this thesis emphasizes qualitative measures, focusing on joint training to minimize the identified challenges and subsequently improve IC. Elements such as trust, collaborative learning, improvisation and flexibility, role clarity, the decision-making process, workload, time, commitment, the knowledge of goals, the skills of leaders, communication, inclusiveness, and respect are found to be critical for effective IC (Greer, 2017; Mendonça & Fiedrich, 2006; Mendonça & Wallace, 2004; Olson et al., 2011). To limit the scope, trust, collaborative learning, and improvisation are the elements included in this thesis.

Although training is vital for response effectiveness, some researchers have argued that a collaborative planning process for training is of equal importance (Dynes & Quarantelli, 1977; Perry & Lindell, 2003; Quarantelli, 1998). A joint collaborative planning process in exercises forms relationships and structures that make real emergency response easier (Bram & Vestergren, 2012). Because unity and teamwork are essential in emergencies, Bram and Vestergren (2012) have determined that joint training can have a positive influence on IC effectiveness. Working in environments where people are exposed to threats may strengthen bonds between individuals and organizations (Bram & Vestergren, 2012). Although IC is considered an important factor in effective emergency response—and in the emergency management literature—few studies have investigated how joint training as a mechanism may

improve IC. This thesis discusses the potential impact of joint emergency training for improving IC by exploring the literature on three critical elements: trust, collaborative learning, and improvisation capability.

2.3 Joint training

Training is a mechanism for developing knowledge, capabilities, and attitude (Salas & Cannon-Bowers, 2001). The training mechanism consists of basic education in individual skills, tabletop exercises (TTEs), virtual simulations, and full-scale exercises (FSEs). In the preparation phase, exercise activities for the next event are critical for future response success (Manoj & Baker, 2007). In this thesis, the term *joint training* refers to TTEs and FSEs in which multiple organizations gather and train together to better prepare for their emergency response. Some studies in the training field have highlighted the difference between the terms *training* and *exercise* (e.g., Bullock et al., 2017; Green III, 2000; McEntire & Myers, 2004; Salas & Cannon-Bowers, 2001; Skinner & Hodges, 2006). According to Salas and Cannon-Bowers (2001), *training* has a performance-related purpose, with defined needs that may require the individuals and organizations to exercise. In contrast, *exercise* refers to activities by which individuals and organizations develop specialized knowledge, skills, and attitudes to meet training needs (McEntire & Myers, 2004). However, in this thesis, the terms are used interchangeably.

Historically, the military has used exercises to prepare for battle (Mietzner & Reger, 2005). Today, exercises are also widely used across civil branches, including the public, private, and volunteer sectors. The goal of the exercises is to simulate serious incidents, which enables stakeholders to train personnel and learn how to respond to and cope with crises in safe environments (Lee et al., 2009). The three primary categories of emergency exercises are drills, strategic exercises, and collaboration exercises (Berlin & Carlstrøm, 2015). *Drills* strengthen individual skills and knowledge and are designed to repeat discipline-specific key elements, such as equipment handling and procedure undertaking (Berlin & Carlstrøm, 2015). *Strategic exercises*

involve simulating events to test and evaluate potential outcomes (Perry, 2004), while *collaboration exercises* are designed to strengthen collaboration between individuals and organizations regarding integration, preparedness, and behavior (Rutty & Rutty, 2012). Flin and colleagues (1996) have contended that collaboration exercises and lectures from other organizations' personnel can improve IC. However, the exercises should be sufficiently flexible to account for uncertainty, unexpected events, and subsequent improvisation (Chen et al., 2008). Of these three categories, collaboration exercises are the focus here.

2.3.1 Emergency collaboration exercises

The concept of *collaboration exercises* is used in this thesis to describe inter-organizational exercises intended to improve integration and professional task distribution in the emergency context (Axelsson & Axelsson, 2006; Drucker, 2012). In collaboration exercises, different organizations work together to integrate and improve their collective handling of emergency situations (Berlin & Carlstrøm, 2015). Collaboration exercises test organizations' ability to employ common resources through IC (Ingemarsdotter & Trané, 2013). They are assumed to include command and control, technology, and emergency plans and procedures and to incorporate enhanced collaboration between organizations at all levels (Sørensen et al., 2018). Moreover, collaboration exercises tend to increase the ability of organizations to help one another, test IC, and prepare participating organizations to react to emergencies in a coordinated manner (Kim, 2013). Collaboration exercises in emergency management are assumed to test and improve preparedness and integration, among other areas (Rutty & Rutty, 2012).

According to Kristiansen et al. (2017), "Successful collaboration exercises appear to improve IC during real events through informal structures, practicing listening and delegating, getting to know one another, and the learning of a common language" (p. 76). This understanding emphasizes the need to construct exercises in which these collaboration elements are effectively trained. Successful collaboration

exercises develop knowledge about other organizations and their culture that is vital for an effective collaborative emergency response (Kristiansen et al., 2017). Emergency collaboration exercises need an emphasis on flexibility. Organizations must see the value in the collaboration and willingly engage in collaborative behavior during exercises and real emergencies to familiarize themselves with their environments and ensure the best collaboration in emergency efforts. In addition, being prepared to resolve hierarchical and bureaucratic challenges requires making the transition from a mechanistic to an organizational exercise model (Berlin & Carlstrøm, 2013).

Three general types or levels of exercises are identified in the literature (Daines, 1991): TTEs, functional exercises (FEs), and FSE. A TTE is the least complex of the exercises. It involves key personnel discussing simulated scenarios to evaluate their state of readiness for emergency management. As a training activity, a TTE gathers key personnel—such as state and local emergency management officials—in a conference room environment. The format is usually informal, with minimum stress involved. The exercise begins with describing a simulated event and proceeds with discussions in which participants evaluate the emergency action plan and response procedures and resolve concerns about coordination and responsibilities (Daines, 1991). An FE involves a higher level of complexity in testing, planning, and training. It examines or validates the coordination, command, and control among various multi-agency coordination centers, but it does not involve any "boots on the ground" (Daines, 1991). Finally, the most complex form is the FSE (Daines, 1991). The purpose of the FSE is to test all—or a major portion of—the functions specified in an emergency response plan (Daines, 1991). In FSEs, the reality of operations in multiple functional areas presents complex and realistic problems that require critical thinking, rapid problem solving, and effective responses by trained personnel. The exercises are conducted in real time, creating a stressful, time-constrained environment that closely mirrors real events. The level of support needed to conduct an FSE is greater than that needed for other exercise types. The data in this thesis are primarily taken from TTE and FSE emergency collaboration exercises.

2.4 Trust

Trust is a critical aspect of improving collaboration (Mathieu et al., 2001). As Thomas (1979) has noted, "Collaboration requires trust in the other party, trust in the other's information, and trust that the other will not exploit oneself" (p. 217). Trust encourages interdependent individuals and organizations to eliminate their fear of exploitation and recognize their existing conflicts (Gibb & Gibb, 1969; Walton & McKersie, 1991), to become more collaborative in their behavior (Deutsch, 1973; Ouchi, 1981), and to generate suggestions for change that are focused on the problem itself (Hackman & Oldham, 1980). Trust is especially important in the context of emergencies, with the concomitant scarcity of resources, as trust fosters collaboration in the allocation of resources within and between organizations (Webb, 1996). In summary, collaboration in allocating resources within and between organizations is difficult to sustain during emergencies where trust is absent. Therefore, in this section, the literature on trust and its importance for emergency management is discussed in detail.

Trust is a complex concept found in various fields, including economics, sociology, psychology, and organizational science (Arnott et al., 2007). Personality psychologists have traditionally regarded trust as an individual characteristic (Rotter, 1971, 1980). Social psychologists have defined it as an expectation about the behavior of others in transactions, focusing on the contextual factors that enhance or inhibit the development and maintenance of trust (Lewicki & Bunker, 1995). Economists and sociologists have been interested in how organizations are created to reduce the anxiety and uncertainty associated with communication among relative strangers (Goffman, 1971; Zucker, 1986). Researchers in different fields have mostly agreed on the importance of trust in social interaction, though they disagree on its definition (Rousseau et al., 1998).

Rotter (1971) has defined trust as "a generalized expectancy held by an individual or group that the word, promise, verbal, or written statement of another individual or group can be relied on" (p. 444). In contrast to Rotter's "generalized

expectancy," which is a relatively stable personality characteristic, social psychologists view trust as an expectation specific to a transaction and the person with whom one is transacting. For most of these theorists, vulnerability is a key element of trust. Trust, by its nature, provides the opportunity for malfeasance on the part of those being trusted (Granovetter, 1985, p. 491; Lewis & Weigert, 1985). Without a situation in which the possible damage may be greater than the advantage, it would simply be a matter of rational calculation that would lead to choosing the course of action, as the risks would remain within acceptable limits (Luhmann, 1988). Moorman, Deshpande, and Zaltman (1993) have claimed that, without vulnerability, trust is unnecessary because the outcomes are insignificant for the trustor. Due to the literature's focus on the vulnerability aspect of trust, this thesis relies on the definition proposed by Mayer, Davis, and Schoorman (1995), considered one of the most robust. Trust is defined here as follows:

> The willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party. (Mayer et al., 1995, p. 712)

Trust is considered a multi-level, multi-dimensional, and dynamic concept. (Butler, 1991) Like most inter-organizational studies of trust, this thesis emphasizes interpersonal trust as a starting point. According to Gulati (1995), "Intuitively, trust is an interpersonal phenomenon" (p. 92). Trust may exist on the inter-organizational level, which is the type explored in this thesis (Bradach & Eccles, 1989). McAllister (1995) has distinguished between affect- and cognition-based aspects of trust. Although his framework concerns the interpersonal level, it may also work at the inter-organizational level because individuals decide about accepting vulnerability—even if they do so on behalf of organizations. Sako (1998) has applied a similar analysis and suggested that trust can be based on the trustee establishing competence, goodwill, or contractual promise-keeping. Mishra (1996) has noted comparable components of trust and argued that trust is founded on competence, openness, reliability, and caring.

Further, Das and Teng (2001) have conceptualized trust as two-dimensional and emphasized the importance of competence and goodwill. The variation among these studies illustrates that trust can have different foundations. However, in line with McAllister (1995), this thesis studies trust according to affect-based and cognition-based views.

Affect-based trust concerns the emotional bonds between individuals (Lewis & Weigert, 1985). People make emotional investments in trust relationships, express genuine care and concern for their partners' welfare, believe in the intrinsic virtue of such relationships, and have faith that these sentiments are reciprocated (Pennings & Woiceshyn, 1987; Rempel et al., 1985). On the other hand, Cook and Wall (1980) have offered a broad definition of cognition-based trust, defining it as a trustor's belief in the trustee's competency or ability to meet their obligations. Mishra (1996) has identified competence as the ability to interpret information correctly, and Nooteboom (2002) has incorporated the skills and knowledge required to use technology into the concept. Thus, cognition-based trust is grounded in the perceived trustee's abilities, skills, and expertise, which together facilitate performance in a specific domain (Mayer et al., 1995; McAllister, 1995; Sako, 1998). In this thesis, the terms "cognition-based trust" and "competence-based trust" are used interchangeably.

Several scholars have highlighted the importance of trust in emergency management (e.g., Kapucu et al., 2010; Lundberg & Asplund, 2011; Mishra, 1996), as trust is known to reduce conflict, increase knowledge-sharing, and make people more cooperative in their operational behavior (Ouchi, 1981). According to Longstaff, Yang, and Society (2008), trust appears to improve communication during emergency collaboration, while a lack of trust increases the need for preparedness efforts before latent incidents. Inspired by the insights from the literature on trust, the emergency management literature has also addressed the importance of inter-organizational trust in the emergency management context (Foulquier & Caron, 2010).

Uhr, Johansson, and Fredholm (2008) have described trust as a latent system condition that influences the manifestation of organizational tasks, inter-organizational boundaries, and structures. Relationships developed before the actual emergency response (i.e., through daily collaboration) serve to build trust, decrease inter-organizational boundaries, and tie organizations together (Kapucu, 2006). Kapucu (2006) has argued that trustworthy networks of relationships between organizations should ideally be built before emergencies occur. Building trust in the preparedness phase requires a willingness to collaborate, information-sharing, and a set of shared values (Kapucu, 2006). Inter-organizational pre-training allows social relationships between partners to develop over time, which may create trust and shared mental models (Franco et al., 2009). However, although trusting organizational relationships are important for IC, Kapucu, Arslan, and Demiroz (2010) have explained that interdependency between organizations can increase the likelihood of successful collaboration, even if trust is lacking, and can serve as a foundation for building trust.

Trust in organizations is often regarded as something that develops and strengthens over time (Kramer, 1999; Mayer et al., 1995). However, this may not be possible in temporary groups of diversely skilled people who are expected to work collaboratively on a complex task, often under time constraints (Goodman & Goodman, 1976). *Collaborative emergency responses* are examples of temporary organizations, where a temporary team is assembled on an as-needed basis for the duration of a task and staffed by members of different organizations or even different countries (Meyerson et al., 1996). In such a team, members from different organizations and levels must collaborate. Communication occurs primarily through technological aids, such as radio, phone, and email. People from different organizations rarely or never see one another in person. According to O'Hara-Devereaux and Johansen (1994), “Trust is the glue of the global workspace and technology doesn’t do much to create relationships” (pp. 243–244). The organizations responding to emergencies depend on an elaborate body of collective knowledge and diverse skills and have limited time—or no time at all—to identify the knowledge of all participants (Meyerson et al., 1996). In

emergency events, liaison officers from several organizations who infrequently work together are expected to operate synergistically.

The configuration of temporary organizations in time-critical environments is challenging because of the cultural differences between these organizations. Goodman et al. (1976) have found that some temporary groups that do not have a history of trust development display behaviors that presuppose trust. This finding was important, as trust has been identified as influencing an organization's intention to collaborate (Mohr & Spekman, 1994). The rapid-action requirements of many temporary collaborative-working organizations (Faraj & Xiao, 2006) mean there is often little time to develop trust in the traditional ways (Hyllengren et al., 2011).

Overall, emergency organizations must function as temporary collaborative organizations under joint command. In such temporary organizations, under extreme time pressures, swift trust (Meyerson et al., 1996) may emerge quickly. The concept of *swift trust* was developed to explain behaviors in face-to-face temporary teams. In a temporary team, team members have never worked together before and do not expect to do so again (Meyerson et al., 1996). Members of such teams do not have the time to develop trust gradually and cumulatively. Rather, they must act as though trust were present from the start (Jarvenpaa et al., 1998). While trust is typically conceptualized as either an affective construct or a competence construct, swift trust is a form of depersonalized action (Jarvenpaa et al., 1998). It enables members to take action, which in turn helps the team maintain trust and deal with uncertainty, ambiguity, and vulnerability while working on complex interdependent tasks with unfamiliar persons in a situation of high time-pressure (Meyerson et al., 1996). Elements of swift trust include a willingness to suspend doubt as to whether others who are strangers can be counted upon to work on the group's task, as well as a positive expectation that the group activity will be beneficial. Institutionalized and well-defined roles support such trust (Möllering, 2006); therefore, this may be relevant

in emergency responses. Moreover, swift trust is built and maintained by a high level of activity and responsiveness (Coppola et al., 2004).

2.4.1 Trust processes (as stages)

This thesis follows Schilke and Cook's (2013) theory and analyzes trust at both the individual and organizational levels, leading to a cross-level development of trust in an inter-organizational context. The cross-level trust development model includes four consecutive stages (Schilke & Cook, 2013): initiation, negotiation, formation, and operation. A specific relationship between a trustor and a trustee, where either party can be an individual or an organization, characterizes each stage. In the initiation stage, potential partners are first identified before being evaluated and selected. The individuals most relevant to the implementation of inter-organizational relationships are denoted as 'boundary spanners' (Currall & Judge, 1995; Perrone, Zaheer, & McEvily, 2003); they may be managers, directors, or their representatives, and they are primarily in charge of the relevant inter-organizational relationships (Currall & Inkpen, 2003). In the initiation stage, the boundary spanner gathers clues regarding the trustworthiness of the partner organization. The information gained provides a foundation for the development of individual-organization trust. If people become acquainted during interpersonal interactions, the negotiation stage is reached. Here, the boundary spanner communicates with their counterpart in the partner organization, engaging in negotiations. These individual-individual negotiations significantly shape the boundary spanner's trust beliefs. The formation stage involves establishing the partnership by committing various resources (Schilke & Cook, 2013). Here, the boundary spanner transfers trust in an individual counterpart to the partner organization (individual-organization). Consequently, in the operation stage, a common understanding about the trustworthiness of the partner organization develops and becomes institutionalized; in this way, organization-organization (inter-organizational) trust is established (Schilke & Cook, 2013). Finally, in new relationships between organizations with prior inter-organizational experience, organizational-level trust feeds back into the boundary spanners' trust (Schilke & Cook, 2013).

Gausdal's (2012) framework for trust-building processes in the context of networks can be closely linked to Schilke and Cook's (2013) model. In this framework, contact, communication, direction, resource-sharing, and temporary groups are identified as five trust-building processes (Gausdal, 2012). Four of these processes may explain what happens in Schilke and Cook's (2013) four stages; however, Schilke and Cook (2013) do not address Gausdal's fifth process—temporary groups and the building of swift trust. Contact, which implies that people from different organizations meet face-to-face for rich communication and interaction, may happen at the initiation stage, while frequent and collaborative communication may occur at the negotiation stage. Direction, which includes developing a common language, values, and goals, may happen at the formation stage. Finally, resource-sharing, which includes sharing scarce resources, such as time, people, equipment, and infrastructure, may occur at the operation stage. Thus, Gausdal's (2012) trust-building processes may also be viewed as stages of trust.

Although trust is considered an important factor in the emergency management literature and has been identified as key to improving IC, studies of building processes and enhancing trust at inter-organizational levels in emergency management are scarce (Lane & Bachmann, 1998). The concept of trust is explored in Articles 1 and 3.

2.5 Learning

Learning is a critical factor in emergency response organizations because it can develop individual, group, and organizational competence (Tynjälä, 2008). Learning is typically defined as a relatively permanent change in knowledge, skills, or attitudes produced by an experience (Salas et al., 2006). It can be described as processes taking place at different levels, where learners may be individuals, groups, whole organizations, or inter-organizational networks (Tynjälä, 2008). Learning is a multi-dimensional phenomenon with several possible approaches; in this thesis, the focus is on learning from joint training in an emergency context. Working definitions of "learning" at different levels are presented below.

Learning at the individual level is defined here as acquiring new knowledge (Sommer & Njå, 2012). Scholars have identified two major interpretations of individual learning (Becket & Hager, 2002; Harel & Koichu, 2010; Malloch et al., 2010). The individual cognitive approach to learning focuses on individuals as learners, where learning is understood as the acquisition of information and reasonable behavior (Baddeley, 1999; Bandura & Walters, 1977; Ormrod, 2020; Piaget, 1972; Skinner, 1965). The sociocultural approach to learning focuses on the social relations between people rather than on the individual in isolation (Gherardi et al., 1998). Hence, learning from joint training is considered to be situated in and occurring through processes of participation in various activities and interactions among colleagues (Billett, 2010; Collin, 2002; Eraut, 2007; Lave & Wenger, 1991; Wegner, 1987). Several definitions of "group learning" emerged from a review of the literature. This study uses the definition proposed by London, Polzer, and Omoregie (2005), which describes group learning as "the extent to which members seek opportunities to develop new skills and knowledge, welcome challenging assignments, are willing to take risks on new ideas, and work on tasks that require considerable skill and knowledge" (p. 114).

Extensive literature reviews have explored organizational learning with multiple conceptualizations (Crossan et al., 1995; Easterby-Smith, 1997; Huber, 1991; Jones & Macpherson, 2006). The general definition by Huber (1991) details the point of departure toward understanding organizational learning: "An organization learns if any of its units acquire knowledge that it recognizes as potentially useful for the organization" (p. 126). This definition is valuable because it avoids the assumption that learning inevitably leads to mental and behavioral changes. However, this definition does not address the process aspect of learning and does not explain when and how the knowledge obtained is useful (Crossan et al., 1995; Torres & Preskill, 2001). Therefore, this thesis follows the cross-level process approach, which assumes that organizational learning is a multi-level process linked through psychological and social processes (Bratianu, 2015; Crossan et al., 1999). Learning from experiences with other organizations is a primary method of organizational learning (Levitt & March, 1988).

This experience highlights the importance of organizations emphasizing collaboration and exploring learning that builds on relationships between organizations (Jones & Macpherson, 2006). This point leads to the final level—namely, inter-organizational learning—which is a natural result of the growing importance of inter-organizational relationships. In recent years, the focus of studies on organizational learning has shifted to multi- and inter-organizational learning (Mozzato & Bitencourt, 2014). Inter-organizational learning can be seen as the collective acquisition of knowledge by groups of organizations, thereby encompassing the notion of interaction between them (Larsson et al., 1998). Thus, inter-organizational learning is distinct from organizational learning in that it includes the effects of interaction between organizations, which generate synergy and foster learning (Mozzato & Bitencourt, 2014). Moreover, organizations tend to learn from the experiences of others rather than from their own (Perry, 2004). Inter-organizational learning is supported by organizational processes of knowledge creation and retention (Greve, 2005).

Researchers including Crossan, Maurer, and White (2011); Engeström and Kerosuo (2007); Greve (2005); Hardy, Phillips, and Lawrence (2003); Inkpen and Tsang (2007); Jones and Macpherson (2006); and Nooteboom (2008) have highlighted the need for more studies on inter-organizational learning. Thus, inter-organizational learning processes have become an increasingly relevant field of research, particularly as researchers attempt to understand the context and processes involved in new organizational relationships and settings. However, in previous studies, inter-organizational learning in relation to different settings has not been thoroughly explored (Crossan et al., 2011; Engeström & Kerosuo, 2007; Inkpen & Tsang, 2007; Knight & Pye, 2005; Larsson et al., 1998). The thesis aims to contribute to closing this knowledge gap by extending the literature on inter-organizational learning processes from the joint training perspective.

Crossan, Lane, and White (1999) have developed the 4Is framework, which illustrates the processes of learning and how those processes evolve and are

incorporated within organizations. The framework contains a multi-level view of learning and consists of different learning processes that occur within an organization, such as intuiting, interpreting, integrating, and institutionalizing. Crossan et al. (1999) have defined *intuiting* as a subconscious process that occurs at the individual level. They argue that this is the beginning of learning and is bound to happen in a single mind (Crossan et al., 1999). *Interpreting* is the second learning process, which Crossan et al. (1999) have defined as the conscious elements of individual learning shared in groups. *Integrating*, the third learning process, is defined as the change of collective understanding at the group level, which functions as a bridge to the organizational level. In this learning process, the authors argue that the development of shared understanding between individuals occurs and that a change in action is based on mutual adjustments. Crossan et al. (1999) have defined *institutionalizing* as the process in which learning is incorporated across the organization. This process works by embedding learning into the organization's systems, structures, routines, and practices. The process of institutionalizing depends on the defined tasks, specified actions, and organizational mechanisms implemented so that the learning can be put into action (Crossan et al., 1999). Later, Jones and Macpherson (2006) extended the 4I framework to a "5I framework" by including the inter-organizational level and adding *intertwining* as the fifth process (the fifth "I"). The term *intertwining* indicates active engagement between an organization and its external knowledge network. It also conveys that learning mechanisms are at the interstices between organizations and not only within organizational boundaries.

This thesis follows the multi-level view of learning because insights and ideas occur in individuals and not organizations (Nonaka & Takeuchi, 1995; Simon, 1991). Nevertheless, an individual's knowledge does not independently come to bear on the organization. Instead, ideas are shared between individuals, with actions being taken and mutual understanding being developed (Daft & Weick, 1984; Huber, 1991; Argyris & Schön, 1996; Stata, 1989). In this thesis, the term *collaborative learning* is used to

describe collaboration-related learning from joint training explored in each learning process.

2.5.1 Collaborative learning

In this thesis, *collaborative learning* refers to learning from joint training about the structure, culture, interests, and capabilities (and limitations) of other organizations and the systematic assessment of lessons learned to improve future collaborations. Collaborative learning is important because it helps resolve intractable problems (Jones & Macpherson, 2006). Participation in a collaborative network enables organizations to cross boundaries between organizations and fields of expertise (Tynjälä, 2008). As Fayard et al. (2008) have stated, collaboration between organizations, unlimited by organizational boundaries, gives rise to collaborative learning.

There are multiple ways of enhancing collaborative learning, including drawing on personal experiences, engaging in problem-solving processes, participating in collective reflection forums, and enhancing individual knowledge (Sommer & Njå, 2012). Joint training should emphasize collaborative learning elements and have a clearly defined purpose to develop collaborative abilities (Andersson et al., 2014). For example, before an exercise, participants must be informed that the primary objective is to develop collaboration rather than solve complex and predefined tasks. Exercises that have an explicit collaboration focus, provide clear instructions, and are free from long waiting times are perceived to strengthen collaborative learning that can be useful in an actual emergency response (Berlin & Carlstrøm, 2015). Therefore, it is advantageous for exercises to be limited in scope so that participants can maintain an overview of ongoing scenarios and collaborative developments (Andersson et al., 2014). Unfortunately, emergency exercises have tended to focus rather narrowly on the development of technical skills and expertise. While the acquisition of technical skill is clearly a necessary condition, organizations have become increasingly aware of the importance of interpersonal competencies for effective IC (Berlin & Carlstrøm,

2015). Thus, researchers have recognized the need for greater focus on collaborative learning from joint training.

The goal of joint training should not necessarily be to practice predefined tasks but rather to develop learning about common tasks, such as inter-organizational awareness and collaborative performance (Borell & Eriksson, 2013). The idea of collaborative learning in joint training is rooted in Stein's (1997) theories of first-order and second-order learning (Berlin & Carlstrøm, 2015). From an emergency perspective, *first-order learning* occurs when participants acquire knowledge during an exercise but do not transfer or apply that knowledge to a real incident. *Second-order learning*, in contrast, occurs when participants take the knowledge acquired from the exercise and apply it to real-life scenarios.

Although interest in the learning dimension of exercises has grown in recent years (Berlin & Carlstrøm, 2008, 2011, 2014, 2015; Kim, 2013; Perry & Lindell, 2003; Roud & Gausdal, 2019; Stein, 1997), studies have yet to explore collaborative learning as a critical element to improve IC in emergency management. Collaborative learning is further addressed in Articles 2 and 3.

2.6 Improvisation capability

The notion of improvisation arises in varied contexts, and the term *improvisation* has been defined differently in various domains, including management, music, theater, therapy, and education. Several of these definitions share similar features, such as the "just in time strategy" (Weick, 1987, p. 229), "real-time composition" (Pressing, 1988, p. 142), "practice without planning" (Embrey et al., 1996, p. 22), creative and spontaneous behavior for the management of an unexpected event (Magni et al., 2009), simultaneous conception and execution (Zheng et al., 2011), and as a response to an unexpected or unanticipated situation that is outside the boundaries of an organization's preparations (Magni et al., 2009).

Increasingly, improvisation is described as a capability. However, although the term *capability* is used extensively in the literature, its meaning differs among researchers (Barreto, 2010). In this thesis, having a specific capability implies that the organization (or its parts) can perform a particular activity in a reliable and at least minimally satisfactory manner (Helfat et al., 2009). This thesis follows Winter's (2003) view of a capability as a high-level routine, where routines are behaviors that are learned, highly patterned, repetitious or quasi-repetitious, and founded in part in tacit knowledge. Therefore, improvisation capability requires high-level practice of regularly practiced routines. Improvisation occurs at various levels; this thesis refers to improvisation at the inter-organizational level, where more than one actor, who may be either a person from another organization or a group of people from different organizations, is involved (Frykmer et al., 2018). Hence, this thesis defines *improvisation capability* as the organization's capacity to act spontaneously when responding to problems or opportunities in a novel way. However, improvisation capability goes beyond ad hoc activity that does not reflect practiced or patterned behavior and does not solely refer to a spontaneous action (Vera et al., 2016; Helfat & Winter, 2011). Rather, improvisation capability is a process of considering different options and previous experiences, which is made possible when there are known standards that support the overarching goal (Czarniawska, 2009).

The emergency management literature has long emphasized the need to plan for unexpected events (Bullock et al., 2017; Dynes & Drabek, 1994; Lindell et al., 2006). Plans constitute institutional knowledge that extends beyond individuals who have experienced prior disasters. The planning process is designed to imagine emergency scenarios not previously anticipated, foster the development of informal networks, and facilitate IC (Wachtendorf, 2000; Wachtendorf, 2004; Hightower & Coutu, 1996). Pre-planning enhances the capabilities of the organizations involved (Dynes & Drabek, 1994). At the same time, every definition of an emergency implies that community resources are stressed or overwhelmed (Kreps, 1998), making it impossible to plan fully for every eventuality. Plans that claim to account for every contingency an emergency

may present become “fantasy documents.” Such documents indicate that plans have been made to contend with improbable events rather than provide assurance that the plan fully anticipates every challenge that a disaster would pose (Clarke, 1999; Wachtendorf, 2004). Consequently, in an emergency situation, improvisation occurs under increased time constraints and in environments with a high degree of ambiguity (Frykmer et al., 2018; Kendra & Wachtendorf, 2007; Mendonça, 2007; Mendonça, 2001; Webb & Chevreau, 2006). As a result, improvising can be risky. At times, the improvised action is beneficial, while it may have negative consequences in other cases. In this thesis, the focus is on the beneficial aspect of improvisation and the need for flexibility in organizational structures.

Quarantelli (1998) has noted several conditions that influence emergent action, including the perception of a need to act on urgent matters, a supportive social climate for collective action, relevant pre-emergency relationships, and access to resources. Plans may change rapidly: they may cease to be applicable (Turner, 1995); they may need to accommodate many organizations involved in a larger emergency response due to the multifaceted nature of an event (Mendonça, 2001); the allocation of resources for one task may render them unavailable for other tasks (Turner, 1995); and the responsibility for dealing with unexpected circumstances may not have been assigned to a particular organization (Scanlon, 1994).

Emergency events increase the need for collaboration among actors from numerous emergency organizations. Variables that complicate emergency responses are the presence of various formal and informal institutions (Van de Ven & Walker, 1984), cultural differences, and a lack of trust between different parts of the preparedness system (Cohen et al., 1999; Kapucu, 2006). Increased environmental volatility may also call for command structure flexibility for improvisation and rapid reorganization for further collaboration (Borch & Batalden, 2014; Turoff et al., 2009). Therefore, the improvisation capability can be an important element of effective IC in emergency response (Mendonça, 2001). This ability can be developed through joint

training (Rerup, 2001). Collaboration exercises can enable organizations to act under conditions of uncertainty and pressure, with limited access to resources and information, developing improvised performances the way they would in a real situation (Woods & Hollnagel, 2006). Thus, exercises may help organizations develop the improvisation capability needed in critical situations. Although some researchers have studied the concept of improvisation in emergency management, few studies have explored improvisation capability as a critical element to improve IC. This concept is considered in Article 4.

2.7 Conceptual model

Based on the literature presented, a conceptual model was developed that explains the relationships between the variables considered for the thesis (see Figure 1 below).

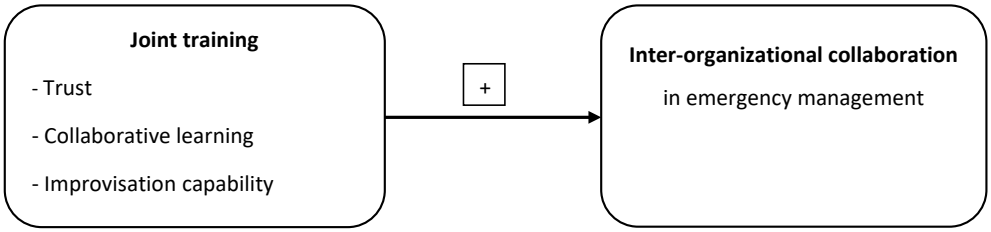

Figure 1. Preliminary conceptual model

3. Methodology

This chapter covers the methodological aspects of this doctoral thesis. It first presents the argument for the pragmatic perspective and then discusses the choices regarding research design. Further, it presents the empirical setting and data collection. The chapter closes with an assessment of the quality of this research and an elaboration of the ethical considerations.

3.1 A pragmatic perspective

A research philosophy is a system of beliefs and assumptions about the development of knowledge. One develops knowledge in a specific field when embarking on research (Saunders, 2011). At every stage of the research, one makes numerous assumptions, which are made consciously or otherwise (Burrell & Morgan, 2017). These include assumptions about human knowledge and the realities encountered in the research. These assumptions inevitably shape the researcher's understanding of the research questions, the methods used, and the interpretation of the findings (Crotty, 1998). There are five major philosophies in business and management research: positivism, critical realism, interpretivism, postmodernism, and pragmatism. This thesis is inspired by a pragmatic philosophy.

Inexperienced emergency managers commonly respond to ambiguity by calling for more information. They are usually trained to make critical decisions based on assessments of short- and long-term consequences rather than multiple scenarios (Ansell & Boin, 2019). While coordinating for large-scale emergencies, they rely on plans and established structures that are not well suited to such complex events (Clarke, 1999). This approach is rational and reasonable (Klein, 2011; Zelikow & Allison, 1999). However, while such a rational approach may be appropriate when problems are relatively simple and stable, what works in normal conditions does not necessarily work in times of emergency (Ansell et al., 2017). This response may, in fact, be unfavorable. Some circumstantial evidence suggests that emergency managers who

excel in times of emergency tend not to follow the rational approach (Bechky & Okhuysen, 2011; Weick & Sutcliffe, 2011). Ansell and Boin (2019) offer this explanation:

> They realize that uncertainty is inherent to crisis. They work with what they have, making decisions based on a few core principles rather than a semi-complete picture of the situation; they stumble forward relying on the professionalism of their employees, offering communications that carefully balance imagery with facts. (p. 1018)

To those who lack experience and training, this approach may appear to be unclear and unstructured, and arguably, it is. However, this is not the "chaos" so often defined by observers of emergency management (Ansell & Boin, 2019). Ansell and Boin (2019) have argued that this approach is best described as pragmatic, as pragmatic ontology and epistemology focus on improving practice. Pragmatists adopt a wide range of research strategies, the choice of which is driven by the specific nature of the research problems (Saunders et al., 2015).

A group of American philosophers and social thinkers have formulated the principles of pragmatism (Menand, 2001). As a philosophy, pragmatism emphasizes the experiences of individuals in their interactions with the world and defines *truth* as that which works (Kelemen & Rumens, 2008). This thesis takes a pragmatic approach because of its practical rationality and focuses on problem-solving in the face of uncertainty. Pragmatism reflects a compromise between objectivism and subjectivism and accepts the use of both qualitative and quantitative methods in the study of a topic (Rossman & Wilson, 1985). This thesis adopts both methods to examine different aspects of the same phenomenon in a single case study. Pragmatism has influenced theorizing around policy-making, institutions, organizations, and public administration (Ansell & Boin, 2019), but it has not been applied extensively in the academic study of emergency management.

This thesis assumes the pragmatic view of what constitutes reality. For example, in Article 3, emergency exercises are studied to examine the usefulness of FSEs and

TTEs, which has direct implications for practice. The ontology of pragmatism recognizes that reality is complex and embedded in a flow of interconnected events (Fendt et al., 2008). Such complexity is acknowledged in all four articles. Regarding epistemology, pragmatism focuses on problem-solving and guiding further action (Miettinen, 2006). In this thesis, the knowledge that is produced highlights the meaning of collaboration from different perspectives in emergency management and guides emergency management practice. For example, Article 4, which deals with improvisation capability, provides insights into how improvisation capability is improved to achieve a higher level of performance in emergency responses.

Instead of moving from theory to data (as in deduction) or from data to theory (as in induction), an abductive approach moves back and forth between the two (Suddaby, 2006). Importantly, abduction is not simply a combination of induction and deduction, as it also adds specific elements. According to Alvesson and Skoldberg (2009), abduction focuses on understanding both the underlying and overarching patterns. This approach to theory development aligns with what many organizational and management researchers actually do. In the abductive approach, data are collected to explore a phenomenon, identify themes, and explain patterns. This generates a new theory—or modifies an existing theory—that is subsequently tested through additional data collection (Saunders et al., 2015). The abduction approach to theorizing is used at the thesis level; in an individual article, knowledge is produced through different modes of theorizing that are often appropriate to the pragmatic philosophy (Saunders et al., 2015).

3.2 Research design: Case study

The research design determines how this study should be conducted to answer the overarching research question, “How can joint training improve inter-organizational collaboration in emergency management?” . A case study design was selected in this thesis for several reasons (Eisenhardt, 1989; Silverman, 2017; Yin, 2011). First, case studies can be a valuable starting point if there is only limited theoretical knowledge

about a particular phenomenon and where a practical/pragmatic result to inform practice is desired (Siggelkow, 2007; Creswell, 2003; Johnson & Onwuegbuzie, 2004). As outlined in previous chapters, our knowledge about the role of joint training in improving IC in emergency management and its contribution to trust, collaborative learning, and improvisation is indeed still limited. Hence a case study design seemed the most suitable manner to investigate the role of joint training in IC in emergency management.

Second, case studies are most appropriate when the researcher is interested in "how," "what," and "why" questions, and this thesis asks a "how" question (Yin, 2003). Based on the formulation of the overarching research question in this thesis, a case study is suitable because it involves an in-depth investigation of single or multiple cases to acquire profound and detailed information related to the phenomena under investigation in its context (Eisenhardt, 1989; Silverman, 2017; Yin, 2011). This thesis is particularly interested in exploring the relationship between joint training and IC (see Figure1) and gaining in-depth knowledge to generate further questions, defining the grounds for new research in the conclusions. For that purpose, a preliminary conceptual model (Figure1) grew out of the literature review and was made concrete by examining theory in light of the emergence reality of the case. The preliminary conceptual model was continually revisited and revised as the study progressed and finally presented in the discussion (Figure 2). The revised conceptual model (Figure 2) was developed based on the storyline that emerged in the case under study and helped the author understand how organizations, acting together, may contribute to improving IC in emergency management.

Third, case studies are particularly relevant when it is necessary to understand a complex social phenomenon because of its uniqueness (Swanson & Holton, 2005). The multidisciplinary nature of emergency management and the complexity inherent in IC make the phenomena under study unique and complex. Therefore, the author of this thesis chose a case study that enabled her to explore the patterns based on the

emergency personnel's interpretation of the role of joint training on IC and the inherent meaning linked to their action. This in-depth exploration of the phenomenon in this thesis increased the possibility of understanding the latent and underlying issues in the selected case (Thomas, 2011; Miles, Huberman et al., 2018). Recognizing the interrelation between the critical elements of IC in the case of this thesis is a result of the in-depth exploration of the phenomenon (see Figure 2).

In addition, the author chose the case study design because it enables flexibility and openness to adapt to inquiries throughout the research process (Patton, 2002; Miles & Huberman, 1994). Finally, case studies permit researchers to engage in close interaction with practitioners (Gibbert, Ruigrok, & Wicki, 2008), which is fruitful for studying practices (Cetina, Schatzki, & Von Savigny, 2005).

By defining a case study as a design whose purpose is to describe as accurately as possible the fullest, most complete description of the case, it follows that the researcher determines not only how and why a phenomenon occurs, but also what it is, how much, how often, where it came from, and so on. In short, the goal of capturing the complexity of the phenomenon in its context requires, at a minimum, consulting multiple sources of data (Swanson & Holton, 2005). Although case studies are often qualitative, case study research can also embrace the quantitative paradigm and be based on "any mix of quantitative and qualitative evidence" (Yin, 2003, p. 15). Therefore, this thesis includes quantitative and qualitative methods (a mixed-methods approach) within a case study design to increase the overall validity and capture the complexity of the phenomenon under investigation. The quantitative data of this thesis covered the behavior that the selected case sought to explain (the outcome of joint training).

3.2.1 Mixed Methods

The choice to use mixed methods was largely influenced by the specific research question in each article. The quantitative method (Johnson & Onwuegbuzie, 2004;

Maxwell & Delaney, 2017) articulates assumptions consistent with what is commonly called a "positivist philosophy." Such research maintains that social science inquiry should be objective—i.e., time- and context-free generalizations (Nagel, 1986) are desirable and possible, and the real causes of social scientific outcomes can be determined reliably and with validity. The qualitative method values constructivism, idealism, relativism, humanism, hermeneutics, and, sometimes, postmodernism (Guba, 1990; Guba & Lincoln, 1989; Schwandt, 2000). In such research, time- and context-free generalizations are neither desirable nor possible (Guba, 1990).

A *mixed-methods* approach can be defined as the "use of two or more research methods in a single study, when one or more of the methods is not complete itself" (Morse, 2016, p. 9). The mixed-methods approach recognizes that both quantitative and qualitative methods are important and useful. This approach aims not to replace either of these methods but rather to draw from the strengths and minimize the weaknesses of both in a single research study and across studies (Onwuegbuzie & Leech, 2004). The mixed-methods approach allows the researcher to address the research problem from different angles, enhancing understanding and testing more potential relationships (Molina-Azorin et al., 2012). This approach is used at the thesis level, in which individual articles built on separate methods are combined in a thesis to respond to the research problem. Philosophically, mixed-methods research uses the pragmatic system of philosophy.

The initial part of the thesis (Articles 1 and 2) employs qualitative methods that provide insights into the research problem in general and the concepts of trust and learning in particular. Subsequently, these concepts are investigated using a quantitative method (Article 3). The quantitative part of the thesis involves a study of emergency exercises, rather than real incidents, because they are the part of the training that is accessible; thus, the concepts could be measured quantitatively.

Some researchers argue that incommensurability issues (i.e., a lack of common measures) can arise with mixed-method research (Kuhn, 1996). However, others argue that the method is beneficial because it allows the study of a phenomenon from different perspectives (Yvonne Feilzer, 2010). Employing both qualitative and quantitative methods thus provides a more complete understanding of the topic, and the work thus benefits from the strengths of each method. In this respect, the choice here was aligned with the pragmatic perspective, which views the use of multiple methods as desirable (Rossman & Wilson, 1985).

3.3 The empirical setting of the case

The importance of social context and the empirical setting has long been debated in organizational studies (Pfeffer et al., 1976; Weick, 1995). The field of this thesis is emergency management, and the Arctic Sea region was selected as the context. The main types of emergencies in the Arctic are search and rescue (SAR), oil spills, terrorist attacks, fires on ships, and mass evacuations. Even if the probability of such emergencies is low, the consequences can be complex and catastrophic (Coppola, 2006). The Arctic Sea region is multi-national, and because emergency management at sea involves both civil and military—or naval—organizations, data for this thesis were collected from both types of organizations. The empirical data in this thesis are primarily from three Arctic countries (Iceland, Canada, and Norway), with some additional findings from Russia.

Among others, police, joint rescue centers (JRCC), coast guards (CG), fire brigades, and volunteer organizations such as the Red Cross are the key organizations involved in emergency operations in the selected case. In emergency situations, these organizations act to solve a common set of problems with shared resources, knowledge, rules, and structures (Beck & Plowman, 2014). However, this thesis interviews the JRCC (civil) from the operational level and the CG (military) from a tactical level because, in almost all types of Arctic emergencies, they are involved and closely collaborate. Though the organization of maritime emergency response differs worldwide, in terms

of command structures and vertical and horizontal hierarchies, JRCCs and CGs have a similar set of responsibilities with respect to emergency management in all three Arctic countries. The comparable organizational profiles were another reason to study them in this thesis. However, the quantitative data of the study also includes personnel from fire brigade, police, and oil response organizations; captains of large passenger vessels; and the JRCCs and CGs.

The empirical setting of the case is the Arctic Sea region for two reasons. First, the Arctic context amplifies the challenges related to emergency response due to extreme climate and weather conditions, combined with long travel distances and sparsely populated areas (Borch et al., 2016). Because of this, emergency response actions in the Arctic Sea region are recognized as particularly challenging jobs that demand highly skilled emergency personnel, including responders on board the ships that operate in these areas. Thus, managing emergencies in the Arctic Sea region increases the need for collaboration between organizations not only within one country, but also support from neighboring countries because of limited infrastructure and emergency capacity (Kheiri Pileh Roud et al., 2016).

Emergency response systems in most countries are characterized by strict structures, a high degree of formalization, and a range of SOPs for different kinds of response operations. There is a command hierarchy, written communication routines, and a broad set of laws and regulations behind the operational system. These may make collaboration more challenging in the Arctic Sea region. Emergency organizations might have to deviate from the established organizational structures and management principles (Andreassen & Borch, 2020) to deal with the complexity of emergency events there. This complexity is related to the range of organizational levels with the increasing number of interdependencies of heterogeneous elements—teams of organizations, jurisdictions, and management levels (Czarniawska, 2007; Weick & Sutcliffe, 2011). Elgsaas and Offerdal (2018) have suggested that proper institutional arrangements, cross-border collaboration activities within the maritime preparedness

systems, and the common interests of collaboration in the region may improve the overall emergency preparedness in the Arctic. However, navigating the complex systems of emergency preparedness within each country is a challenging task. There is a range of linguistic and cultural differences and divergent roles in international politics. There might be a need for instant, on-the-spot tailor-making in the forms of cooperation used in specific situations. Therefore, familiarity with neighboring countries' emergency preparedness systems in the Arctic is an important issue.

Second, the growth in commercial activity in the Arctic Sea region increases the potential for unwanted events (Borch et al., 2016). Much of this commercial activity is linked to passenger and cruise transportation involving many vessels, ranging from large cruise ships carrying thousands of passengers to smaller open boats taking tourists to local destinations. For example, in the Norwegian Sea region, such activity is expected to increase in the coming years (Brunvoll, 2020). Maritime operations in the Arctic face the challenges of limited infrastructure and fast-changing weather conditions, such as low temperatures with ice and icing, polar lows, and, in winter, the polar night (Marchenko et al., 2015). A change in traffic patterns calls for an increased focus on possible accidents that could negatively impact lives, health, and the Arctic environment. Threats to human safety and the environment, as well as a challenging context, necessitate a strengthening of the maritime preparedness system and IC in this area (Borch & Andreassen, 2015).

The Norwegian government recognizes the need to strengthen preparedness and capacity in the Arctic due to increasing traffic and activity levels. In response to the challenges mentioned above, the Norwegian government has defined new priorities for foreign policy development in the Arctic region. There is a need for more robust solutions, detailed policies, a solid understanding of the Arctic ecosystem, academic knowledge and expertise in different areas, and close dialogue between various parties. Norway intends to strengthen international collaboration over multilateral initiatives, such as the Arctic Council, and teamwork between research communities and the

private and public sectors at the national and international levels; further develop research activities; develop the transport system in the north; and promote sustainable economic activity in the north for better emergency preparedness and environmental protection (Norwegian Ministry of Foreign Affairs, 2014). This thesis explores the role of joint training in improving IC in emergency management in the Arctic to shed light on this recognized need.

3.4 Data collection

This thesis consists of one semi-conceptual article and three empirical studies. The data collection methods include semi-structured in-depth interviews, archival document analysis, observations, and a survey. The methods used in each article are summarized in Table 2 and further explained below.

Table 2. **Overview of methods**

	Article 1	**Article 2**	**Article 3**	**Article 4**
Article title	Trust and emergency management: Experiences from the Arctic Sea region	Emergency collaboration exercises and learning: Experiences from the Arctic	Trust and learning from collaborative emergency exercises: differences between full-scale and tabletop exercises	Collective improvisation in emergency response
Method	Qualitative	Qualitative	Quantitative	Semi-conceptual
Design	Case study	Case study	Survey	Combination of a literature review and an empirical pilot study
Data material	21 interviews and observations of three exercises	Archival data, such as logs, reports, and presentations; exercise observation reports; and background conversations from four exercises	Answers from 173 respondents	Review of 23 articles on improvisation and emergency management; six interviews

3.4.1 Interview

The interview is the most widely used qualitative method, partly for its flexibility and the level of interaction it allows with participants (Bryman & Bell, 2015). The degree to which the interview should be structured depends on the research purpose and context, and the options range from unstructured to survey interviewing (Patton, 2002). Three main types of interviews are used in qualitative research: highly structured, semi-structured, and unstructured. Structured interviews are sometimes known as "standardized" or "scheduled," and they principally consist of a questionnaire administered by interview. Each respondent is asked the same questions, in the same order, though there may be an "open comments" section, as in a self-administered questionnaire (Williamson, 2018). In semi-structured interviews, the interviewer has a list of questions in the general form of an interview guide, but the sequence of questions can vary. The interviewer usually has the opportunity to ask further questions (Bryman & Bell, 2011). In an unstructured interview, the interviewer has only a list of topics to cover.

According to Kvale (2008), interviews are valuable for gaining an understanding of the meanings that people associate with contexts. The contextual complexity of this thesis and the multidimensional nature of elements for improving IC necessitate qualitative interviews to ensure an explorative approach and sufficient flexibility. In this approach, knowledge is produced through interaction between the informants, and the questions are posed based on situated personal judgment (Kvale & Brinkmann, 2009). However, the researcher must have a strong listener position to avoid exerting influence on the outcome of the interviews (Kvale & Brinkmann, 2009). This approach ensures the openness needed to explore the importance of IC in emergency management in the Arctic. However, a structure is crucial so that the researcher can keep track of the interviews and ensure their comparability (Patton, 2002; Yin, 2011). A common concern with qualitative interviews is that they provide little basis for scientific generalization and are particularly context sensitive (Yin, 2003).

Semi-structured interviews were chosen here to guarantee openness and flexibility while also ensuring comparability. This choice also helped with clarifying questions that were unclear for the informants during the interviews and giving in-depth information about the concepts and context (Bryman & Bell, 2015). The interviews were conducted based on an interview guide. The interview guide was divided into two parts: the first part was general and open, and the second part was more specific and contained follow-up questions with scope for additional comments. Most of the interviewees were contacted in advance, and participation was voluntary. The interviewees were sent the same invitation, which included a brief background of the researcher. The standard protocols described in the invitation stated that the interviews would be used only for this research, the confidentiality of the interviewees would be maintained throughout, and there were no potential conflicts of interest in the process. Researchers approached some of the interviewees on the spot during conferences or exercises. Candidates were given a brief research background verbally and were asked if they were interested in participating in an interview.

Semi-structured interviews were used for two articles in combination with other data collection methods. Article 1 aims to contribute to process theories of trust in emergency management rather than to a variance theory of trust (Langley, 2007), and the primary focus is the sense informants made of the formation of trust. The concern is how trust develops over time and is based on previous experiences as a form of understanding that is very much grounded in the flows of activities (Gehman et al., 2018). An in-depth case study with (primarily) qualitative data analysis was chosen, and the interviews are the main source of data. The data for Article 1 were collected from triangulated observations, qualitative interviews, questionnaires, and secondary data sources. Semi-structured and structured questionnaires were used to generate confirmatory results and background knowledge despite differences in the methods of data collection, analysis, and interpretation. However, using structured survey questions for triangulation resulted in only a small number of respondents. Therefore,

the data were very thin compared to the more detailed responses from several open-ended surveys.

The interviews for Article 4 were conducted to complement the literature review. Semi-structured interviews may elicit "subjective theories" that the interviewees spontaneously mention while answering open questions (Flick, 2018). The intention is not to influence the interviewees by asking questions about specific challenges identified in the literature but instead to let them describe about their experiences and voice their opinions about improvisation in an emergency context. The responses were then analyzed to determine whether the specific variables identified were similar to those found in the literature.

3.4.2 Archival data and observation

Archival data, observations, and interviews provided important material for this thesis, particularly for Articles 1, 2, and 4, which explored trust, learning, and improvisation. However, the use of archival data was limited and mainly used as background information. Archival data included publicly available reports of relevant exercises, logs from emergency organizations, and presentations. Observations were included to increase the quality and reliability of the data-gathering process (Jick, 1979) and to ensure that the researcher was properly informed about the empirical context (Martela, 2012). Five exercises were observed for this thesis (see Table 3): two FSEs (Exercise Nord [Norway] in 2015/19 and a SARex exercise [Norway] in 2016) and three simulated TTEs (Host Nation Support [Norway] in 2016, AECO SAR [Iceland] in 2016, and Arctic SAR [Norway] in 2016). The JRCC and the CG took part in all five exercises. Exercise Nord included Norwegian actors (police and hospitals, in addition to the JRCC and CG). The SARex exercise occurred in Svalbard and aimed to test the implications of the Polar Code for national policies. It included several universities and Norwegian public authorities. The host nation support also included Norwegian actors, but as the scenario concerned providing support to a Russian vessel, some Norwegian actors acted on behalf of Russia. AECO SAR included Norwegian, Russian, and Icelandic actors.

In the Arctic SAR exercise, the actors were primarily from education and research institutions in Norway, Canada, and Russia. Table 3 presents an overview of the observed exercises.

Table 3. Overview of the observed exercises

Name of exercise	Year	Type of exercise	National/International
Exercise Nord	2015/2019	FSE	National
SARex exercise	2016	FSE	National
Host Nation Support	2016	TTE	International
AECO	2016	TTE	International
Arctic SAR	2016	TTE	International

Overall, the archival data and observations were used to gain insights into the IC and the process of learning and trust development in emergency organizations. The interpretation of the observation notes revealed patterns that might not have been evident in interviews and archival data (Saldana, 2011) and facilitated the sense-making process during data collection.

3.4.3 Survey

In Article 1, a closed-ended survey was used in combination with interviews, observation, and secondary data. Informants were asked to complete the survey immediately after the interviews. The questionnaire contained the trust measures on affect- and cognition-based trust within organizations from McAllister (1995, p. 37), along with a version of these measures, adjusted to the inter-organizational level and context. A five-point Likert scale, where 1 meant “not at all” and 5 meant “to a large extent,” was used for each measure. The questionnaire data were organized in a table (Appendix 1 in Article 1) showing the distribution of answers and the average values of each measure and variable. Because of the low number of respondents (15), no factor analysis was performed, nor was a more advanced statistical method used.

The aim of Article 3 is to develop an instrument a) to measure collaboration, collaborative learning, trust, and usefulness in collaboration exercises as a whole; and b) to investigate the outcomes of emergency collaboration exercises in general and the possible outcome differences between TTEs and FSEs in particular. Quantitative research was conducted using a questionnaire to assess collaboration, learning, usefulness, and trust (CLUT instrument). The survey was distributed to emergency personnel involved in collaboration exercises in Norway and Canada during the spring of 2018. All the emergency personnel who participated in this study were from the CGs, police, municipalities, private rescue companies, shipping companies, fire brigades, ambulance personnel, and JRCCs with experience in maritime collaboration exercises. The participants' responses addressed their previous TTEs and FSEs and collaboration-oriented learning objective exercises.

The survey instrument was an extended version of the CLU instrument (Berlin & Carlstrøm, 2015), with a specified scale from Sørensen et al. (2018) that measures perceived collaboration, collaborative learning, and usefulness based on a Likert scale ranging from 1 to 5, where 1 is "strongly disagree" and 5 is "strongly agree." The extension added "trust," and the literature was reviewed to select items to measure trust. The final instrument, denoted by the acronym CLUT, holds four variables and 26 items and was used twice in the questionnaire—once for TTEs and once for FSEs.

A combination of two nonprobability sampling techniques (convenience and purposive) was used. Most responses (120) were collected via an online version of the survey in English, while the remainder (53) were collected using hard copies in Norwegian. Due to the sampling techniques and approach to data collection, all those invited to answer the online questionnaire did so. All data from Canada were collected via the online survey, while both hard copies and the online version were used for data collection in Norway. The hard copies were distributed to around 200 people in an emergency seminar (Emergency Day) in Norway, and 53 people responded. The rest of the data from Norway were collected via the online survey. Respondents were full-

time, publicly hired emergency personnel in various positions, including operational staff in the field, staff officers, and officers at command posts.

3.5 Research quality

This thesis incorporated different methods to view a phenomenon from different perspectives to provide an enhanced understanding. Because the researcher's observations and practical and theoretical knowledge were the most important instrument for the analysis—and because people are notoriously poor processors of information (Eisenhardt, 1989)—there is a danger that the conclusions may be false or premature. The criteria used to judge the research quality are, therefore, important. The quality standards for the qualitative method differ from the common validity and reliability measures needed for the quantitative method, and they are discussed in parallel in the following sections.

3.5.1 Internal (contextual) validity

Such research aims to authentically capture the lived experiences of people and represent them in a convincing text that demonstrates the researcher fully understands the case (Lukka & Modell, 2010; Ryan et al., 2002). The key question is whether the thesis has captured the phenomenon it was intended to capture (Tashakkori & Teddlie, 2003). Internal validity is an essential manifestation of validity. In quantitative research, the ultimate question is whether one can draw valid conclusions from a study, given the research design and controls employed (Ryan et al., 2002). To an extent, it concerns the relationship between a piece of research and existing theory (Arbnor & Bjerke, 1977). In qualitative research, contextual validity refers to the credibility of case study evidence and the conclusions drawn (Ryan et al., 2002). It also relates to the trustworthiness of the raw data, collection process, and interpretation (Schwandt et al., 2007).

Threats to the internal validity of this quantitative work could have arisen during the research process. The research design is always of crucial importance when

pursuing high internal validity. Here, threats to internal validity include insufficient knowledge of or contradictions in the logic. Deficiencies in the later stages of research—during data collection, analysis, and interpretation—can also lead to low internal validity. During data collection, threats to internal validity include instrumentation issues (Tashakkori et al., 1998), order bias, and researcher bias in the use of techniques (Onwuegbuzie, 2003). One way to mitigate these threats is by discussing the logic of the research, the issues related to instruments, and the level of consistency with experienced supervisors and co-authors. The testing and calculation were conducted multiple times to prevent any statistical errors. The credibility of the qualitative findings was enhanced by combining interviews, observation, and analysis of archival data. This triangulation revealed different aspects of empirical reality and reduced the sensitivity to errors, such as loaded interview questions and biased responses (Patton, 2002). An ongoing dialogue with supervisors and co-authors during the qualitative study enhanced the credibility of the data interpretation.

3.5.2 External validity (generalizability and transferability)

External validity is a key principle in quantitative research (Ryan et al., 2002). This ensures that one can draw general conclusions based on the model used and data collected, allowing the results to be generalized to other samples, periods, and settings. Population, time, and environmental validity are common problems that can threaten the external validity of a quantitative study (Ryan et al., 2002). Population validity refers to whether implications can be drawn from the study of a given population; it is closely connected to the sampling technique. Purposive and convenience sampling were most appropriate for this research. This type of non-probability sampling may lower external validity because the results are only generalizable to the sample. However, similar studies have found comparable relationships between the variables studied here in other samples. Time validity concerns the extent to which the results of a particular study conducted at one point in time can be generalized to other periods. The quantitative part of this thesis focused on exercises, and these can be influenced substantially by communication and technology. Therefore, in the event of future

developments in knowledge and technology, a replicated study might produce different results due to structural changes in the relationships between variables. Although this study's results are not particularly time sensitive, they may not be generalizable in the long term or several decades from now. Moreover, the results of the quantitative part cannot be generalized to IC in general because of the specific nature of the population and sample group within the single case studied in this thesis. In addition, due to the low number of survey respondents, the correlation and regression analysis results are offered for the understanding they can provide of the attributes of the selected case only, and they are not generalizable.

Environmental validity indicates that the results can be generalized across settings. This research is sensitive to its context of the Arctic environment. Except for a small part of the quantitative data collected from southeast Norway, most of the data were from the Arctic region. Therefore, there is a risk that the results may not be fully applicable in other environments, such as the Mediterranean, where more resources are available, and weather conditions are more stable. Thus, the study has somewhat low environmental validity (Ryan et al., 2002).

In the qualitative method, generalizability is concerned with whether the results are transferable (Lincoln & Guba, 1985) and to what degree the findings are relevant and applicable to other contexts (Eriksson & Kovalainen, 2008; Shenton, 2004). In the case of this thesis, the original sample of people, setting, and procedures is carefully described to permit appropriate comparisons with other samples (Miles & Huberman, 1994). In the qualitative part of the thesis, the context description of the case regarding emergency management, the need for IC, and the role of trust are classified as sufficiently "thick" (Geertz, 1973) in the sense that the phenomena are described in enough detail that one could evaluate the extent to which the conclusions drawn are transferable to other times, settings, situations, and people (Geertz, 1973). In addition, the in-depth case descriptions could facilitate further replication efforts. Thus, the

transferability of the findings appears to be established. Practitioners and academics may relate their findings to their own situations (Shenton, 2004).

3.5.3 Reliability (confirmability)

In quantitative work, *reliability* generally refers to the extent to which a variable or set of variables is consistent with what it is intended to measure. When multiple measurements are taken, the reliable measures are consistent in their values (Hair et al., 2006). Miscellaneous sources of error—such as typos and other errors in data collection and analysis (Ihantola & Kihn, 2011)—may also threaten reliability at any stage of the quantitative research process. This thesis benefits from a clear and standardized structure. The items and instruments are described carefully to prevent misinterpretation. Pre-testing was done to ensure that the questionnaire was of an appropriate length and was readable. Reliability in quantitative research can be assessed through Cronbach's α (Taherdoost, 2016); it was calculated to measure the validity of the instrument, and the result was 0.88, which is considered satisfactory (Brace et al., 2016).

In the qualitative method, procedural reliability refers to confirmability, which is related to consistency and typically means that another person who examined the work would reach similar conclusions (Eriksson & Kovalainen, 2008; Ihantola & Kihn, 2011; Ryan et al., 2002). Careful documenting and reporting should allow the reader to assess how the researchers have collected, produced, and interpreted the data. However, there are threats to reliability at every stage of the qualitative research process (Lillis & Mundy, 2005). To minimize the threat to the reliability of the qualitative findings, accurate and systematic interview questions were developed. The interview guides were also tested to prevent misunderstandings and remove any misleading questions. The interviews were recorded and transcribed, which helped decrease random errors and ensure consistency throughout the process—from data collection to final results. The articles include quotations taken from the interviews to make as much data available as possible.

In the qualitative method, the role of the researcher in enhancing reliability is explicitly described (Miles & Huberman, 1994), and the researcher him/herself is the main instrument for data collection, interpretation, and analysis (Yin, 2015). Therefore, the researcher's personal values, judgments, and ideological preferences may influence the research design and interpretation of the findings, which may consequently lead to biased conclusions (Eisenhardt, 1989). Accordingly, at least two researchers were involved in the research process to minimize the subjectivity involved in the interpretation process. Overall, this thesis addresses the threats to reliability by comparing the results with previous research findings and through discussions with co-authors and supervisors. The process described above thus enhanced the procedural reliability of this thesis. The following table summarizes the tactics used to minimize the threats to the validity and reliability of this thesis.

Table 4. Tactics used to minimize the threats to validity and reliability

Criteria	**Tactic**	
	Qualitative method	**Quantitative method**
Validity	Used multiple sources of data (triangulation) Discussed the data and results with fellow researchers, field experts, and informants Provided thick descriptions Used quotations to make data available Received feedback and had interactive contact with the informants	Received expert opinion to increase internal validity Described the sample in detail
Reliability	Reported the materials used for analysis Ensured that at least two researchers reviewed and agreed Cross-checked the findings with similar studies Reported the logic used for moving from data to the final results Explained the analytical procedures	Calculated Cronbach's α Obtained consensus from three emergency management researchers Explained the analytical procedures

3.6 Ethical considerations

Ethical issues were considered at all stages of the thesis to ensure the protection of the participants in the study. Other ethical and legal issues, such as data management, copyright, openness and honesty in communication, and affiliations and conflicts of interest were also considered. Ethical conduct is not limited to a specific phase of the research process but is an ongoing concern throughout (Kvale, 2008). In Norway, all projects involving the storage and processing of personal and sensitive information must be reported to and approved by a national organization. For the social sciences, this organization is the privacy protection unit at the Norwegian Social Science Data Service (NSSDS). Once the organization received the proposal for this study, it granted its approval, and the data collection began.

All efforts were made to ensure that this study complied with the relevant ethical principles. Diener and Crandall (1978) have described the four primary principles as the avoidance of harm to participants, the assurance of informed consent, the prevention of invasion of privacy, and the avoidance of deception. Harm can take numerous forms, including physical harm, stress, harm to career prospects, and harm to participants' self-confidence (Diener & Crandall, 1978). Thus, great care was taken with informants to reduce these risks. Qualitative method issues, in particular, relate to the privacy of people affected by the research and how the researcher gains access to the participants. Additionally, it is important to guarantee the participants' freedom to choose and avoid harming the relationship of trust between the participants, the researchers, and the wider society (Bell & Bryman, 2007). The participants received all the essential information about the research, its purposes, and the consequences of their participation. Efforts were made to ensure the accuracy of the data collection; subjective selectivity was avoided, and selection biases were minimized. The quantitative data were collected primarily using SurveyMonkey software. The hard copies of the quantitative questionnaire were anonymous and submitted to one of the authors of Article 3. Any survey items or information that could enable the

identification of the individual responders were not included in the reporting of the results.

As the author of this thesis, I declare that there are no potential conflicts of interest with respect to this research and its findings. One of the objectives of such research is to be of value to society. With this thesis, I have sought to provide novel insights into the emergency management and IC debate.

4. Summary of Articles

This chapter presents a summary of the articles included in this thesis. Please note that the articles are presented in full in Part II.

4.1 Article 1

Article 1 intends to enrich the theoretical understanding of inter-organizational trust and its development across phases of emergency management. This article, therefore, focuses on the role and the development of trust in the emergency management phases of preparation, response, and evaluation. The research question is as follows: *what is the role of inter-organizational trust, and how is it developed across phases of emergency management?*

This article relies on insights from the cross-level trust development literature (Schilke & Cook, 2013; Gausdal, 2012) and discusses how trust develops across emergency management phases. The literature on emergency management (McEntire, 2007; Thomas, 1979; Kapucu, 2008; Kapucu et al., 2010) provided a solid background against which to build the argument and identify the role of trust in each phase of emergency management, as well as noting how each phase contributes to the development of trust.

A case study of the multinational Arctic Sea region was undertaken to address the research question. Data were harvested through the triangulation of observations, questionnaires, interviews, and the gathering of secondary data. The primary data sources were interviews and observations. The data collected through observation were taken from three exercises, covering 22 hours in total. Twenty-one interviews were undertaken. Fifteen of the interviews were in-depth, semi-structured sessions with four key informants in the Norwegian JRCC, five key informants from the Norwegian CG, three key informants from Iceland's JRCC, and three key informants

from the Icelandic CG. The other six interviews were not as long and were more open-ended with informants from other emergency organizations in Norway.

At the end of each interview, a questionnaire was given to informants. The questionnaire contained the trust measures on affect- and cognition-based trust within organizations from McAllister (1995, p. 37), along with a version of these measures, after adjustment to the inter-organizational level and the context. A five-point Likert scale, where 1 meant "not at all" and 5 meant "to a large extent," was used for each measure.

This article finds that trust improves coordination, collaboration, communication, information-sharing, and preparedness, and it reduces conflicts in the preparation phase. In the response phase, it "lets the I become we": trust enables different organizations to act cooperatively (swift trust) and improves reliability, openness, and the overall response quality. In the evaluation phase, it improves learning from experiences in general and from mistakes in particular. The findings of this article accord with the cross-level process model advanced by Schilke and Cook (2013), which illustrates that trust between organizations can be developed throughout consecutive stages of relationships across the phases of emergency management. This article finds that, in the preparation phase, "ordinary" inter-organizational trust is fostered by two activities in particular: joint table-top exercises and joint training programs. In the response phase, some ordinary trust may be developed by a joint goal and task orientation and the sharing of competence, time, and equipment. Most importantly, swift inter-organizational trust is developed within large temporary joint organizations working to save lives, the natural environment, and equipment under extreme time pressure. Although the evaluation phase holds substantial potential to use this swift and fragile trust to develop more resilient forms of inter-organizational trust, this potential is underexploited due to the low priority accorded to this phase in our case.

This article contributes to the thesis by exploring how joint training as a mechanism develops trust in the preparedness phase and contributes to improving IC in emergency management. The findings demonstrate that, as the joint training occurs outside emergency situations, it is a suitable means of creating trust between emergency organizations and has the potential to influence the earning and sharing of knowledge (Kapucu, 2008; Matzler et al., 2011). Overall, this article shows that trust could be a critical element to improve IC in emergency management.

4.2 Article 2

Article 2 considers collaborative learning from an inter-organizational perspective and intends to enrich the literature on inter-organizational learning by investigating it in the context of collaborative emergency exercises. The study assumed that inter-organizational learning is part of the continuum of organizational learning, as proposed by Crossan et al. (1995), Bapuji and Crossan (2004), Holmqvist (2009), Knight (2002), Knight and Pye (2005), and Crossan et al. (2011). This exploratory study aims to empirically challenge and validate the suitability of the 5I framework for emergency management and to develop theoretical nuances that enrich the overall understanding of inter-organizational learning processes. The research question is as follows: *How can the inter-organizational learning process occur as a result of emergency collaboration exercises within a complex environment?*

This article relies on a cross-level view of learning enhancement and is based on the framework developed by Crossan, Lane, and White (1999), which illustrates the processes of learning and how such learning evolves and is incorporated within organizations. The individual level is based on the learning processes of intuiting and interpreting, while interpreting and integrating are present at the group level. The integrating and institutionalizing occur at the organization level. Finally, the intertwining process occurs at the inter-organizational level (Jones & Macpherson, 2006).

The article employs methodological triangulation to identify those elements that both facilitated and hindered learning during collaborative exercises. Data collection processes consisted of a collection of qualitative methods, including archival data from emergency organizations, background discussions, field observations, and unstructured, in-depth interviews centered around four exercises. This article examines data between 2016 and 2019 from four sea-based Arctic exercises. For each of the exercises, the difficulties posed by the environment were central. All exercises were designed to suit the Arctic environment, and the existence of unpredictability determined the scenarios due to a set of unique conditions. These conditions included climatic conditions, the social environment, and the geographic environment.

The findings were segmented into the 5I framework processes of intuiting, interpreting, integrating, institutionalizing, and intertwining (Jones & Macpherson, 2006). Analyzing the 5I framework in this article demonstrated that these processes could be acknowledged at the inter-organizational level. However, the findings suggest expanding the framework by adding two more processes at the group and inter-organizational levels. This article contributes to the literature by extending the 5I inter-organizational learning framework by adding *interconnecting* and *internalizing* processes.

This article contributes to the thesis by demonstrating that undertaking emergency collaboration exercises influences collaborative learning in an emergency management context. It sheds light on how the enhanced collaborative learning from joint training may contribute to improving IC. The findings and understanding generated in Article 1, together with the enhanced collaborative learning recognized in Article 2, highlight how trust and collaborative learning from joint training are two critical elements in improving IC in emergency management. This understanding is considered as a partial basis for the quantitative study in Article 3.

4.3 Article 3

Article 3 seeks to contribute to the scarce research on the outcome of collaboration exercises. The article intends to develop an instrument to measure perceived collaboration (Hocevar et al., 2006), collaborative learning (Sommer et al., 2013), trust (Roud & Gausdal, 2019), and usefulness (Berlin & Carlstrøm, 2015) in collaboration exercises and to investigate the outcomes of emergency collaboration exercises in general, as well as the possible outcome differences between TTE and FSE exercises in particular. The research question of this article is as follows: *To what degree does joint training contribute to useful learning and trust-building in collaborative emergency response?*

This article borrows insights from previous studies in different contexts that show that exercises improve collaboration and add experience to organizations that they otherwise would not have gained (Kapucu, 2008; Metallinou, 2018; van Laere & Lindblom, 2019). The existing literature indicates that collaboration exercises may produce results with limited usefulness in an actual emergency situation (Borell & Eriksson, 2013). The sources to date conflict as to why the usefulness of collaboration exercises is limited; the cited reasons range from a lack of sufficient attention to variation (Borell & Eriksson, 2013) to failing to prioritize the strategic learning aspects of the collaborative exercises (Berlin & Carlstrøm, 2015).

Based on the existing literature and assuming that collaboration engenders learning and subsequently usefulness (Gredler, 1992), four propositions are developed:

> P1: *Learning positively influences the usefulness of collaboration emergency exercises.*
>
> P2: *In emergency collaboration exercises, IC positively influences individual learning.*
>
> P3: *IC in emergency collaboration exercises positively influences inter-organizational trust.*

P4: *In emergency collaboration exercises, inter-organizational trust positively influences individual learning.*

A quantitative methodology questionnaire—CLUT—was developed and used to assess trust, usefulness, collaborative learning, and collaboration. CLUT is an extension of the CLU instrument (Berlin & Carlstrom, 2015), with the scale designed by Sørensen et al. (2018) to measure perceptions of collaboration, learning, and usefulness. CLU was extended to CLUT by adding trust. Like CLU, CLUT includes a Likert scale ranging between 1 and 5, with 1 being "strongly disagree" and 5 being "strongly agree." Data collection was undertaken using a sample of 173 full-time emergency management personnel from Canada and Norway (112 from Canada, 61 from Norway). The full statistics appear in the tables in the Article 3, Part II.

The bivariate analysis revealed that usefulness, collaborative learning, and collaboration outcomes were high for both types of exercises. FSEs were perceived to have greater collaborative learning and usefulness outcomes than TTEs. Stronger relationships were identified between the perceived effects on collaborative learning and usefulness, collaboration, and trust in tabletop compared to full-scale exercises. In contrast, the relationship between the perceived effects on collaboration and trust was stronger in FSEs. Multiple regression analysis showed that the variables used to measure exercise usefulness can better predict TTE outcomes (see the statistics in Article 3 in Part II). Across all respondents, the four propositions—P1, P2, P3, and P4—were supported.

This article contributes to the thesis by implying that joint training can make participants more familiar with the capacity and interests of fellow organizations, creating social capital by strengthening their professional networks. This article suggests that there could be two means of improving IC to manage emergencies. First, significant correlations between usefulness, collaborative learning, trust, and collaboration were found in FSEs and TTEs. Second, Article 3 partly concurs with

Articles 1 and 2 that collaboration outcomes from joint training may influence trust (inter-organizational level) and collaborative learning (individual level), which could subsequently serve as critical elements in improving IC in emergency management.

4.4 Article 4

Article 4 explores the importance of improvisation in emergency management. This article was built on the assumption that improvisation is an important factor in the success of a collaborative emergency response (Mendonça, 2001). In the context of IC, one approach to developing collective improvisation could be joint training (Roud & Gausdal, 2019). The term "collective" in this article refers to improvisation at the inter-organizational level. Although researchers have studied improvisation in emergency management, few studies have explored joint training for improving collective improvisation capability in emergency response in a complex context. This article seeks to fill this gap with the following research question: *How can joint training improve collective improvisation capability in emergency response?*

While this article did not undertake classical hypothesis testing, certain sections of the literature review were geared towards developing propositions. The empirical pilot study consists of a case study that employs chiefly quantitative data from Norway's military and civil organizations. This pilot study assesses whether support existed for the propositions and preparation for extended research for quantitative testing. The literature review findings demonstrate that the complexity of context, organizational structure, organizational memory, inter-organizational trust, and inter-organizational communications and information exchange may influence the capabilities of improvising collectively. The article develops six propositions as a result of the literature review.

P1: *Joint training positively influences collective improvisation capability in emergency response.*

P2: *As collective improvisation is crucial in a complex environment, and joint training can positively influence this capability, joint training is more crucial in the complex context.*

P3: *A hybrid organizational structure may improve collective improvisation capability in emergency response*.

P4: *The organizational memory level may mediate the relationship between joint training and collective improvisation capability in emergency response.*

P5: *The inter-organizational trust level may mediate the relationship between joint training and collective improvisation capability in emergency response.*

P6: *The proper communication and information exchange may mediate the relationship between joint training and collective improvisation capability in emergency response.*

The findings indicate that improvisation plays a vital role in emergency response. The findings suggest that, when an organization gives its personnel authorization for collaboration with external organizations, the collaborative response to emergencies has greater efficacy. Additionally, the findings demonstrate that organizations following up on points their representatives learned from collaborative task forces improves their collective improvisation capability. The findings also show that response speed is essential in the face of unpredicted events with previously unencountered problems. This means that the capability for improvisation is important in dealing with an emergency. Informants frequently referred to organizational structure and "hierarchy," stating that hierarchies play a vital role in dealing with emergencies. The findings indicate that it is important for emergency personnel to have the flexibility to improvise. Flexibility does not mean there is no need for command and control; otherwise, collaboration would become chaos. A balance of structure and flexibility can improve response effectiveness. The findings show that, in a high workload

situation where several organizations are working together, only the response team that can anticipate the other's needs and adapt to changing situations will be successful. If organizations have the awareness coupled with the knowledge of actors' competence areas stored in memory, then they have a decent system for collective improvisation. Joint trainings are an efficient way of increasing experience levels and introducing organizations, allowing for improved perspectives of the competence of other organizations and in developing competence-based trust. Though affect-based trust is of primary importance for organizations to collaborate effectively (McAllister, 1995), this article does investigate its development within training and exercises. In addition, the findings demonstrate that the exchange of information and effective communication played a significant role when improvising collectively in emergency responses, especially in the Arctic. The findings highlight the importance of the informal communication networks formed following collaborative operations. Joint training can create platforms for the development of communication skills to re-establish shared language and professional terms.

In total, the findings confirm that organizational memory, inter-organizational trust and communication, and information-sharing are prerequisite and mediating variables that positively influence collective improvisation capability. Organizational structure and complex context also influence this capability in emergency response. All the propositions were either partly or entirely supported by the interviews.

This article contributes to the thesis by exploring how improvisation capability may be improved via joint training. The article contributes to the training and emergency management literature by introducing organizational memory, inter-organizational trust, and inter-organizational information-sharing as mediator variables in the relationship between joint training and improvisation capability. Further, it sheds light on the importance of improvisation capability as an important element for improving IC in emergency management.

5. Discussion

This chapter aims to illustrate and discuss the main contributions of this thesis to current knowledge on the role of joint training in improving IC in emergency management. This chapter discusses the aggregated findings from the four articles to answer the overarching research question: *How can joint training improve inter-organizational collaboration in emergency management?* It reflects on the main research findings of this thesis by addressing the four research questions raised in Chapter 1. This chapter argues that joint training contributes to trust, collaborative learning, and improvisation capability for improving IC. The thesis discusses the findings that the informants and survey participants (emergency personnel) perceived as improving IC. The thesis does not study how the emergency organizations implement the joint training outcomes or evaluate actual IC improvement. This chapter ends with limitations and possible areas for future research.

5.1 Role of joint training in developing trust

RQ1: *What is the role of trust in improving inter-organizational collaboration, and how is such trust developed across emergency management phases in general and from joint training in particular*? The findings of this thesis imply that joint training plays an important role in developing trust among the organizations involved in emergency management. This section discusses the role of joint training in developing trust, which may be an important element of minimizing the challenges in IC and enhancing improvement. Trust in itself has been highlighted as conditional for collaboration in the emergency management context, and a lack of it can cause ambiguity, defensiveness, and a reluctance to report mistakes after incidents or exercises (Drupsteen & Guldenmund, 2014; Moynihan, 2008). Studies of IC from a different context, such as railway accidents and tornadoes, highlight that a lack of inter-organizational trust is one of several factors that has hindered the IC in emergency response (Liu, 2011; McEntire, 2002). Similarly, the findings from the selected case of the thesis suggest that the development of inter-organizational trust is one of the most important

elements for improving IC; informants frequently emphasized that trust is a prerequisite for collaboration.

The need for adequate time to develop trust is well documented in the literature (Erakovich & Anderson, 2013; Kramer, 1999; Kramer & Tyler, 1995; Mayer et al., 1995; Vangen & Huxham, 2003). Because there is no time to develop trust during a collaborative emergency response, it is crucial to participate in joint training to develop it. Article 1 shows that developing trust is particularly critical when the collaboration is not mandated because the actors may feel less urgency to go through the process. According to Steigenberger (2016), joint training can have a significant function in developing trust, as emergency organizations have relatively infrequent interaction in their daily operations. Similarly, Franco et al. (2009) have noted that joint training allows social relationships between partners to develop over time, which may create trust and shared mental models. The findings of Article 1 highlight that the inter-organizational trust developed via joint training, over time, and through frequent communication results in consistent actions and openness to sharing knowledge and information about other organizations. These findings partly confirm the literature, where trust appears to reduce conflict, increase knowledge-sharing, and make people more cooperative in their operational behavior (Ouchi, 1981), and it improves communication during potential IC in emergencies in the future (Longstaff et al., 2008).

Several informants indicated that joint training helps them become familiar with other organizations, and, further, they associate familiarity with developing inter-organizational trust. Familiarity refers to whether emergency organizations in decision-making roles are familiar with the resources, equipment, and capabilities of other organizations (Pramanik, 2015). The findings from Articles 1 and 4 indicate that this familiarity and expectation for future collaboration can lead to trust development among the organizations involved in joint training. Competence-based, inter-organizational trust may be developed because organizations become more familiar with the competence of the collaborating organization in joint training. This is in line

with the definition of trust by Mayer et al. (1995), which concentrates on predictions and expectations. The findings of this thesis further suggest that, in a situation where organizations have previous experience and were involved in delivering a joint task, the existence of familiarity and trust can increase the extent to which emergency organizations can share or utilize resources from other organizations. The aggregated findings of thesis suggest that the existence of trust may support flexibility in organizational structure and routines during collaboration. This is partly in line with Pramanik, Ekman, Hassel, and Tehler's (2015) findings regarding the correlation between familiarity and trust in the context of civilian and military collaboration. It also corresponds to Uhr et al.'s (2008) view of trust as a latent system condition that influences the manifestation of organizational tasks, inter-organizational boundaries, and organizational structures.

Earlier studies of trust in emergency management contexts (Kapucu et al., 2010; Lundberg & Asplund, 2011; Mishra, 1996) have indicated that inter-organizational trust is crucial in emergency management; following them, this thesis explores how inter-organizational trust may develop throughout consecutive relationship stages by following Schilke and Cook's (2013) cross-level framework. Article 1 illustrates how joint training in the preparedness phase provides a platform for establishing an organizational relationship in which information is gathered and emergency personnel search for trustworthiness clues. During the preparedness phase (and the planning phase of joint training), the partners initiate *contact* and start *communication*; the frequency of contact and collaborative communication that can occur during preparatory meetings is positively related to the development of trust.

Negotiation takes place through interpersonal communication and interaction, where planning and preparation mature, and organizational collaboration is formalized through agreements. The conversations and negotiations provide conditions for establishing a level of conformity for collaboration based on a deepening of mutual knowledge and shared goals that may strengthen the process of developing inter-

organizational trust. Boundary spanners may have transferred trust to their organizations during joint preparation for collaborative exercises. Article 1 further indicates that the trust development processes of contact, communication, direction, and resource-sharing (Gausdal, 2012), as well as those inherent in the initiation of temporary organizations, are active in the preparedness phase of emergency management in general and particularly in the planning phase of joint training.

Because of the joint goal and task orientation and the sharing of time and equipment, the processes of *direction* and *resource-sharing* are also active in the response phase. Most importantly, because of the need to collaborate with partner organizations to save lives, nature, and equipment under extreme time pressure, depersonalized swift trust is developed in the response phase. The development of swift trust could be relevant in exploiting large-scale collaborative exercises, in which actors are not very familiar with each other from the planning phase. This development may be even more pronounced in a harsh and vulnerable environment like the Arctic, where individuals presume that they share common values, attitudes, and goals (Staats et al., 1996). Therefore, the trust development processes of temporary groups (Gausdal, 2012; Jarvenpaa et al., 1998; Meyerson et al., 1996; Zaheer & Harris, 2006) that build swift trust appear to be highly active in sizeable temporary emergency management organizations during the response phase. Article 1 finds that the evaluation phase (both for training and real incidents) has a low priority, even though emergency personnel are aware of its critical role in developing trust and improving collaborative learning. During the evaluation phase of exercises, inter-organizational relationships may enter the operation stage, where a common understanding develops regarding the trustworthiness of partner organizations.

5.2 Role of joint training in enhancing collaborative learning

RQ2: *How might joint training contribute to collaborative learning in emergency management?* The findings from Articles 2 and 3 imply that joint training can play an important role in collaborative learning and resolving intractable problems in

emergency management. Several scholars have highlighted the importance of training for individual competence development (Borell & Eriksson, 2013; Borodzicz & Van Haperen, 2002; Sommer et al., 2013; Sommer et al., 2017). However, the findings of this thesis stand out as the first to explain learning from a cross-level perspective. Thus, this section discusses the role of joint training in collaborative learning from that perspective. Further, this section suggests how enhanced collaborative learning from joint training may minimize the challenges and improve IC in emergency management. Several studies have shown that collaborative learning throughout participation in joint training can enable organizations to bridge organizational boundaries and fields of expertise (Jones & Macpherson, 2006; Tynjälä, 2008). Several informants stated that collaborative learning, which is enhanced via joint training, is particularly beneficial for performing joint emergency management tasks. The quantitative part of this thesis also confirms that emergency personnel perceive that collaborative learning improves IC. The findings of Article 2 demonstrate that collaborative learning from joint training provides organizations with a platform for the exchange, transformation, and creation of knowledge, which further improves IC in emergency management. Similar to the conclusion of Sommer and Njå (2012) regarding the learning processes in a Joint Rescue Coordination Center, the findings of this thesis demonstrate that drawing on personal experiences, engaging in problem-solving processes, participating in collective reflection seminars, and enhancing individual knowledge can all contribute to enhancing collaborative learning.

This thesis follows the 5I framework, a cross-level process approach to exploring the concept of collaborative learning, because insights and ideas occur in individuals and not organizations (Crossan et al., 1999; Jones & Macpherson, 2006). The 5I framework operates across levels and consists of different learning processes that occur within an organization, such as *intuiting* (individual level), *interpreting* (individual-group level), *integrating* (group-organization level), *institutionalizing* (organization level), and *intertwining* (organization-inter-organization level). The findings of Article 2 on the 5I intuiting process show that individuals enhance learning

through personal experience from joint training. The findings also show that joint training can facilitate learning at an individual level by giving participants opportunities to make mistakes, test different strategies, practice taking action under time pressure, and become familiar with the technology and communication tools that help establish personal comfort.

The findings of Article 2 on the *interpreting* process of 5I (the conscious elements of individual learning that are shared in groups) reveal that an openness to divergent views, testing innovative approaches, asking for guidance, constant dialogue among individuals and supervisors, and practicing the professional language of emergency response contribute to the collaborative learning from joint training. According to Andersson et al. (2014), by giving individuals sufficient latitude to improvise, make mistakes, and test different strategies, joint training can enhance individual learning that can be shared in a group (learning at the individual-group level). Allowing freedom to improvise in joint training may increase the probability of individual mistakes, but it may also improve their improvisation capability and subsequently reduce the number of errors in real emergencies. Based on the literature, participant encouragement and support for improvising have been important success factors in learning at both group and individual levels (Courtney-Pratt et al., 2012). Informants experienced their most positive perceived individual learning as useful when supervised by their leader or exercise controller and when they could freely ask questions. Thus, the findings on the interpreting process partly support the literature (Courtney-Pratt et al., 2012).

Article 2 examines the 5I integrating process and finds that learning at a group level is enhanced through shared understanding, mutual adjustment, and interactive reflections. This process was found to function as a bridge to the organizational level (Billett, 2010; Collin, 2002; Eraut, 2007; Lave & Wenger, 1991; Wegner, 1987). Article 2 further shows that discussions after exercises and realistic scenarios make exercise participant learn the most. Several informants noted that the application of systematic

feedback and guidelines facilitates collective sense-making from joint training. This is in line with the conclusions from Berlin and Carlstrøm (2015) and Sørensen et al. (2018), who have determined that sufficient forms of exercise feedback mechanisms (discussions, seminars, and after-action reports) contribute to collaborative learning.

The findings of Article 2 on the 5I institutionalizing process (the process through which learning is incorporated across the organization) show that substantial debriefing and sharing of knowledge (including achievements and lessons learned) could be a way to enhance collaborative learning at the organizational level. The recurrent theme recognized in the studies by Berlin and Carlstrøm (2015), Jenvald and Morin (2004), Kim (2013), and Lonka and Wybo (2005), which applies across different exercise types and learning dimensions, is that debriefing and systematic feedback sessions after exercises are key factors for stimulating learning and motivation. The findings from exercise observations reveal substantial effort at the tactical and operational levels and limited efforts at the high-level organizational discussions on the strategic level (from the AECO exercise). The high-level organizational discussion is particularly important in the Arctic Sea region because incidents in this region may demand international collaboration, where mutual understanding at a political level matters greatly. In line with the importance of mutual understanding at the political level, the findings from Article 2 suggest that each organization that participates in joint training needs its own “hot wash-up” (the immediate “after-action” discussions and performance evaluations following a training session or major event) so that personnel who were not involved in joint preparation phase activities will hear about other organizations’ capabilities and resources.

The importance of discussions following an exercise was recognized during the observation of Arctic SAR exercise. During the exercise (Arctic SAR), a discussion was noted about where (and on which vessels) helicopters had the opportunity to land and take off. This was interesting in terms of the institutionalizing process, learning at the organizational level, and how resources might be utilized. It appeared that the

emergency organizations were not aware of the availability of some resources. Though the organizational representatives in the Arctic SAR exercise learned about these resources, systematic reporting and archiving of the learning outcomes from the exercises did not occur. The lessons are not easily retrievable if other individuals and groups from these organizations want to access this information. The findings of Article 2 suggest that joint training can contribute to collaborative learning by providing access to debriefings and evaluation reports and a commitment to implementing the outcomes in their own organizations.

The thesis follows Jones and Macpherson (2006) and connects learning on the inter-organizational level to an intertwining process, which is an active engagement between the organization and its external knowledge network. This indicates that learning enhances the interstices between organizations. Articles 1 and 2 reveal that networking and inter-organizational trust facilitate inter-organizational learning from joint training and confirm Matzler et al.'s (2011) finding that trust affects knowledge-sharing and learning. Further, they shed light on the role of networking as a platform to develop inter-organizational trust. The findings of Article 2 highlight that continuous dialogue, mutuality, and active participation in joint training are particularly essential for developing inter-organizational learning. This is in line with Persson's (2010) determination that conversation and active participation are crucial for learning in situations that demand IC in the emergency management context. The aggregated findings of this thesis show that joint training makes organizations familiar with the international laws and regulations that apply to IC in emergency management. This is critical in the Arctic context because many counties may participate in international collaboration (due to the scarcity of resources) in large incidents. Therefore, familiarity with other organizations' cultures and international regulations becomes critical for effective international IC.

While exploring the learning processes in joint training, the thesis identifies learning effects that could go beyond the 5I framework. Article 2 reveals that the 5I

framework covers learning among the group levels only to a minor degree. At this level, the potential to expand the framework is recognized by adding a process. Groups from the same organizations from different levels and departments learned how to cooperate and communicate, as did groups of people from different organizations. For example, the fire brigades' on-scene personnel closely interacted with the CG personnel during the Nord Exercises (Nord, 2016, 2018, 2019). Notably, a form of inter-group collaboration enabled participants to learn efficient ways of working together by establishing mutual understanding over a short time for emerging temporary organizations (including groups from different organizations or the same organizations).

The findings from Article 2 suggest the learning process between groups; however, further quantitative data are required to test and fully support this idea. Thus, this thesis adds a new process (at the group level) to the 5I framework, *internalizing*, because the group established a swift understanding and transferred information internally among its members during the emergency response exercises.

In addition, similar to the group level, the thesis reveals that the 5I framework covers learning among the inter-organizational levels to a minor degree. At this level, the potential to expand the framework by adding a process is recognized the by authors. The literature review on previous studies suggests that the inter-organizational level is only a sub-group of the organizational level (Crossan et al., 1995; Bapuji & Crossan, 2004; Holmqvist, 2009; Knight, 2002; Knight & Pye, 2005; Crossan et al., 2011). However, there is potential for inter-organizational-level learning to be fostered through joint training in the emergency management context. Some research from a sociocultural approach to learning could provide a conceptual background for this learning level (Mozzato & Bitencourt, 2014). However, this idea lacks empirical support. The findings of Article 2 reveal that, in some exercises (for example, AECO), participants from different emergency management networks gathered to learn from each other. This learning facilitates communication and familiarizes them with other

structures and working procedures. In other words, they learn from being connected to a larger network. Thus, this thesis adds a process (at the inter-organizational level) to the 5I framework called *interconnecting*—the learning process between inter-organizational networks. Overall, this thesis has contributed to the 5I framework of Crossan et al. (1995) and Jones and Macpherson (2006) by adding two new processes, *internalizing* and *interconnecting.*

The thesis tests the relationships among joint training, inter-organizational trust, collaborative learning, and the perceived improvement of IC (the perceived usefulness of learning and trust outcomes) to address RQ3: *To what degree are trust development and collaborative learning useful for inter-organizational collaboration in emergency management?* Article 3 assesses whether the enhanced collaborative learning and the inter-organizational trust developed from joint training (collaborative exercises) are perceived to be useful in future IC in emergency management. Similar to previous studies in the contexts of health care, firefighting, and security, the thesis confirms that joint training contributes to collaborative learning, which is perceived to improve IC in emergency management (Magnussen et al., 2018; Sørensen, 2017; Sørensen et al., 2018, 2019; Berlin & Carlstrøm, 2015). However, the trust aspect has not been considered in previous studies, and this is a new dimension added to the CLUT instrument this thesis employs (see Section 3.4.3).

The findings of Article 2 show that trust has a degree of influence during collaborative exercises; it was further shown that trust can be created in the course of exercises, which aligns with the research of Gausdal (2012) as it relates to networks and that of Roud and Gausdal (2019) as it relates to emergency responses by multiple organizations. The thesis validates the finding that joint training contributes to collaborative learning and inter-organizational trust development in the context of emergency management. The results confirm that inter-organizational trust offers more collaborative learning opportunities in joint training. Likewise, the results validate the conclusion that inter-organizational trust positively influences the sharing

of evaluation reports among emergency organizations, improving the collaborative learning effects of joint training (Roud & Gausdal, 2019). More detailed statistics are available in Article 3 in Part II.

The findings of Article 3 reveal slightly different outcomes between FSE and TTE exercises. The summary of scores for each item of the survey shows that the mean of all items within the usefulness and collaborative learning variables was higher in FSEs than TTEs. However, the opposite was the case in the mean of all items within the collaboration variable (TTEs scored higher than FSEs). In the correlation analysis, stronger relationships were identified between the perceived effects on usefulness and collaborative learning, collaboration and collaborative learning, and trust and learning in TTEs. The stronger correlation between collaboration and collaborative learning in TTEs could be because there is a greater level of communication and in-person interaction during TTEs, thus allowing respondents to reflect and ask questions with greater freedom than during FSEs. This is in line with the finding that communication and discussion allow for novel learning (Paton & Jackson, 2002; van Laere & Lindblom, 2019). The stronger correlation between usefulness and collaborative learning with TTEs may be because the exercises were more participant-led, allowing for experimentation with a variety of solutions and greater assessment of the available options. It may also be that TTEs induce less pressure and have a lower fear of failure, resulting in more creativity in discussions and thus improving collaborative learning. The stronger correlation between trust and collaborative learning in TTEs suggests that the TTEs may function as trust-building arenas. Most emergency personnel believe that the exercises can be very helpful in terms of face-to-face collaboration without intensive stress. TTEs also provide the opportunity to give comments and obtain feedback. In-depth conversations on challenges that emerge during TTEs can establish a shared view among the organizations and their collaboration exercises and training programs (Roud & Gausdal, 2019). Nevertheless, a bivariate analysis revealed a stronger correlation between collaboration and trust in FSEs than in TTEs. This could be because FSEs are generally more intense and realistic,

revealing the competence of the collaborating parties and thus leading to the development of trust based on competence.

5.3 Role of joint training in improving improvisation capability

RQ4: *How can joint training improve improvisation capability to improve IC in emergency management?* Article 4 confirms that improvisation capability can be improved by joint training (Mendonça, 2001). The findings from the selected case of this thesis go further and delve into how improvisation capability may improve IC in emergency management. Several scholars have claimed that improvisation is one of several important factors besides planning, technical communication, and bilateral agreements to improve IC in emergency management (Borch & Batalden, 2014; Mendonça, 2001; Turoff et al., 2009). Several informants addressed the importance of improvisation, reflecting on the flexibility necessary to receive, process, and act on orders from external organizations in a collaborative emergency response. In light of that, the findings from Article 4 show three variables that can influence improvisation capability via joint training. The findings from the literature review and semi-structured interviews reveal that organizational memory, inter-organizational trust, and inter-organizational communication and information-sharing are recognized as influential variables on improvisation capability.

The importance of organizational memory in developing improvisation is well documented in the literature (Crossan et al., 2005; Mendonça, 2007; Moorman & Miner, 1997, 1998; Moorman & Miner, 1997, 1998; Størseth et al., 2009; Vera & Crossan; 2005). The findings of this thesis suggest that improvisation is, to some extent, grounded in organizational memory. The findings of Article 4 reveal that access to logs and evaluation reports from previous joint training can increase organizational memory levels. Thus, the capability of improvisation can result from the increased organizational memory level (Pina e Cunha et al., 1999). The findings from Article 4 indicate that joint training may provide conditions for working together smoothly and improvising collectively. Further, individuals who have undergone training together

cooperate more effectively, do not need to plan in as much detail, face fewer misunderstandings, and become less confused in situations that require improvisation. Article 4 confirms that joint training influences organizational memory because participating organizations learn how to improvise through the formalization or routinization of their improvised action (Vendelø, 2009). Article 4 suggests that the training organizer or controller should manipulate scenarios that call for improvisation, evaluate the improvised action of participants, and implement the outcomes for future training. This indicates that improvisation can provide input for and serve as a first step in trial-and-error learning. This case is similar to when organizations retain insights obtained during improvisational troubleshooting for later investigation (Vendelø, 2009). Overall, the aggregated findings suggest that joint training can improve improvisation capability by increasing the organizational memory level.

The aggregated findings of this thesis confirm that inter-organizational trust and familiarity significantly improve IC, especially with regard to improvisation and decision-making processes (Andersson et al., 2014; Roud & Gausdal, 2019). The findings from Articles 1 and 4 indicate that trust plays a significant role in emergency management and processing sensitive information by facilitating joint problem-solving and collective reflections that can substantially affect improvisation capability. This is partly in line with the literature that suggests that inter-organizational trust may help actors concentrate on finding solutions to problems, allowing them to improvise and implement novel strategies to improve IC (Weick & Roberts, 1993; Christensen et al., 2016). The findings of Article 4 reveal that, in trust-based countries like Norway and Iceland, improvisation is not sanctioned or interpreted as an error. This could be why informants mostly reflected on the positive aspect of improvisation and its role in facilitating IC. This partly confirms Gredler's (1992) findings that the trust-based approach potentially increases improvisation. Additionally, the findings demonstrate that joint training is an efficient way of increasing inter-organizational experience, allowing for improved perspectives of the competence of other organizations. This can assist in developing trust based on competence (Abrams et al., 2003). Though affect-

based trust has been identified as highly important for organizations to collaborate effectively (McAllister, 1995), this thesis did not investigate its development within training and exercises. Overall, the aggregated findings of this thesis suggest that joint training can improve improvisation capability via the development of inter-organizational trust.

All informants addressed the significance of exchanging information and effective communication. This could be because effective communication is recognized as one of the key elements for successful IC (Olson et al., 2011). The findings of this thesis demonstrate that exchanging information plays a significant role when improvising in collaborative emergency responses, especially in a challenging context like the Arctic Ocean. The reason could be that access to information and an appropriate informational infrastructure among emergency organizations in a complex environment becomes more crucial for rapid decision-making (Bharosa et al., 2009; Comfort & Kapucu, 2006). The findings from Articles 1, 2, and 4 highlight the importance of the informal communication networks formed following joint training. Thus, the findings suggest that joint training can create platforms for the development of communication skills to re-establish shared language and professional terms. This could greatly strengthen communications, which are crucial in improvisation during genuine emergencies (Johansson & Hollnagel, 2007). In line with Pigeau and McCann (2000), the findings reveal that being familiar with partner organizations' communications technology and information structures is especially significant for improvisation. The aggregated findings of this thesis regarding the importance of communication suggest that smooth communication and information-sharing achieved from joint training can positively influence improvisation capability.

5.4 The role of joint training in improving IC in emergency management

Training has been recognized as a mechanism to develop competence in general and in emergency management in particular. However, the concept of joint training and its outcomes has received insufficient attention in relation to improving IC. Accordingly, scholars have emphasized collaboration exercises by exploring collaborative learning outcomes to improve the collaborative emergency response (Berlin & Carlstrøm, 2011, 2014, 2015; Magnussen et al., 2018). While previous research has explored the outcomes of the joint training concept at the individual, group, and organizational levels, this thesis expands our understanding by exploring the phenomenon across levels. This thesis treats joint training as a mechanism that contributes to critical elements (trust, collaborative learning, improvisation capability) of improving IC in emergency management.

Insights from the IC literature have been used in combination with the views of training, trust, learning, and improvisation researchers in emergency management to answer the overarching research question: *How can joint training improve inter-organizational collaboration in emergency management?* The discussions of key findings in Sections 5.1–3 show that joint training contributes to trust development, collaborative learning enhancement, and improvisation capability improvement. This section connects trust, collaborative learning, and improvisation capability and explains their contributions to improving IC. It does so by demonstrating how these elements may minimize the identified IC challenges, such as having diverging structural and cultural frames that direct somewhat different understandings (Kapucu & Garayev, 2011), a lack of flexibility in the decision-making process, changing routines and procedures (Kim, 2013; Smith, 2004), inaccurate information and knowledge-sharing, and recourse allocation (Boin & Bynander, 2015; Chen et al., 2010; 't Hart & Sundelius, 2013; Moynihan, 2008).

The findings of the role of joint training in developing trust reveal that, by participating in joint training, emergency organizations develop inter-organizational trust that contributes to resource-sharing, institutional familiarity, communication, flexibility in organizational structure (room for improvisation), mutual respect, reduced conflict, enhanced collaborative learning, and mutual understanding and shared goals. This thesis confirms that, with a high level of trust in the other organizations acting to achieve a common goal, strict hierarchical control and command structures could be loosened (Andreassen & Borch, 2020). Therefore, by increasing the level of trust from joint training, emergency organizations tend to be more open to collaboration and accomplishing a collective task. Thus, the thesis suggests it is likely that these findings may improve IC in emergency management.

Key findings of this thesis regarding collaborative learning from joint training are condensed under the following seven approaches: 1) the development of a mutual understanding; 2) the willingness to collaborate and share information; 3) the exchange of expertise; 4) continuous dialogue, smooth communication, and collective reflections on and the evaluation of a joint task; 5) less resistance to organizational change; 6) the opportunity to commit errors and extend abilities through testing a variety of strategies; and 7) the increased familiarization of actors with the partners' organizational structures. Based on the literature and the above discussions, the thesis suggests that these findings may improve IC in emergency management. The thesis validates the finding that joint training contributed to collaborative learning and trust development, which are perceived to improve IC in emergency management. Further, it sheds light on the relationship between trust and collaborative learning and confirms a significant correlation between them.

The discussed findings of this thesis and the literature demonstrate that the increased organizational memory, inter-organizational trust, and smooth inter-organizational communication and information-sharing from joint training improve improvisation capability in emergency management. As the terms, organizational

memory and collaborative learning were interchangeably used while exploring the improvisation concept (based on the memory definition in this thesis, collaborative learning has frequently been recoded as memory), the findings show that collaborative learning can influence improvisation capability, and improvisation can be an input of collaborative learning (memory). This explains a two-way relationship between collaborative learning (memory) and improvisation capability. The thesis further implies that joint training improves improvisation capability with regard to the decision-making process by helping adapt and modify extant structures, rules, routines, and procedures. However, this thesis does not test the correlation between improvisation and IC quantitatively, and this needs to be assessed in future research.

The thesis suggests that joint training contributes to establishing better communication and informal contacts. Joint training encourages the "getting to know" behavior that has been found to create more open attitudes, understanding, and trust between organizations and that can subsequently improve IC. This joint training contribution may fall under a concept found in the literature called *socialization* as a facilitator of better collaboration among teams (Alexander, 1995). In an inter-organizational context, socialization refers to a proactive strategy that allows individuals and organizations to modify their approaches and adjust to new roles as opposed to the restrictive task or role previously assigned (Ashforth & Saks, 1996; Jones, 1986; Lalonde, 2010; Pramanik, 2015; Van Maanen & Schein, 1977). Emergencies are unexpected events that cannot be responded to with a restrictive set of rules, procedures, or routines (Rosenthal et al., 1989; Lalonde, 2010). Active participation in joint training as a proactive strategy of socialization plays a significant role in emergency management because it enables individuals and organizations to adapt to a new environment they have not "mastered" (Lalonde, 2010; Louis, 1980; Pramanik, 2015). The findings of this thesis confirm that joint training can contribute to socialization to manage such situations and develop collaborative attitudes by using informal channels to find solutions (Lalonde, 2010) and consequently improving IC.

Further, the thesis suggests that flexibility in emergency organizations is critical in improving IC. Flexible procedures allow room for improvisation and the recognition of interdependence, whereas strict structures and the formalization of roles and procedures limit collaboration (Alexander, 1995; Hatch & Cunliffe, 2006). Flexibility has particular salience in the field of emergency management, as incidents are often described as unexpected. In their work on organization structures, Hatch and Cunliffe (2006) have referred to flexibility as a necessity in unstable environments (Hatch & Cunliffe, 2006). The findings from the case studied in this thesis show that joint training can provide greater flexibility to meet changing demands in the unstable environment of an emergency situation and subsequently improve IC. After discussing the findings in this chapter, socialization and flexibility are recognized as two critical approaches through which joint training can contribute to trust, collaborative learning, and improvisation capability and consequently improve IC. This is in line with Pramanik's (2015) finding that socialization and flexibility improve IC in a civil-military context. Table 5 shows how the key findings about improving IC can be categorized under flexibility or socialization approaches.

Table 5. Contribution of joint training as an important element for improving IC

Element	Flexibility	Socialization
Trust	Increasing flexibility in sharing resources Increasing flexibility in organizational structure	More institutional familiarity, communication, and mutual respect Reduced conflicts Enhanced collaborative learning More openness to collaboration and accomplishing a collective task Establishment of mutual understanding and shared goals
Collaborative learning	Decreasing resistance to organizational change Providing the opportunity to commit errors and extend abilities through testing a variety of strategies	Willingness to collaborate, share information, and exchange expertise Continuous dialogue and smooth communication Increased collective reflections on and evaluation of the joint task Development of mutual understanding and increased familiarization of actors with the partner's organizational structure
Improvisation capability	Increasing flexibility in the decision-making process by helping adapt and modify extant structures, rules, routines, and procedures Increasing freedom from pre-established procedures and strategies	Enhanced collaborative learning Development of inter-organizational trust Smoother inter-organizational communication and information-sharing between organizations

The aggregated findings of the thesis shed light on the relationships among trust, collaboration learning, and improvisation capability in improving IC in emergency management. These interrelationships in a high-risk context like the case of the Arctic Sea region can be more visible because the Arctic characteristics amplify the challenge associated with IC in emergency management. Today, some Arctic counties have perceived the threat of maritime incidents in the region and arrange regular joint exercises, such as Barents Rescue and Exercise Barents, to address this concern. These exercises are international emergency management training to improve cross-border collaboration when dealing with natural and human-induced disasters, large-scale accidents, and other emergencies in the region. However, there is a need for more international joint training between Arctic countries. Research demonstrates the

possible differences in the assumptions of participating organizations arising from national backgrounds and political history in collaborative emergency management (Kuipers et al., 2015; Christensen et al., 2016). The findings of the thesis suggest that informal meetings with better scope to openly share the goals, tasks, and priorities of partner organizations in joint training could minimize background and political challenges to IC. Apart from the contextual factor, the interrelationships identified in the thesis represent a dynamic interaction among trust, collaborative learning, and improvisation capability in improving IC in emergency management.

Figure 2, a revised version of the preliminary conceptual model (see Figure 1), illustrates how the variables from Figure 1 appeared after studying the phenomena in this thesis. Figure 2 explains the relationship between joint training (independent variable) and IC in emergency management (dependent variable). Moreover, it shows the interrelations among the developed trust, enhanced collaborative learning, and improved improvisation capability from joint training that are perceived as important elements of improving IC. The investigation of the relationship between joint training and IC shows that the trust developed in joint training can improve IC. However, the ways IC can influence trust have not been explored. Furthermore, Figure 2 shows that the enhanced collaborative learning from joint training is perceived as improving IC. The discussion of findings and the literature provide evidence of this relationship; however, this thesis does not explore the opposite direction of this relationship. Nevertheless, the experience of collaborative response and the incident evaluation reports from real IC may have beneficial learning outcomes. Further research is needed to investigate how this IC may influence collaborative learning.

Further exploration of the relationship between joint training and IC demonstrated that the improved improvisation capability from joint training is perceived to improve IC. Similar to the influence of trust and learning on IC, the findings of this thesis explore only one direction of this relationship, and no evidence regarding effective IC and its influence on improving improvisation capability is recognized.

Although the thesis did not problematize or investigate the interrelationships among the important elements (trust, collaborative learning, and improvisation capability), the findings demonstrate such an interrelation. The thesis provides empirical evidence that trust developed from joint training is perceived to contribute to collaborative learning and improvisation capability. Future research should explore the possible negative influence between them. The only two-way relationship recognized in the case of this thesis is the correlation between collaborative learning and improvisation capability. Future research should quantitatively validate this correlation.

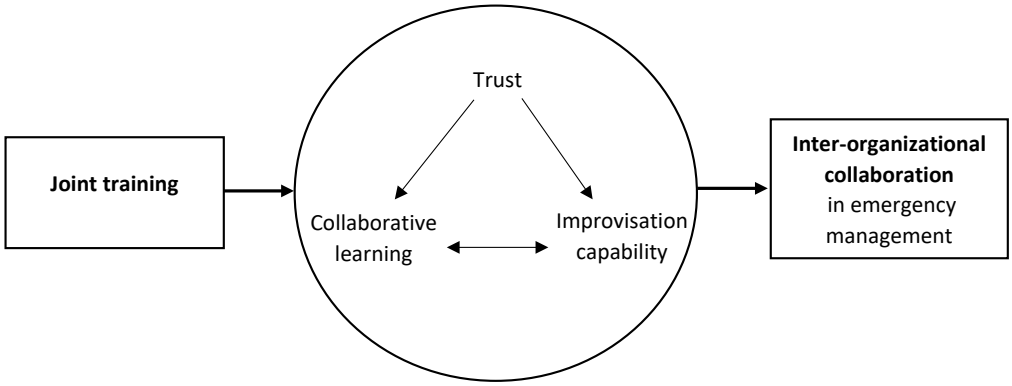

Figure 2. Revised conceptual model

A large body of literature in emergency management focuses on the role of training in strengthening individual skills, knowledge, and discipline-specific competencies, such as equipment handling and procedure undertaking (Berlin & Carlstrøm, 2014; Sørensen, 2017). Joint training often has an overall goal—working together to integrate and improve collective handling of emergency situations—and specific objectives, such as testing new technology, mobilizing resources, and applying new policy and rules. The summary of findings reveals that joint training can contribute to trust development and improve improvisation capability regardless of the specific objectives of individual joint training. This contribution sheds light on a critical but less-visible aspect of joint training in emergency management: trust and improvisation

capability. This model should be developed by implementing adjustment strategies, such as the feedback and feedforward between the boxes in Figure 2, to achieve effective IC in the future. This could include an assessment of trust-based and improvised actions in IC performance. Considering the results of an assessment in the evaluation, analysis, and design of joint training could contribute to collaborative learning from joint training and consequently better IC performance and effective emergency response.

5.5 Limitations and further research

This thesis has some limitations that should be acknowledged, and its findings need to be developed in future research. The limitations are described below.

Joint training's contribution to trust, collaborative learning, and improvisation capability may have been due to the particular features of the context studied and certain training designs in this thesis. The literature (e.g., Meyerson et al., 1996; Wenger et al., 2002; Abrams et al., 2003) also indicates that the researcher's competence, features, and personality play a role in the creation of relationships. For example, the author's language skills might have affected the interpretation of the data from interviews. As a foreigner, it was somewhat challenging to interview the military personnel. Hence, the findings might differ if a researcher with the same nationality and historical background as the informants were to collect and interpret the data.

For the current work, semi-structured interviews were conducted, focusing on collaboration in search and rescue operations in the maritime emergency context. It would be valuable for another researcher to replicate the study in a different professional context and different settings. Although the interview findings were similar to those presented in the literature, semi-structured interviews on another type of emergency—such as violent action or oil spills in emergency management contexts—could provide a wider empirical basis for comparison.

The thesis does not measure the improvisation capability as such but suggests influential factors. The same is true for the IC improvement in emergency management. The thesis explains how joint training is perceived to improve IC (how it is perceived to be useful for IC) in emergency management. Because this thesis did not observe how organizations implemented the joint training outcomes, it cannot measure how much the identified variables actually influence the IC effectiveness of emergency organizations in a common problem-solving space.

The findings from the multi-national Arctic Sea region case may not be relevant to emergency management in all regions and contexts. However, the data primarily concern full-time employees of emergency organizations, and the findings might be different in contexts dominated by volunteer personnel. These are limitations regarding the transferability of the results. The data for this thesis were collected from different nations, and the influence of political and national histories on the participants' responses and their perceptions of IC were not considered. Similar studies with participating organizations in different nations with more variety in national history, and polity could add a wider scope regarding the comparisons across organizations. Although this thesis discusses findings from several nations, no comparative approach was undertaken. Each nation might have a different level of flexibility in the command structure during training and real emergency responses. Therefore, the outcome of training in terms of trust and improvisation capability might be distinct in each nation.

Collaboration and trust are dominant features of Scandinavian culture (Metallinou, 2018), whereas Canada has a slightly more competitive culture, which may have played a role in the results. Again, these cultural differences were not considered, which may have biased the findings. English was used for the interviews and collecting observational data despite not being the first language of most informants or the researcher. This, too, may have influenced the results. Further research should continue to explore how trust is developed in each phase of

emergency management, particularly during the collaborative exercises. The thesis calls for more research into the factors that facilitate and hinder the development of trust among emergency organizations at the inter-organizational and interpersonal levels. Political tension and distrust between two countries could hinder trust development at the international level. Even though political tension has little impact in search and rescue, the same may not be true in another type of emergency response in the Arctic (such as violent action). This could be studied in a longitudinal research setting, with data collected over a long period to capture the rhythm of the trust-development or trust-repair process.

The quantitative component of this study would benefit from a larger sample size, which could provide a more precise mean value and allow the researcher to pinpoint outliers more easily (Balnaves & Caputi, 2001). Nevertheless, due to the relatively small number of emergency response organizations, the data collected in the case of this thesis may give a relatively accurate indication of the perceived level of trust, collaborative learning, and the usefulness of the exercises. It is important to note that the situational awareness of the needs, communications, and responsibilities of others (and people's mental models of these) could significantly affect how participants assess and perceive the outcomes of an emergency exercise. Thus, the participants may have interpreted the meanings differently, which may have influenced their answers and resulted in somewhat lower term validity. Future research could consider these factors in their design. The small number of participants in this study limited the transferability of the results when separating managerial-level and on-site responders. Thus, the data were gathered from a nondifferentiated study population. Therefore, further studies should include this factor in their research design and analysis to investigate the differences in the answers at each level.

The levels of analysis also have some limitations. In the quantitative component, collaborative learning is measured at the individual level, while trust and collaboration are investigated at the inter-organizational level. In future research, the design should

be developed further to better access all outcomes at the inter-organizational levels. The quantitative survey findings should be tested in other contexts to verify their causality and generalizability. Finally, the setting, including the joint training in general and exercise scenarios, may vary locally, nationally, and regionally, but this study does not explore this element in depth. Thus, further studies are suggested to consider these issues.

6. Contributions and Conclusions

This chapter reflects on the theoretical contributions of the thesis and the implications for practice and policy, and it ends with conclusions.

6.1 Theoretical contributions of the thesis

Emergency management is a multidisciplinary field. Therefore, the findings of this thesis contribute to multiple bodies of literature. This thesis contributes to the IC, training, trust, collaborative learning, and improvisation capability literature in several ways. These contributions are elaborated in the following paragraphs.

The thesis contributes to the IC and training literature by exploring the role of joint training and providing empirical evidence from a multinational context for improving IC. Other research on IC also emphasizes the value of training within a different discipline, but there appears to be little examination of its role in improving IC in a multinational emergency management setting. Additional contributions include studying IC in highly specialized organizations (emergency organizations) characterized by internal hierarchies and levels of expertise and by exploring the role of joint training in trust development, collaborative learning enhancement, and improvisation capability improvement. Hence, it expands knowledge by introducing the relationships among these concepts to improve IC. The thesis contributes to the IC literature by discussing the development of trust and collaborative learning enhancement from a cross-level perspective in a collaborative context. It demonstrates that the individual and organizational levels are not separate but are, in fact, highly intertwined. The thesis demonstrates that the contributions of joint training to important elements (trust, collaborative learning, and improvisation capability) of improving IC can be categorized into *socializing* and *flexibility*, two general approaches that several scholars (Van Maanen & Schein, 1979; Jones, 1986; Ashforth & Saks, 1996; Alexander, 1995; Lalonde, 2010; Pramanik, 2015) perceive as enriching IC. The concept of familiarity unexpectedly appeared after the analysis and discussion of findings as an outcome of

joint training that may improve IC. This can suggest how further studies may explore the concept of familiarity and measure how much this factor influences IC effectiveness.

Thus far, few studies have considered how joint training influences trust. This thesis contributes to the trust literature in several ways. It illuminates the role of trust and its development through the emergency management phases in general and in the joint training in particular. The findings confirm the importance of trust in the rapid formation of temporary organizations (Faraj & Xiao, 2006; Hyllengren et al., 2011; Curnin et al., 2015). This thesis contributes to knowledge of trust in the emergency management context by empirically verifying the importance and role of inter-organizational trust in the Arctic Sea region. It further contributes to the literature by exploring the concept of trust and confirming that it affects knowledge-sharing and collaborative learning and enables an organization to capture, reuse, and share information from joint training. Finally, the trust developed through joint training is identified as a driver of improved improvisation capability.

This thesis expands the understanding of how joint training may contribute to collaborative learning in several ways. It confirms that joint training is essential for collaborative learning and resolving intractable problems (Jones & Macpherson, 2006) and illustrates how collaborative learning through participation in joint training enables organizations to bridge organizational boundaries and fields of expertise (Tynjälä, 2008). This thesis underlines the importance of continuous participation in joint training, where organizations learn how to effectively handle emergencies together and share this learning with other organizations. The work gives empirical evidence that collaborative learning from joint training provides organizations with a platform for the exchange, transformation, and creation of knowledge. This thesis contributes to the cross-level learning framework by adding *internalizing* and *interconnecting* processes to the 5I framework, which was created to assess small- to medium-sized manufacturing enterprises. Applying the framework in the joint training context demonstrates a new way of acquiring broad-based understandings of

collaborative learning at a different level. The thesis examines how the relationship between participation in joint training and collaborative learning is perceived to improve IC in emergency management. Finally, the thesis suggests that joint training that is followed up with in-depth debriefings, seminars, and opportunities to improvise can provide more valuable opportunities for collaborative learning in improving IC in emergency management.

The thesis expands the understanding of how improvisation capability is improved by joint training in several ways. The work confirms that organizations are more resilient when they can anticipate shifting environments, develop planned courses of action, and demonstrate flexibility and the ability to improvise collectively under time constraints when unanticipated situations emerge (Mendonça, 2007). The findings address Frykmer et al.'s (2018) call for more empirical studies on improvisation at the inter-organizational level in the emergency management context. This thesis explores how the individuals and organizations involved in joint training may develop collective sense-making and improvised action in the Arctic Sea region, which is marked by a high degree of uncertainty. A contribution is made to the improvisation literature by recognizing how joint training improves improvisation capability via organizational memory, inter-organizational trust, and communication and information-sharing. The application of the organizational memory concept in relation to training is novel because, to the best of my knowledge, this concept has not been explored in relation to joint training in the emergency management context.

6.2 Implications for practice and policy

This thesis has several implications for practice. In Norway, collaboration was introduced as the fourth national-emergency preparedness principle in 2012 (Norwegian Ministry of Justice and Public Security, 2012). Since then, few studies have explored the concepts of collaboration and joint training. This thesis could help managers and exercise designers focus on further collaboration activity outcomes to improve emergency response collaboration in several ways.

First, the thesis illuminates the importance of managers and commanders realizing that trust is central to the effectiveness of emergency management. This study concludes that collaborative learning can be strengthened by embedding trust elements in joint training. Reflection seminars that focus on unsolved problems and that allow the respondents to identify the problems that may lead to changes in structures, behaviors, working methods, and the confirmation of existing knowledge and procedures might contribute in this respect. Second, it acknowledges that joint training influences improvisation capability in emergency responses. This thesis has implications for collaboration, as it moves people from an individualistic perspective to an acknowledgment of the collective. In effect, one sees one's duty as a single piece of the larger picture of the emergency response.

Third, the thesis suggests that interagency networks (such as Emergency Prevention, Preparedness, and Response meetings)—not only during and after emergencies, but in routine times, as well—would be a positive step toward the establishment of shared mental values and the eradication of discrepancies arising from different values and organizational goals. The open and truthful exchange of ideas is the ultimate goal of such dialogue, facilitating coordination and enhancing collaboration during emergency decision-making processes and response operations. The annual Emergency Prevention, Preparedness, and Response (EPPR) meeting is a valuable example of such a network.

Fourth, the thesis indicates that a greater degree of flexibility in the command structure and decision-making processes under time pressure in emergency situations can improve IC. At the same time, complex interactions and unexpected sequences cannot simply be solved by either control or improvisation in emergency response. Each emergency contains a certain amount of disorder; as a result, some degree of command and control is needed to restore stability. In practice, emergency organizations should train to maintain a balance between control and improvisation in each situation.

This thesis is also relevant for policymakers, as it points to the need to develop and adopt a joint training that emphasizes IC improvement. It might be of interest, for instance, for the Arctic Coast Guard Forum and the Arctic Council. As the mission of these organizations is to facilitate collaboration, the thesis can provide in-depth insight into the role of collaboration activities. As third parties, they build solid relationships between nations and contribute to trust development and the establishment of mutual understanding. As a result of the development of mutual trust, a central data repository can be created. This data repository, containing each country's resources and capabilities, could improve awareness and transparency in future emergency responses.

6.3 Conclusions

Several studies have emphasized the necessity of improving IC in emergency response and the need for joint training, but there is a lack of knowledge on the role of joint training in improving IC in emergency management. This thesis contributes to this recognized knowledge gap by answering the overarching research question: *How can joint training improve inter-organizational collaboration in emergency management?* The main finding is that trust, collaborative learning, and the improvisation capability developed from joint training are important elements in the process of improving IC in emergency management. Moreover, this thesis shows that the contributions of joint training to these important elements for improving IC can be categorized into socializing and flexibility, two general approaches that other scholars have found can enrich IC.

By starting with theories and using a case to enlarge their domain, this thesis provides analytical generalizations. The descriptions of, for instance, the challenges and examples the interviewees provided were largely similar to those that were identified through the review of international scientific literature. Although the sample of interviewees was limited to three Arctic nations that were exposed to domestic and multi-national contexts of IC, the findings from the literature review, which was

multinational in nature, supported the interviews. Thus, it is likely that the findings are not unique to a specific context of IC in the case of maritime emergency response in the Arctic Sea region, nor are they unique to national backgrounds, such as that of Norway, but they might also be valid for a larger population of emergency operations belonging to other organizations and nations. Therefore, the empirical evidence from this thesis can be relevant to other organizations that exhibit characteristics similar to the context of the emergency response in the Arctic Sea region in relation to central dimensions, such as a hierarchical command structure, and operation in an environment where the frequency of predatory emergencies is low. The findings might also be informative in other large-scale inter-organizational contexts with high risk, vulnerability, uncertainty, and time pressure, e.g., large-scale IT and construction projects. However, this assertion is conditional, as this thesis only examines a single case. Further single and comparative case studies are needed to nuance or challenge this assertion. Although more research is needed, this thesis addresses IC issues that are valuable for society, academics, and emergency organizations.

7. References

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Trust and emergency management: Experiences from the Arctic Sea region

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ABSTRACT

Trust has long been identified as an essential component in different disciplines. However, trust in the context of emergency management is a less often researched phenomenon. This article intends to enrich our theoretical understanding of trust by exploring the role of interorganisational trust and the process of trust development across phases of emergency management. To achieve this, a critical case study of the cross-national Arctic Sea region is conducted. The findings reveal that in each phase of emergency management, trust has a critical role to play such as improving coordination, communication, reliability and learning. Moreover, a cross-level framework for trust development is presented in order to illustrate how each phase of emergency management contributes to process theories of trust. The article explicates how the preparation phase contributes to developing interorganisational trust. The response phase contributes significantly to developing swift interorganisational trust. Although the evaluation phase has significant potential to transform this swift and fragile trust into a more resilient interorganisational trust, this potential is underexploited due to the low priority accorded to this phase. The article elaborates on trust in the emergency context and brings the group and project level concept of swift trust to the interorganisational level of analysis.

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Introduction

Because it bolsters interorganisational performance, communication and cooperation (Foulquier & Caron, 2010; Gausdal, Svare, & Möllering, 2016; Mishra, 1996; Virrantaus, Mäkelä, & Demšar, 2009; Zucker, 1986), trust is one of the keys to strengthening interorganisational collaboration (Mathieu, Marks, & Zaccaro, 2001). On the grounds of substantial uncertainty, a high risk of cognitive and organisational errors (Webb, 1996), and high dependency of other organisations, interorganisational trust is crucially important in the context of emergencies. Swift trust, which is 'a unique form of collective perception and relating that is capable of managing issues of vulnerability, uncertainty, risk and expectations' (Meyerson, Weick, & Kramer, 1996, p. 167), is therefore of particular interest here. Prior research on interorganisational relationships has examined trust at varying

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levels, the majority of the studies analysing trust at the individual (Child & Möllering, 2003; Jap & Anderson, 2003) or organisational levels (Das & Teng, 2001; Poppo, Zhou, & Ryu, 2008). Swift trust is studied mostly at the group and project levels. The current study, however, follows Schilke and Cook's (2013) theory and analyses trust at both the individual and the organisational levels, leading to a cross-level development of trust in interorganisational relationships. Moreover, it aims to bring swift trust to the interorganisational level.

Emergency management (EM) deals with risk and risk avoidance (Brennan & Krohmer, 2006) related to the combined action of an organisation's own resources and assistance from supporting organisations or authorities (Haddow, Bullock, & Coppola, 2017). In emergency situations, 'a fast, coordinated and efficient response among many different organisations, under urgent stress conditions is crucial' (Comfort & Kapucu, 2006, p. 107); and since there are seldom alternatives, the actors rarely select their collaboration partners. Emergencies are therefore an interesting and important context for studying interorganisational trust.

Emergency management (EM) is a process of different phases (Chen, Sharman, Rao, & Upadhyaya, 2008). Trust may play a different role in each phase, and different trust-development processes may take place. Even if the concept of trust has found its way into the EM literature to some degree (e.g. in Mishra, 1996; Pramanik, 2015; Roud, Borch, Jakobsen, & Marchenko, 2016; Schmied et al., 2017), the role of trust and trust development in different phases remains largely unaddressed. This paper, therefore, focuses on the role and the development of trust in the EM phases of preparation, response and evaluation. The research question is: 'What is the role of interorganisational trust and how is it developed across phases of emergency management?'

To answer this question, and to build a framework of interorganisational trust in different phases of EM, a case study is conducted, using mainly qualitative data from civil and military organisations in three Arctic nations involved in cross-national EM at sea. The structure of the paper is as follows: This introduction is followed by the theoretical framework, then the methods, findings, discussion, and finally, the concluding remarks.

Theoretical framework

Definition of trust

Trust is considered a multi-level, multi-dimensional and dynamic concept (Butler, 1991) and may be defined as the willingness to be vulnerable (Mayer, Davis, & Schoorman, 1995). Researchers view trust as a gradual development process (Möllering, 2013; Schilke & Cook, 2013; Schoorman, Mayer, & Davis, 2007). McAllister (1995) distinguishes between affect- and cognition-based aspects of trust. Although his framework was developed at the interpersonal level, it may also work at the interorganisational level, because the decision whether to accept vulnerability is made by individuals – even if they do so on behalf of organisations. While the affect-based aspect of trust is grounded in reciprocal care and concern, as well as in emotional bonding (McAllister, 1995), the cognition-based aspect of trust includes the trustee's perceived abilities, skills and expertise that facilitate performance within a specific domain, which is close to competence-based aspects of trust (Lewicki & Bunker, 1996; McAllister, 1995; Nooteboom, 2002). Nevertheless, different cultural dimensions may influence how trust can be applied at the

interorganisational level (Marshall, 2003): for instance, cognition-based trust is not sufficient for interorganisational collaboration within organisations with a collectivistic culture (Chen, Chen, & Meindl, 1998), while cognition-based trust will be more positively related to collaboration in an individualistic culture (Chen et al., 1998). On the other hand, affect-based trust will be more positively associated with interorganisational collaboration in organisations with a more collectivistic culture.

Swift trust is a 'category-driven trust, that is actors can deal with one another more as roles than as individuals. Expectations, consequently, are more standardised and stable and defined more in terms of tasks than personalities' (Grabher, 2002, p. 210). Swift trust, which is built on and maintained by a high level of activity and responsiveness (Coppola, Hiltz, & Rotter, 2004), and is based more on need and compulsion than on emotional or cognition processes over time, is different from ordinary trust. It may flourish even though the ordinary antecedents to trust are absent (Meyerson et al., 1996). Swift trust enables members to take action, and this action helps the group to maintain trust and deal with uncertainty, ambiguity, and vulnerability while working with strangers on complex interdependent tasks in situations of high time pressure (Meyerson et al., 1996). Such trust, which includes a willingness to suspend doubt about whether strangers can be counted on to get the work done, as well as a positive expectation that the group activity will be beneficial, is supported by institutionalised and well-defined roles (Möllering, 2006); it may therefore be relevant in emergency operations. Swift trust, however, is closely connected to the particular context (Jarvenpaa & Leidner, 1999); as a consequence, other efforts must be taken to build more resilient and ordinary trust (Möllering, 2006).

Level of analysis

Investigating the nature of trust, a distinction emerges between the parties involved in the trust relationship. The trustor holds certain expectations about another party and, as a result, may or may not be willing to be vulnerable to the actions of the other party, while the trustee is assessed by the trustor (Mayer et al., 1995). In the context of interorganisational relationships, both the trustor and the trustee can be represented by different levels of analysis (Currall & Inkpen, 2002), either by an individual or by an organisation. This paper studies trust across multiple levels of analysis by discussing how trust at one level may lead to, and develop, trust at another level – via for example collaboration, communication, shared values, competence and capabilities, knowledge exchange and resource sharing within and between levels (Chou, Wang, Wang, Huang, & Cheng, 2008; Fulmer & Gelfand, 2012; Jarvenpaa & Leidner, 1999).

The individuals most relevant to the implementation of interorganisational relationships are denoted as 'boundary spanners' (Currall & Judge, 1995; Perrone, Zaheer, & McEvily, 2003), and may be managers, directors, or their representatives, who are primarily in charge of the relevant interorganisational relationships (Currall & Inkpen, 2003). According to the individual and organisational levels of analysis, the following three distinct categories are applicable to trust in interorganisational relationships (Schilke & Cook, 2013): individual–individual (interpersonal), individual–organisation (institutional) and organisation–organisation (interorganisational). These relations are the building blocks of the cross-level process model of trust (Schilke & Cook, 2013) that is further developed in the EM context of this study.

Trust processes (as stages)

The cross-level model of trust development includes four consecutive stages (Schilke & Cook, 2013): initiation, negotiation, formation and operation. A specific relation between a trustor and a trustee, in which both parties can be either an individual or an organisation, characterises each stage. Although the model may not be fully applicable to every inter-organisational relationship, it constitutes a baseline model that might be relevant in the EM context. In the initiation stage, potential partners are first identified before being evaluated and selected. Here, the boundary spanner gathers clues regarding the trustworthiness of the partner organisation. The information gained provides a foundation for the development of individual–organisation trust. If people become acquainted during interpersonal interactions, the negotiation stage is reached. Here, the boundary spanner communicates with his or her individual counterpart in the partner organisation, engaging in negotiations. These individual–individual negotiations significantly shape the boundary spanner's trust beliefs. The formation stage involves setting up the partnership by committing various types of resources (Schilke & Cook, 2013). Here, the boundary spanner transfers trust in his or her individual counterpart to the partner organisation (individual–organisation). Consequently, in the operation stage, a common understanding about the trustworthiness of the partner organisation develops and becomes institutionalised; in this way, organisation–organisation (interorganisational) trust is established (Schilke & Cook, 2013). Finally, in new relationships between organisations in which there is prior interorganisational experience, organisational-level trust feeds back into the boundary spanners' trust (Schilke & Cook, 2013).

In EM, the response phase is performed by a temporary collaborative network-similar organisation, and all phases of EM may require interorganisational collaboration. Even though collaboration with other organisations has a higher voluntary factor in networks than in EM, we also find Gausdal's (2012) framework for trust-building processes in the context of networks to be relevant for EM. In this framework, contact, communication, direction, resource-sharing and temporary groups are identified as five trust-building processes (Gausdal, 2012). Four of these processes may explain what happens in Schilke and Cook's (2013) four stages; however, the fifth of Gausdal's processes – temporary groups and the building of swift trust – is not covered by Schilke and Cook (2013). Contact, which implies that people from different organisations meet face-to-face for rich communication and interaction, may happen at the initiation stage, while frequent and collaborative communication may occur at the negotiation stage. Direction, which includes the development of a common language, values and goals, may happen at the formation stage; finally, resource-sharing, which includes the sharing of scarce resources like time, people, equipment and infrastructure, may occur at the operation stage. Thus, the trust building processes may also be viewed as stages of trust. Through this study both trust processes (stages) and emergency phases are discussed.

Emergency management and trust

Emergency management is defined as 'the preparation for and the coordination of all emergency functions, other than functions for which military forces or other federal agencies are primarily responsible, to prevent, minimize, and repair injury and damage resulting from disasters' (McEntire, 2007, p. 258). Because trust is generally known to

reduce conflicts, increase knowledge-sharing, and make people more cooperative in their operational behaviour (Ouchi, 1981), 'collaboration requires trust in the other party' (Thomas, 1979, p. 271). Inspired by insights from this general trust literature, the importance of interorganisational trust has also been addressed in EM (Foulquier & Caron, 2010). Here, solid trust seems to improve communication and crisis coordination, whereas lack of trust increases the need for preparedness efforts before potential emergencies (Longstaff & Yang, 2008).

The most widely accepted phases of EM are prevention, preparedness, response, recovery and evaluation (Boin & McConnell, 2007). 'Prevention' refers to actions that prevent a disaster, reduce the chance of it happening, or lessen its damaging effects (Kapucu, 2008). 'Preparedness' refers to actions taken before impact, including planning, training and exercises, and this is the realm of emergency planners, who construct plans to minimise the effects of hazards and emergencies (Kapucu, 2008). 'Response' refers to actions taken during the initial impact of a disaster, including those to save lives and to prevent further damage to the environment and property. 'Recovery' refers to actions taken after the initial impact, including those aimed at achieving a return to normality (Haddow et al., 2017; Kettl, 2005). 'Evaluation' allows the actors to make adjustments to practices and policies, enabling better performance next time (Mushkatel & Weschler, 1985). This paper is limited to the preparedness, response and evaluation phases.

Trust and relationships between different organisations must be built outside of emergency situations (Kapucu, 2006) and before a disaster strikes (Kapucu, Arslan, & Demiroz, 2010) – that is, in the preparation phase. Important factors for developing trust in this phase include willingness to collaborate, information-sharing and a set of shared values (Kapucu, 2006). Interorganisational pre-training allows social relationships between the partners to develop over time, which may create trust and shared mental models (Franco, Zumel, Holman, Blau, & Beutler, 2009).

In the response phase, time is a crucial factor. Because of low sea and air temperatures and the highly vulnerable environment, time is even more critical in the Arctic. The organisations operating here depend on an elaborate body of collective knowledge and diverse skills, and have an extremely short time, or no time at all, to find out who knows precisely what (Meyerson et al., 1996). The nature of communication here is mostly command and control. The organisations involved function as one temporary collaborative organisation under joint command; in such temporary organisations with extreme time pressure, swift trust (Meyerson et al., 1996) may emerge quickly.

Like the preparation phase, the evaluation phase also takes place outside of the emergency situation, which makes it an appropriate platform for developing trust among the emergency organisations (Kapucu, 2008). Trust affects knowledge-sharing and learning (Matzler, Renzl, Mooradian, von Krogh, & Mueller, 2011) and enables organisations to capture, reuse and share information and lessons learned from past mistakes (Dirks, 2000). This phase, moreover, is a valuable opportunity to utilise the temporary, fragile swift trust as a basis for the development of a more resilient trust.

Methods

This study aims to contribute to process theories of trust rather than to a variance theory of trust (Langley, 2007), and concentrates primarily on the sense made by informants about

the phenomenon. The authors are interested in how trust develops over time and on the basis of previous experiences, a form of understanding that is very much grounded on the flows of activities (Gehman et al., 2018).

To answer the research question, an in-depth case study with mostly qualitative data analysis was chosen. The data were collected by triangulating observation, qualitative interviews, questionnaires and secondary data. All data collection was done with informed consent.

Research context and case

The context of this study is the management of emergency operations, and the Arctic Sea region was selected as a critical case (Yin, 2013). The main types of emergencies here are search and rescue (SAR), oil spills, terror attacks, fires on board ships and mass evacuations. Even if the probability of such emergencies is low, they could have complex and catastrophic consequences (Coppola, 2006). The Arctic Sea region is multi-national, and since emergency management at sea involves both civil and military – or naval – organisations, data for this study were collected from both types of organisations. The observational data were collected from three joint exercises involving Iceland, Norway and Russia, and the interview data were collected from Icelandic and Norwegian organisations. To ensure comparable organisational profiles, EM operators in the two main organisations responsible for maritime emergencies in each nation were selected for the in-depth interviews: the naval coast guard (CG) from the tactical level and the civil joint rescue coordination centre (JRCC) from the operational level. These organisations have a similar size and set of responsibilities with respect to EM in the two nations.

Data collection and analysis

Three exercises were observed for a total of 22 h: one full-scale exercise, Exercise Nord (Norway) in 2015/16, and two simulated 'table-top' exercises, Host Nation Support (Norway) in 2016 and AECO SAR (Iceland) in 2016. The JRCC and the CG took part in all three exercises. Exercise Nord included Norwegian actors (police and hospitals in addition to JRCC and CG). Host Nation Support also included Norwegian actors, but since the scenario was to provide support to a Russian vessel, some Norwegian actors were acting on behalf of Russia. AECO SAR included Norwegian, Russian and Icelandic actors.

One of the authors attended as an observer at the Nord and Host Nation exercises, using an observation guide that governed the data collection. Observational activities included writing an observation log and taking photographs. For AECO SAR, a colleague kept a written log in accordance with the observation guide. In the case of Exercise Nord, the planning meetings and the distribution of responsibilities among the actors were also observed. On the appointed day, the coordination of the exercise was observed for five hours at the JRCC in Bodø, Norway. Apart from one female participant in one strategic planning meeting, all the participants observed were male. Among other instances, critical decision-making, communication patterns, potential conflicts and resource allocation were monitored. As regards Host Nation Support, the coordination of the exercise was watched for seven hours at the Norwegian Coastal Administration in Horten, Norway. Three female and seventeen male participants were observed. The scenario

was a collision between Russian and Norwegian vessels resulting in a large oil spill. Since the key focus here was on interorganizational and cross-border cooperation, we were able to study – among other things – decision-making processes, arrangements according to bilateral agreements, command and control levels, and communication between Arctic states. The coordination of the AECO SAR exercise was observed for two days – three hours on the first day and seven hours on the second – at the Rúgbrauðsgerðin in Reykjavik, Iceland. The Icelandic JRCC and CG were the key actors, and eight female and thirty-eight male participants were observed. The aim was to detect ways of strengthening cooperation and exchange of knowledge between the Arctic cruise industry and the Arctic emergency service providers in low-probability and high-consequence emergency contexts, such as the Arctic. After all the exercises, the observer was offered the opportunity to ask questions. The subsequent observational analysis was carried out in three steps: First, relevant images obtained during each exercise were selected. Second, images and observation logs were coded. Third, all observational data were sorted and analysed as a whole (Mays & Pope, 2000; Miles, Huberman, Huberman, & Huberman, 1994).

In total, twenty-one interviews were carried out. Fifteen of those were in-depth, semi-structured interviews with three key informants in the Icelandic CG, three key informants in the Icelandic JRCC, five key informants in the Norwegian CG and four key informants in the Norwegian JRCC. The remaining six were shorter, open-ended interviews with informants from other Norwegian emergency organisations. Apart from one female Icelandic CG informant, all informants were male. The selected informants were managers, directors or leaders and therefore spoke on behalf of their organisations. The interview guide for the semi-structured interviews was pilot-tested on two informants within the emergency field and then adjusted. All interviews were carried out in English and took place between December 2016 and August 2017.

All interviews were fully transcribed and then analysed in three steps: First, the interview transcripts were read several times to identify the informants' experiences during their participation in different EM phases. Second, sections expressing the informants' opinions about trust were highlighted: quotations relevant to the research question were reduced to condensed units that captured key thoughts. Examples of condensed units include 'Everyone is skilled at their task', 'Trust is a prerequisite in our profession', and 'Trust is presumed in large operations'. Third, the condensed units were coded, first deductively, then inductively (Miles, Huberman, & Saldana, 2014). The secondary data consist of exercise reports, protocols and log books. In the process of analysis, the secondary data and the coded qualitative data from the observations and interviews were merged and organised in tables. These are presented in Table 1.

The questionnaire (Appendix 1) contains the trust measures on affect- and cognition-based trust within organisations from McAllister (1995, p. 37) along with a version of these measures, after adjustment to the interorganizational level and to the context carried out by the authors. A five-point Likert scale, where 1 means 'not at all' and 5 means 'to a large extent', was used for each measure. The questionnaire was completed by all fifteen in-depth interviewees immediately after the interviews. The data from the questionnaire were organised in a table (Appendix 1) showing the distribution of answers and the average values of each measure and variable. Because of the low number of respondents (15), no factor analysis was carried out, and a more advanced statistical method was not used, either.

Table 1. Analysis process and codes from the qualitative data.

Emergency phases	Trust stages	Trust building processes	Level of organisational relationships	Codes
Preparation	Initiation and Negotiation	Contact, Communication, Direction, Temporary groups, Resource-sharing	Individual–organisation Individual–individual	*Trust is a prerequisite for collaboration* Trust establishes relationships Trust establishes shared view Trust familiarises with procedures Trust establishes comfort Trust provides expectations and predictions Trust initiates resource sharing Trust initiates knowledge dissemination
Response	Formation	Formation of ordinary trust based on pre-existing relationship and Formation of Swift trust Resource-sharing	individual–organisation	*Trust – a prerequisite in emergency situations* *Trust is presumed in response* *Emergency personnel are competent in general* *No time to build trust* *No choice than to trust in order to achieve goals* *Consistency is crucial for trust development* *Control is needed to prevent misunderstandings* Trust increases willingness to cooperate Trust improves coordination, openness and reliability Trust is supported by bilateral agreements Trust has invisible effect in large-scale coordination
Evaluation	Operation	Potential for:Contact, Communication, Direction, Resource- sharing	Organisation–organisation	*Continual evaluation facilitate trust development* *Ongoing interaction leads to resilient trust* *No time constraint in evaluation may build resilient trust* *Joint evaluation facilitates trust development* *Joint accomplishment of tasks develops cognitive trust* Trust improves collaboration, learning Trust improves organisational relationships Trust developed in evaluation reveals reliability and consistency Trust supports improvisation and flexibility in organisational structure and routines

Note: Codes in *italics* are antecedents for trust and codes with normal font are outcomes of trust.

Findings

The findings chapter is organised according to the process of trust development in the three EM phases – preparation, response and evaluation. In conclusion, the results from the questionnaire are presented. To attribute quotes to the specific organisations, each quote is marked with the first letter of the nation and the acronym for the type of organisation, namely I-JRCC, N-JRCC, I-CG and N-CG.

As a general backdrop to the subsequent sections, the findings strongly indicate that the Arctic context, with its long distances, cold climate and darkness, constitutes the main challenge for EM. Moreover, moderate language issues, such as difficulties interpreting the meanings of words, symbols and signs, were observed during the exercises.

Trust in the preparation phase

This phase includes planning, training and exercises. According to an N-JRCC informant, 'Preparation for emergencies is the most important phase of emergency management, in order to minimise the damage'. The observations revealed that the sharing and dissemination of information were both critical and problematic, beginning with whom to trust in unfamiliar settings. This was particularly challenging in terms of non-SAR provider organisations. Observations also indicated that sharing detailed information is particularly critical in the Arctic when open communication is not possible. In such cases, participants must rely on a pre-existing knowledge base and common expectations of how to perform, which makes them more vulnerable. Emotional volatility, such as fear, stress and other emotions, might be aggravated by the lack of information, but this was not addressed in the exercises we observed.

Some informants mentioned the importance of seminars and annual meetings and agreed that participation in the Arctic Council, the Coast Guard forum, conferences and seminars is vital during the preparation phase, in terms of enabling collaborating organisations to share knowledge, strengthen relationships and develop a mutual understanding. An N-CG informant argued that 'having ongoing interaction with different professions from various disciplines is necessary. This is a valuable way to increase awareness and to become familiar with [an]other organisation's perspective on a common issue, which will make us better prepared'. Another informant from I-CG pinpointed job exchange as a way to build trust: 'there is a good opportunity in our organizational relationship with Norway; for example, we have exchanged with personnel from VARDØ, which helped organisations to become more familiar with the organisational structures and the culture of cooperation'.

The actors do undergo capability and vulnerability analyses, but these are very limited and not distributed to other organisations or departments. An N-JRCC informant stated that 'we have the overview of resources available in the country but not from the other neighbours; it would be good if we could share these data with the others, although not the military resources, of course'. Conversely, an I-JRCC informant argued that 'at least in Iceland we don't have political tension that may cause challenges for cross-border cooperation or conflict at strategic level, while that might not be the case in the near future'. Another informant argued that emergency responses may be hindered by customs and border control, where communication failures may prevent organisations from providing a rapid response. One example of such a situation in the findings was a

well-organised international exercise requiring equipment. Despite the due preparations, when the visitors arrived they were not allowed to bring their EM equipment across the border.

Several informants emphasised the value of training and claimed that training is very practical and useful for future emergencies. One I-JRCC informant argued that 'we should be aware that training is one of the main components of human interaction and relation-building between agencies (organisations)'. The informants believed that trust needs time and continuity in relationships. They therefore suggested joint educational programmes, where personnel can spend time together, work on the same task, and develop a deeper relationship, this will develop trust at the personal level.

Most informants emphasised the value of exercises for interorganisational trust building. The table-top exercises appeared to function as trust-building arenas, and most informants agreed that they can be very helpful in terms of face-to-face collaboration without intense stress. Some mentioned that such exercises also provide the opportunity to make comments and to receive feedback during the exercise. It was also observed that in-depth conversations about challenges that emerged during table-top exercises contributed to establishing a shared view among organisations. Our observations showed that some actors knew each other from previous exercises, and that close relationships existed among some of them. An I-CG informant argued that 'we might experience some conflicts during exercises, but we are experts collaborating together and I believe in my colleagues as well as any externals involved in search and rescue operation[s]'. Regarding full-scale exercises, one I-JRCC informant made the following statement:

> Through full-scale exercises, it is easier to find our weaknesses in terms of communication and human relations. These regular exercises help us to be familiar with each other's capabilities and capacities, so that can influence our level of trust for further cooperation.

Some informants argued that, in light of the opportunity provided by joint exercises to become more familiar with each other's personalities and professional capabilities, they would benefit more from frequent, small, joint exercises than from large-scale but infrequent ones. Finally, the informants demanded more joint Arctic exercises.

Trust in the response phase

In the response phase, the need for, and the development of trust seems to be different from the other phases. Although the interviewees agreed that trust also has a role to play within and between the organisations here, it seems to be of minor importance. In explaining why, some informants argued that:

> Trust is a prerequisite in our profession and in emergency situations, it is like we have no other choice than to trust each other to achieve our common goals (I-CG).

> It is not easy to answer, the reason why it has little effect is maybe because we have not experienced the absence of trust in [a] crisis situation to actually realise its effect … each emergency is unique and the effect of trust may differ from one to another (N-CG).

> Especially in times of crisis, we do not discuss whether we trust each other or not, we only deliver the best we can, maybe because we are in a place where sufficient trust is already present (N-JRCC).

It seems as though, in response, there is no option but to trust. Although the majority of informants believed that competence, openness, reliability and caring were crucial during collaborative responses, it was not easy for them to pinpoint which of these factors mattered more. Nevertheless, most informants highlighted competence and openness, while some emphasised reliability. A chief deputy in I-CG stated that:

> Our field is mainly competence-based, and our competence is experience-based. In fact, in response time, we are sure that other organisations will have the openness to help us, but to what extent we can rely on them may vary from one organisation to another. We are results-oriented during an operation and we leave all our emotions behind.

An N-CG informant who believed reliability to be very important told us that 'During operations we count on our partner's competence and their willingness to cooperate, but it is critical how much we can rely on them, and how consistent they are'. Stressing the importance of reliability, informants agreed that cooperation between similar organisations with comparable responsibilities was smoother than when dealing with different organisations.

Norwegian informants (both from JRCC and CG) made the point that within civilian organisations the focus on trust is not a daily concern because it is already there: when it comes to search and rescue, they have shared values. On the other hand, an Icelandic informant (I-JRCC) argued that 'trust within organisations is more critical because a lack of it may extend the response time, especially if people are not clear about their role – then the trust issues will be most visible'. As far as interorganisational trust is concerned, most of the informants believed that in a large international operation, all organisations involved need to cooperate on a trustworthy platform, otherwise 'without organisations trusting each other, the emergency situation becomes much harder to handle for all' (I-JRCC).

When interviewees were asked to reflect on the monitoring and controlling of the other organisations, JRCC informants from both nations claimed that their job was to follow the organisation's directives, and one of them told us that 'this is not because we do not trust people on the scene but the information might be misunderstood, that is why we do that' (N-JRCC). Another argued that 'without the correct information and good communication, competent personnel, good ships and helicopters will not be useful, thus we need to check and control if the message has been received fully' (I-JRCC). He went on to claim that because communication is essential in emergencies, the actors need to be prepared and trained in proper communication both within the organisation and with other partners involved.

Some informants referred to the IAMSAR (International Aeronautical and Maritime Search and Rescue) manual as very helpful, albeit with potential for improvement. A scene coordinator in several small and medium incidents believed that trust between the on-board leader and his team was very strong, but claimed that: 'I know what to check, because I am aware of my team's weaknesses and strengths, but when it comes to cooperating with other organisations or even other nations, I guess the controlling and cooperating might be a big challenge' (I-CG). His colleague believed that 'it is better to have a bit of response delay and double-check the operation, than just trust too much in your team, to avoid a silly mistake result[ing] in a catastrophe'.

Informants from N-JRCC did not point out language and cultural issues as factors at play in cooperating with other nations; however, one of them noted that the maritime staff

were all fluent in English. An I-JRCC informant followed this up with the following comment:

> Luckily the communication technology is much improved these days and we use stand-by translators to prevent misunderstanding in cooperating with other nations. However, when we want to approach Russians, we still go through JRCC in Bodø [Norway]; maybe it is because they have closer relations with them.

International trust in the response phase is supported to some degree by bilateral agreements, like for instance the one in place between Norway and Russia: 'Developing mutual respect and trust was one of our main concerns, and we have succeeded over many years in establishing a platform for sharing competence and knowledge' (N-JRCC).

Trust in the evaluation phase

Several informants indicated that post-exercise, or even post-incident, debriefings reveal to some extent the reliability and consistency of the partners, in comparison to the planning stage. In other words, the accomplishment of tasks in each of the preparation and response phases can boost confidence in other organisations' competence and ability. An N-CG director suggested that connections between organisations can be strengthened by continually evaluating and reassessing exercises and incidents. In relation to continual assessment, another N-JRCC informant highlighted that 'only ongoing organisational interaction can lead to robust trust'. Short evaluation reports are written after each incident. These are mostly generated internally and are kept internal, as they are not freely shared with other departments or organisations. External entities may, however, gain access to the reports by request. Most informants commented that analyses and reports of previous incidents could have received more attention. Until recently, no method of systematically sharing data existed to ensure that future planning was based on lessons learned from the past, except for large-scale incidents. Nevertheless, the Norwegian JRCC did introduce a Search and Rescue (SAR) reporting programme in 2016. The programme requires the coast guard and certain rescue organisations to complete their reports immediately after an incident. The report format is simple: it includes the reason for the incident along with a description of what went wrong and how similar incidents should be handled in the future. Because of its simplified reporting system and the possibility of using the database for further analysis and evaluation processes, the programme was praised by some (N-CG) informants. However, one N-CG informant objected that 'Even though the [SAR] reporting system is beneficial, it is not sufficient to have lots of reports and logs without broad analysis and circulation among the actors'. By arguing that 'sometimes we make the evaluation together with all participants, and it is indeed helpful in terms of learning and network building', the I-CG informant demonstrated the learning and networking effect of evaluations. He also mentioned that: 'Even if in some cases the individual may change during phases from preparation to evaluation, the interorganisational connection can develop. Because you will hear about other organisations' competence from your colleague anyway (who has participated in joint activity)'.

An I-CG officer who was active in the international coast guard forums highlighted that:

> There is no doubt about Scandinavian trust-based culture, but I would say my experience shows that the majority of people (worldwide) involved in SAR operations considers it a

> holy task, and they approach it with honesty and tell of their mistakes and failures in evaluation to prevent future problems.

Most informants agreed that sometimes the time gap between incidents or exercises and the final evaluation report is undesirable. One I-JRCC informant reported:

> I prefer to get feedback close to the action I took; it is easier for me to learn from it and remember it. Getting feedback after a couple of months, when I may have forgotten the details of the exercise, is not very useful.

A number of informants emphasised that the response phase was not an optimal time for the development of trust, while the evaluation phase, with its lack of time constraints, allowed more room for the development of resilient trust. Our findings from the observation of international exercises revealed that organisational trustworthiness may vary, depending on the partner's nationality and political status. Moreover, of the few evaluations that were conducted, most were internal, not shared with collaboration partners from the response or exercise, and not given high priority. For example, in one of the exercises observed, no final report was generated due to a funding shortfall. To learn more, improve emergency responses and develop relationships and trust, the informants pointed out the need for more interaction to evaluate incidents and exercises.

Summary of the findings

The role of trust in the different phases is aptly described by one of our informants:

> Trust in the response phase may have little to moderate effect. However, knowing a partner's exact capacities and capabilities might have greater effect in the preparation phase … and is even more important in recovery and evaluation, where you can see the partner's honesty and loyalty. (I-JRCC)

In the preparation phase, interorganisational trust seems to be developed by joint exercises, training and seminars. In the evaluation phase, however, the level of interorganisational interaction and knowledge sharing is low, which results in sparse opportunities for the development of ordinary interorganisational trust. The findings also indicate that EM operators are highly respectful of their lifesaving role and are proud of their saving and rescuing accomplishments. Most operators demonstrated mutual respect for each other due to the nature of their job and their shared objectives. This may generate a high level of identification-based trust.

Most informants highlighted that despite their temporarily function as a single outward-facing organisation during the response phase, they remain conscious of representing different organisations. The organisational structure is therefore probably not experienced as one wholly temporary organisation; hence, interorganisational trust may also play a role during response. Moreover, the informants agreed that trustful relationships, along with not feeling like strangers, were very beneficial in joint responses.

The results from the questionnaire on organisational and interorganisational affect- and cognition-based aspects of trust, which are presented in Appendix 1, show that the trust level is higher within, rather than between, organisations, and that the levels of affect-based aspects of trust are lower than cognition-based aspects. The average level of interorganisational affect trust is low, at 2.6, while the average level of interorganisational cognition-based trust, at 3.5, is described as moderate.

Discussion

The role of interorganisational trust across EM phases

According to the literature, the role of interorganisational trust in the preparation phase is to improve coordination, collaboration and preparedness, as well as to reduce conflicts (Comfort & Kapucu, 2006; Gausdal et al., 2016). This may be due to similar characteristics and communication processes between actors during the preparation phase (Fulmer & Gelfand, 2012). The overall goal of this phase is to develop routines and mutual understanding between the collaborating organisations. We found that interorganisational trust improves communication and information-sharing about available resources, partly confirming the literature.

The findings also reveal that ordinary trust plays a minor role in the response phase and that competence, reliability and openness are important. This is somewhat in line with Mishra (1996), who claims that if competence, openness, caring and reliability are lacking in this phase, the underlying calculus for cooperation will no longer be valid (Mishra, 1996). However, caring was not clearly apparent in our findings, which may be due to the lack of time in the extreme context. Here, the actors need to collaborate to manage highly critical and complex emergency tasks. To be able to do so in a safe way, they need to trust that the collaborating organisations will do what they are expected and commanded to do, with great speed, competence and responsibility. Under extreme time pressure to save human life, the natural environment and equipment, the actors have no alternative: in a way they are forced to trust each other, which is evident in the findings. This trust is in line with the definition of swift trust (Meyerson et al., 1996): it is impersonal by nature, lacks affect, and relies heavily on role expectations and organisational routines. This swift trust contributes to making the actors feel that they belong to the same temporary organisation, viewing themselves as members of a common social category and depersonalising one another by focusing only on features directly relevant to their mission, beliefs and values (Ashforth & Mael, 1996). As Brewer (1991, p. 476) puts it, this lets 'the I become we'. This illustrates that acting cooperatively in this context requires a kind of depersonalised trust that also operates in the absence of any prior interaction with other partners involved. Therefore, during response and under extreme pressure, swift trust may strengthen the temporary interorganisational organisation. This trust is conceptualised as a shared construct by unit members, where members can be individuals, teams or organisations (Fulmer & Gelfand, 2012).

The evaluation phase plays a critical role in improving learning from the response phase and exercises; the findings show that proper information about the entire operational response or exercise process provides a better grounding for learning and for future collaboration. In this phase, trust actively contributes to increased knowledge-sharing, not least by enabling participants to admit mistakes made during the response phase and learn from them. The findings also demonstrate that a higher level of interorganisational trust may result in increased sharing of evaluation reports among organisations, which may further improve the learning effect. Failure to openly share reports in this phase, conversely, may erode trust.

On the basis of this discussion, we have developed a framework for the role of trust in different phases of emergency management, which is presented in Table 2.

Table 2. The role of interorganisational trust in emergency management.

Phases of EM	Preparation	Response	Evaluation
The role of inter-organisational trust	Improves coordination, collaboration, communication, information-sharing and preparedness. Reduces conflicts.	'Lets the I become we' and enables different organisations to act cooperatively (Swift trust). Improves reliability and openness and the overall response quality.	Improves learning from response experiences in general and from mistakes in particular.

In most contexts, interorganisational trust also influences the selection of collaboration partners. This role of trust, however, is rarely relevant in the EM context because the partner organisations – for instance, the regional hospital, the coast guard and the joint rescue coordination centre – are normally taken for granted, at least among the nations involved in the Arctic case.

The findings show that the average level of the interorganisational cognition-based aspect of trust, which is identified as crucial in the response phase, is moderate (3.5). Furthermore, the average level of interorganisational affect-based trust is low (2.6). McAllister (1995) argues that this aspect of trust is the most important for collaborative performance within organisations. Consequently, the low level of affect-based trust may also result in poorer performance in temporary emergency response organisations. The findings did not identify affect-based trust as important for the response phase, which is the main purpose of emergency management. This reason might be contextual, as Norway and Iceland belong to relatively individualistic cultures (Hofstede, Hofstede, & Minkov, 2005), where cognition-based trust will be more positively related to interorganisational collaboration than affect-based trust (Chen et al., 1998). Nevertheless, improved affect-based trust might have an indirect effect on response through increased collaboration and learning in the preparation and evaluation phases.

Trust development across EM phases

According to our findings and Schilke and Cook's (2013) cross-level process model, interorganisational trust may develop throughout consecutive relationship stages across EM phases.

The findings illustrate that the preparation phase in general provides a platform for the initial stage of organisational relationships (individual–organisation), where information is gathered and emergency personnel search for trustworthiness clues. In this phase, the partners initiate contact and start communication; the frequency of contact and collaborative communication, which seems to take place during table-top exercises, is positively related to the development of trust. Furthermore, negotiation (individual–individual) will also take place through interpersonal communication and interaction, where planning and preparation is maturing and organisational collaboration is being formalised through agreements. However, the findings reveal some signs of language problems as well as differing values, internal cultures and competences. These 'cultural differences' (Möllering, 1997) might constitute a threat in the joint direction process, preventing trust from developing. On the other hand, the conversations and negotiations identified provide an opportunity for establishing a level of conformity for collaboration based on a deepening of

mutual knowledge and shared goals, which may strengthen the direction process of developing interorganisational trust. Moreover, during joint preparation, boundary spanners may have transferred trust to their organisations (individual–organisation). The findings further indicate that the trust-building processes of contact, communication, direction and resource-sharing, as well as those inherent in the initiation of temporary organisations, seem to be active in the preparation phase.

Because of the joint goal and task orientation, as well as the sharing of time and equipment, the processes of direction and resource-sharing also seem to be active in the response phase. Most importantly, because of the need to collaborate with partner organisations to save lives, nature and equipment under extreme time pressure, depersonalised swift trust is evidently developed in the response phase. This development may be even more pronounced in harsh and vulnerable environments, where individuals presume that they share common values, attitudes and goals (Staats, Wit, & Midden, 1996). Therefore, the trust development processes of temporary groups (Gausdal, 2012; Jarvenpaa, Knoll, & Leidner, 1998; Meyerson et al., 1996; Zaheer & Harris, 2006) that build swift trust seem to be highly active in sizeable temporary EM organisations during this phase. Meyerson et al. (1996) and Gausdal (2012) studied temporary groups that interact face to face, while Jarvenpaa et al. (1998) studied virtual teams. In the response phase of an emergency, the different organisations have different roles, work at different locations, and communicate mostly by radio and phone. They therefore rarely interact face-to-face. Hence, this study confirms Jarvenpaa et al.'s (1998) finding that swift trust can be developed without face-to-face interaction. The existing literature on swift trust is relevant to temporary groups, and to some degree also to projects (Grabher, 2002) completed under time pressure. Hence, this study also extends the phenomenon of the development of swift trust to large temporary organisations operating under extreme time pressure.

Because swift trust may create a foundation for the development of resilient trust (Wildman et al., 2012), the high level of swift trust generated in the response phase represents significant potential for trust-building in the subsequent evaluation phase. In this phase, interorganisational relationships may be entering the operation stage, where a common understanding regarding the trustworthiness of the partner organisation develops (i.e. where the establishment and institutionalisation of organisation–organisation trust occurs). The interorganisational trust–developing processes of contact, communication, direction and resource-sharing are relevant in this phase. However, in our findings the low priority assigned to this phase results in a low degree of collaboration. Therefore, none of the trust-developing processes (Gausdal, 2012) seem to be active, and no trust appears to have been developed in the evaluation phase. Nevertheless, the findings show that most emergency personnel are aware of the critical role of this phase to improve learning from experiences and to build organisational relationships.

Figure 1 illustrates a process model, building on Schilke and Cook's (2013) model, for the cross-level development of interorganisational trust and relationships in EM.

The findings show that several aspects of interorganisational trust appear to favour improved collaboration in all the three phases of emergency management. Interorganisational trust–developing processes do take place within the preparation and response phases, and there is potential for trust development in the evaluation phase. The preparation phase also holds several opportunities for the development of more trust, especially through exercises in general, table-top exercises in particular, and joint training

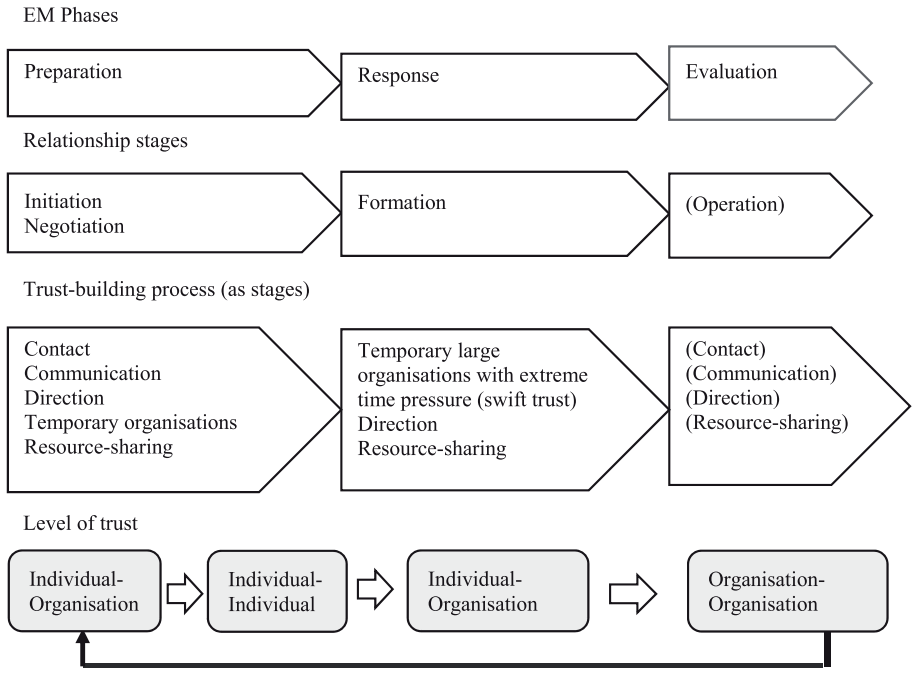

Figure 1. A process framework, adapted from Schilke and Cook (2013), for the cross-level development of trust and relationships in Emergency Management. (The variables in brackets are based on the informants' suggestions and beliefs in the potential to reach these stages and processes, but are not confirmed as materialised in the findings).

programmes. However, the role and development of swift trust in the response phase and the low priority given to the evaluation phase stand out as the most important findings.

We have sought to maximise reliability during the selected data collection through methodology and analytical process, including highlighting example quotations from the raw data. This study also has some limitations. All interviewees come from high-trust nations, which may have biased the findings. The medium for both the interviews and the collection of observational data is English, which is not the first language of either the informants or the authors; this may have influenced the results. Furthermore, the findings from the critical cross-national Arctic Sea region case may not be relevant to EM in all regions. Exercise scenarios and settings, as well as the emphasis on the evaluation phase, may vary locally, nationally and regionally. Nevertheless, a critical case like the one we have presented in this study may contribute to analytical generalisations, as well as shedding light on aspects of the role of trust and how it is built in other contexts; particularly, the role and development of swift trust.

Concluding remarks

We set out to answer the question, 'What is the role of interorganisational trust and how is it developed across phases of emergency management?' The answer to the first part of

this question is that interorganisational trust influences the outcomes of emergency operations. The study finds that in the preparation phase trust improves coordination, collaboration, communication, information-sharing and preparedness, alongside reducing conflicts. In the response phase it 'lets the I become we': it enables different organisations to act cooperatively (swift trust) and improves reliability, openness and the overall response quality. In the evaluation phase it improves learning from experiences in general, and from mistakes in particular.

The answer to the second part of the research question is that in the preparation phase, 'ordinary' interorganisational trust is fostered by two activities in particular: joint table-top exercises and joint training programmes. In the response phase, some 'ordinary' trust may be developed by joint goal and task orientation, as well as the sharing of competence, time and equipment. Most importantly, swift interorganisational trust is developed within large temporary joint organisations working to save lives, the natural environment and equipment under extreme time pressure. Although the evaluation phase holds substantial potential to utilise this swift and fragile trust to develop more resilient forms of interorganisational trust, this potential is underexploited due to the low priority accorded to this phase in our case.

This study has both theoretical and practical implications. Theoretically, it contributes to the trust literature in several ways. First, our findings confirm Jarvenpaa et al.'s (1998) conclusion that swift trust can be developed without face-to-face interaction. Second, our study extends the development of swift trust from the temporary group and project levels to large, temporary interorganisational organisations operating under acute time pressure. Third, this study contributes to the cross-level perspective of trust development by demonstrating that the individual and organisational levels are not separate but in fact highly intertwined. Fourth, the study elaborates on the role and development of trust in the context of emergency management by lifting the group and project level concept of swift trust to the interorganisational level of analysis. The study contributes to the emergency management literature by identifying the role of interorganisational trust and the manner in which trust is developed in the different phases, and by highlighting the low priority given to the evaluation phase. This phase may have the potential to develop interorganisational trust further.

The practical implications include the need to place more emphasis on exercises in general and table-top exercises in particular, as well as on joint training programmes. Furthermore, our findings highlight the importance of the evaluation phase for interorganisational trust building. These implications are relevant to all civil and military emergency actors and to private companies in high-risk industries such as shipping and oil and gas. Finally, by revealing the importance of trust for EM performance, and the moderate-to-low levels of cognition- and affect-based interorganisational trust among EM actors, the study also demonstrates the need for improved trust development in EM. The findings might also be informative in other large-scale interorganisational contexts with high-risk, vulnerability, uncertainty and time pressure, e.g. large scale IT and construction projects.

These findings should be tested in non-Arctic and low-trust contexts and by quantitative enquiry with a large number of participants. Further research should also continue to explore how trust is developed in each phase of emergency management, particularly during joint exercises and training. We call for more research identifying the factors that

facilitate and hinder the development of trust among emergency organisations at the interorganisational and interpersonal levels. This could happen in a longitudinal research setting, where data are collected over a long period of time, in order to capture the rhythm of the trust development process (Gehman et al., 2018). In addition, there is a need for studies investigating the reasons behind the apparently low priority accorded to the evaluation phase in EM.

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No potential conflict of interest was reported by the authors.

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Appendix 1

Table A1. Questionnaire of affect- and cognition-based trust values.

Variable and avg. value	Questions	Not at all 1	2	To a large extent 3	4	5	Avg. value
Organisational affect-based trust 3.4	In our organisation we have a sharing relationship with each other. We can freely share our ideas, feelings, and hopes.				5	10	4.7
	I can talk freely to my colleagues about difficulties I am having at work and know that they will want to listen.		2	4	8	1	3.5
	In our section, we would feel a sense of loss if one of us was transferred and we could no longer work together.		6	9			2.0
	If I shared my problems with my colleagues, I know they would respond constructively and caringly.			3	6	6	4.2
	I would have to say that in our organisation we have made considerable emotional investments in our working relationship.	5	7	3			1.8
Organisational cognition-based trust 4.5	Most of my colleagues approach their job with professionalism and dedication			1	3	11	4.6
	Given our staff track record, I see no reason to doubt their competence and preparation for the job.		1		7	7	4.3
					8	7	4.4

(*Continued*)

Table A1. Continued.

Variable and avg. value	Questions	Not at all 1	2	To a large extent 3	4	5	Avg. value
	We can rely on each other not to make our job more difficult by careless work.						
	Most people, even those who aren't close friends, trust and respect each other as co-workers.			2	6	7	4.3
	If people knew more about each other and their background, they would be more concerned and monitor each other's performance more closely.			5	6	4	3.9
Inter-organisational affect-based trust 2.6	We have sharing relationships with other organisations we cooperate with. We can freely share our ideas, feelings, and hopes.	5	5	5			2.0
	We can talk freely to the other organisations about difficulties we are having at work and know that they will listen.	1	7	6	1		2.4
	We would feel a sense of loss if one of us could no longer work together due to strategic changes.	7	8				1.5
	If we shared our problems with this organisation (coast guard, police, military etc.), we know they would respond constructively and caringly.			11	2	2	3.4
	We would have to say that both organisations have made considerable emotional investments in our working relationship.	5	8	2			1.8
Inter-organisational cognition-based trust 3.5	This organisation (coast guard, police, military etc.) approaches its job with professionalism and dedication.			1	5	9	4.5
	Given this organisation's track record, we see no reason to doubt their competence and preparation for the job.			2	9	4	4.1
	We can rely on this organisation not to make our job more difficult by careless work.				9	6	4.4
	Other work associates of ours who have to interact with this organisation consider them trustworthy.			2	5	8	4.4

14 Emergency Collaboration Exercises and Learning

Experiences from the Arctic

Ensieh Roud and Johannes Schmied

Introduction

A large-scale emergency response typically requires co-ordinated action between multiple actors across many jurisdictions (Kapucu, Arslan, and Demiroz, 2010). Private, public, and volunteer organizations unite competencies and resources to respond to and resolve complex situations (Berlin and Carlström, 2011). Therefore, collaboration among the different organizations is essential to ensuring an effective emergency response. However, collaboration is often problematic in practice (Chen, Sharman, Rao, and Upadhyaya, 2008). Collaboration calls for better preparation through training in general and exercises in particular (Kristiansen, Løwe Sørensen, Carlström, and Inge Magnussen, 2017; Roud, Borch, Jakobsen, and Marchenko, 2016). Specifically, emergency collaboration exercises (ECEs) are designed to develop and test cross-sectoral and inter-organizational collaboration, preparedness efforts, and response quality in joint emergency operations (Rutty and Rutty, 2012).

In some respects, maritime emergencies in the Arctic can be considered more demanding than terrestrial emergencies, owing to the complex environment in which they occur. The Arctic Sea region has one of the most sensitive environments on the planet; therefore, any minor incident in this complex environment has the potential to become a major disaster for people, the organizations involved, and the vulnerable marine ecosystem (Strømmen-Bakhtiar and Mathisen, 2012). Long distances, adverse weather conditions, limited emergency response resources (Borch et al., 2016), and heterogenous organizational structures represent just some of the challenges. In a complex environment, inter-organizational collaboration during emergency response tends to become challenging. As a result, there is a need for the clear hierarchical division of tasks, structure, and rapid decision-making processes (Faraj and Xiao, 2006). However, there is an additional need for flexibility, decision-making under time pressure, and informal co-ordination mechanisms (Faraj and Xiao, 2006).

The importance of organizations working with a collaborative perspective while exploring, learning, and building relationships between organizations is highlighted by, among others, Crossan, Lane, and White (1999). In their study,

the authors discuss different levels of learning. Moreover, researchers including Crossan, Maurer, and White (2011), Engeström and Kerosuo (2007), Greve (2005), Hardy, Phillips, and Lawrence (2003), Inkpen and Tsang (2007), Jones and Macpherson (2006) and Nooteboom (2008) highlight the need to more studies on inter-organizational learning. Inter-organizational learning processes have become an increasingly relevant field of research, particularly as researchers attempt to understand the context and processes involved in new organizational relationships and settings. However inter-organizational learning related to different settings is poorly investigated (Crossan, Mauer, and White, 2011; Engeström and Kerosuo, 2007; Inkpen and Tsang, 2007; Knight and Pye, 2005; Larsson, Bengtsson, Henriksson, and Sparks, 1998). Therefore, we extend the literature on inter-organizational learning by investigating it in the context of collaborative emergency exercises. We further introduce new processes connected to the inter-organizational learning process while building upon the framework of Crossan et al. (1999) and Jones and Macpherson (2006). Our intentions in this exploratory study are to empirically challenge and validate the "Intuiting, Interpreting, Integration, Institutionalizing, Intertwining" (5I) framework and develop theoretical nuances that enrich our overall understanding of inter-organisational learning processes. For this purpose, we study ECEs in the Arctic. In our model, emergency collaboration exercises are context-sensitive. The ECEs in the Arctic can influence inter-organizational learning depending on the complexity of the external environment.

Although interest in the learning dimension of exercises has grown in recent years (Berlin and Carlström, 2008, 2011, 2014, 2015; Kim, 2013; Perry and Lindell, 2003; Roud and Gausdal, 2019), a general study connecting collaboration exercises and the inter-organizational learning process has remained elusive. In this context, there is a need to develop theoretical and empirical reflections and conduct more in-depth studies in the field of inter-organizational learning. The present study is based on the assumption that inter-organizational learning is understood as part of the continuum of organizational learning proposed by Crossan et al. (1995), Bapuji and Crossan (2004), Holmqvist (2009), Knight (2002), Knight and Pye (2005), and Crossan et al. (2011). Following this line of thought, the present study explores how the inter-organizational learning process can occur from emergency collaboration exercises within a complex environment by building upon Jones and Macpherson (2006). Moreover, we offer a preliminary list of facilitators and impediments of learning processes by studying ECEs in the complex environment of the Arctic.

Theory

Learning

Learning is considered a multi-dimensional phenomenon and can be described as processes that occur at different levels, where learners could be

individuals, groups, entire organizations, or inter-organizational networks (Tynjälä, 2008). Learning through emergency exercises is seen as being situated in social contexts, meaning that it occurs through processes of legitimate peripheral participation (Sommer and Njå, 2012).

Learning at the individual level is defined herein as the acquisition of new knowledge (Sommer and Njå, 2012). Two major interpretations of individual learning have been identified by scholars (Becket and Hager, 2002; Harel and Koichu, 2010; Malloch, Cairns, Evans, and O'Connor, 2010). *The individual cognitive approach to learning* focuses on individuals as learners, where learning is understood as the acquisition of information and reasonable behaviour (Baddeley, 1999; Bandura and Walters, 1977; Ormrod, 2008; Piaget, 1972; Skinner, 1965). *The sociocultural approach to learning* focuses on the social relations between people rather than on the individual in isolation (Gherardi, Nicolini, and Odella, 1998). Hence, learning from emergency exercises is considered to be situated in and occurring through processes of participation in various activities and interactions between colleagues (Billett, 2010; Collin, 2002; Eraut, 2007; Lave and Wenger, 1991; Wenger, 2010). Several definitions of group learning were found after reviewing the existing literature. This study will use the definition by London, Polzer, and Omoregie (2005: p. 114), who define group learning as "the extent to which members seek opportunities to develop new skills and knowledge, welcome challenging assignments, are willing to take risks on new ideas, and work on tasks that require considerable skill and knowledge".

Extensive literature reviews have been conducted about organizational learning with multiple conceptualizations (Crossan, Lane, White, and Djurfeldt, 1995; Easterby-Smith, 1997; Huber, 1991; Jones and Macpherson, 2006). The general definition by Huber (1991) is our point of departure toward understanding organizational learning: "an organisation learns if any of its units acquire knowledge that it recognises as potentially useful for the organisation" (p. 126). This definition is valuable because it avoids the assumption that learning inevitably leads to changes in mind and behaviours. However, this definition does not reflect on the process aspect of learning and does not explain when and how obtained knowledge is useful (Crossan et al., 1995; Torres and Preskill, 2001). Therefore, to be more specific, the present study follows the cross-level process approach that assumes that organizational learning is a multi-level process linked through psychological and social processes (Crossan et al., 1999; Bratianu, 2015).

Learning from experiences with other organizations is a major means of organizational learning (Levitt and March, 1988). This experience highlights the importance of organizations working from collaborative perspectives and exploring learning that builds on relationships between organizations (Jones and Macpherson, 2006). This point leads us to the last level − inter-organizational learning − which is a natural result of the growing importance of inter-organizational relationships. In recent years, the focus on studies of organizational learning has been shifting to multi- and inter-organizational learning (Mozzato and Bitencourt, 2014). Inter-organizational learning can

be seen as the collective acquisition of knowledge between groups of organizations, thereby compassing the notion of interaction between organizations (Larsson et al., 1998). Therefore, inter-organizational learning is distinct from organizational learning in that it includes the effects of interaction between organizations, which generates synergy and fosters learning (Mozzato and Bitencourt, 2014). Moreover, organizations tend to learn from the experiences of others rather than from their own experience (Perry, 2004). However, inter-organizational learning is supported by organizational processes of knowledge creation and retention (Greve, 2005).

Collaboration is considered important in inter-organizational learning and helps to resolve intractable problems (Jones and Macpherson, 2006). The general aim of collaboration is to provide organizations with a platform for the exchange, transformation, and creation of knowledge. Participating in a collaborative network enables organizations to cross boundaries between different organizations and fields of expertise (Tynjälä, 2008). Moreover, Fayard et al. (2008) believe that it is the collaboration between organizations, which is not limited to organizational boundaries, that gives rise to collective learning.

Multi-level Framework of the Inter-organizational Learning Process

To date, the organizational learning literature had failed to integrate prior research at different levels of analysis (Glynn, 1996; Huber, 1991; Kim, 1998; Nicolini, Crossan, and Easterby-Smith, 2000) until Crossan, Lane, and White (1999) developed a framework that illustrates the processes of learning and how it evolves and is incorporated within organizations. The framework contains a multi-level view of learning and consists of different learning processes that occur within an organization, such as intuiting, interpreting, integrating, and institutionalizing. This study follows the multi-level view of learning because insights and ideas occur in individuals and not organizations (Nonaka and Takeuchi, 1995a; Simon, 1991). Nevertheless, knowledge of the individual does not independently come to bear on the organization. Instead, ideas are shared between individuals, with actions being taken and mutual understanding being developed (Daft and Weick, 1984; Huber, 1991; Schön and Argyris, 1996; Stata, 1989). Complex organizations are more than ad hoc communities or collections of individuals (Crossan et al., 1999). Relationships become structured, and some of the individual learning and shared understandings developed by groups become institutionalized as organization artefacts (Shrivastava, 1983). Crossan et al. (1999) named this multi-level framework the "4I Framework". Within this framework, four processes connect the individual, group, and organizational levels of learning (Crossan et al., 1999). The individual level is based on the learning processes of intuiting and interpreting, while interpreting and integrating are present at the group level. Finally, at the organizational level, integrating and institutionalizing occur.

Crossan et al. (1999) defined *intuiting* as a subconscious process that occurs at the individual level. They argued that this is the beginning of learning and

is bound to happen in a single mind. Moreover, intuiting learning involves forming personal experiences. Nonaka and Takeuchi (1995b) stated that this intuition is something that appears before individual actions and is difficult to share with other individuals. *Interpreting* is the second learning process, which Crossan et al. (1999) defined as the conscious elements of individual learning that are shared in groups. *Integrating*, which is the third learning process, is defined as the change of collective understanding at the group level, which functions as a bridge to the organizational level. In this learning process, they argued that the development of shared understanding between individuals occurs and that a change in action is based on mutual adjustments. Crossan et al. (1999) also stated that conversation and joint action are essential for the development of shared understanding. They further elaborate that the integrating process will be informal at the beginning. However, if the change of action repeats itself and is noteworthy, the action will be institutionalized. The last learning process of the 4I model is *institutionalizing*. Crossan et al. (1999) defined institutionalizing as the process where learning is incorporated across the organization. This process works by embedding learning into the organization's systems, structures, routines and practices. The process of institutionalizing is dependent on the defined tasks, specified actions, and organizational mechanisms implemented so that the learning can be put into action (Crossan et al., 1999).

The individual and group learning outcomes that ultimately occur in the body of the organization result in a consensus among members of the organization. Thus, the description of the learning process in integrated organizations is created from individuals, groups, and organizations. In the Crossan, Lane, and White (1999) framework, feedforward learning progresses from individuals' intuiting processes, through group interpretation and integrating, to institutionalizing at the organizational level. Feedforward learning enables the crafting and assimilation of new solutions and is the primary mechanism for organizational adaptation. In feedback processes, learning that has become institutionalized guides (or restricts) future individual and group learning, helping organizations (firms) to exploit their existing knowledge. Notably, both feedforward and feedback mechanisms are required for an organization to benefit from learning (Crossan, Lane, and White, 1999; March, 1991). However, Zietsma et al. (2002) criticise the Crossan et al. (1999) framework by claiming that the exploitation of institutionalized learning is only efficient under stable conditions. However, shared cognitive maps limit the ability of group members to notice and interpret discrepant information (Ansoff, 1977; Bettis and Prahalad, 1995), thereby reducing the organization's adaptability. When the environment changes, reliance on existing knowledge can suppress individual intuiting and/or block it from feeding forward through the group and organization levels of learning.

Zietsma, Winn, Branzei, and Vertinsky (2002) added two new concepts to the original 4I framework. First, *"attending"* captures a more active process of information seeking than the framework for the passive term "*intuiting"*

from Crossan et al. (1999), while "*experimenting"* is described as a parallel activity performed by individuals and groups that adds substance to the process of interpreting. Both Zietsma et al. (2002) and Crossan et al. (1999) considered organizational learning processes at three levels of analysis (individual-group-organization) and elaborated on the importance of the external environment to these processes. Later, Jones and Macpherson (2006) extended the 4I framework to what they call 5I framework by including the inter-organizational level and adding *intertwining* as the fifth process (the fifth "I"). The term "intertwining" indicates active engagement between an organization and its external knowledge network. The concept of "intertwining" indicates that learning mechanisms are at the interstices between organizations, and not just within organizational boundaries.

While this framework provides a good understanding of the main processes of the 5I, the present study intends to understand the range and scope of the framework. Part of the study involves scrutinizing the concept to understand the boundaries of the 5I framework. Is the 5I framework complete or can it potentially be extended with the given empirical data? In this study, we explore the inter-organizational learning processes framework in the complex environment of the Arctic by studying collaborative emergency exercises.

In rapidly changing situations within vulnerable and complex environments such as the Arctic, collaboration is not as dependent on a formal structure as it is on ongoing activities that occur in response to future collaboration challenges (Bouty et al., 2012). Owing to a lack of support resource availability and a harsh environment, Arctic emergency management organizations must support each other and develop a collaborative approach towards treating emergencies in the region.

Notably, Hogarth and Makridakis (1981) discuss "competitive" (in this case, "challenging" may be more suitable) and "turbulent" when referring to the complex environments (Hogarth and Makridakis, 1981), with the effects of decisions being *"difficult to predict"*. Hogarth and Makridakis (1981) refer to Slovic, Fischhoff, and Lichtenstein (1977), who suggest that calculating an optimum strategy in a complex environment is challenging. Likewise, in the case of a large-scale emergency in the Arctic, it would be challenging to predict who the participants of a response operation would be, what expertise they have and what further expertise would be required. The Arctic context amplifies challenges related to the aforementioned factors, owing to extreme climate and weather conditions combined with long distances and sparsely populated areas. As a result, Arctic maritime emergency response actions are recognised as particularly challenging jobs that demand well-trained emergency personnel (Borch and Andreassen, 2015).

Emergency Collaboration Exercises in a Complex Environment

Emergency collaboration exercises are unique when it comes to functionality, strategies, and objectives. Objectives can be strategic, focused on practical

knowledge building and/or on improving inter-organizational collaboration. ECEs are one of several types of exercises that have been highlighted by academia. S*trategic exercises* aim to simulate an event to examine the results that different interventions can have (Berlin and Carlström, 2015). Thus, the key aim of these exercises is to study the outcomes of different approaches under different conditions and not to increase the learning of tactical level personnel (Babus, Hodges, and Kjonnerod, 1997). *Drill exercises* aim to strengthen individuals' "knowledge in the practice of their profession" (Berlin and Carlström, 2015) and are suitable for tactical- and operational-level personnel to repeat significant elements. *Collaboration exercises* aim to bring different organizations together to integrate actions across organisational boundaries (Berlin and Carlström, 2015) and may be a combination of strategic and drill exercises. From the learning perspective in emergency management, collaboration exercises develop individual, group, and organizational skills by strengthening leadership and triggering inter-organizational curiosity (Andersson et al. 2014). Collaborative interactions between organizations can foster inter-organizational learning, which can occur through a range of inter-organizational activities such as collaborative exercises. Therefore, the emphasis of this study is on the last exercise strategy: "*collaborative exercises"*.

Notably, the context of a complex Arctic environment can demand increased collaboration. To better understand the significance of a complex environment in combination with ECEs, a clearer theoretical understanding of the environment and its complexity is required.

We base our definition of environment on Dooley (2004); therefore, we consider the environment as a network of external organizations and institutions (i.e. other agents), as well as the physical surroundings (i.e. resources) (ibid.). The environment can both provide the potential to learn from externals, yet it may also mean a potential to "outsource" and rely on someone else to specialize in specific tasks (Moynihan, 2009). A few aspects of the physical environment become particularly important for emergency exercises. Familiarization with the geography of local surrounds and facilities is important for emergency services, whose core role is an emergency response. However, familiarization with the complexity of a particular environment might not occur automatically (Renner, 2001).

In the present study, complexity characterizes the environment to which organizations and individuals within the organizations are exposed to. We use the definition of complexity proposed by Erdi (2008: p. 7), who defines it as a system where *"circular causality, feedback loops, logical paradoxes and strange loops"* appear. Additionally, the system could be affected by the fact that a "*small change in the cause implies dramatic effects, emergence and unpredictability"*.

As a result, based on Dooley (2004) and Erdi (2008), we can define a complex environment as an organization's network of external organizations and institutions (i.e. other agents) as well as the physical surrounding

(i.e. resources) that affects the organization, owing to *"circular causality, feedback loops, logical paradoxes and strange loops"* and the fact that a "*small change* [may imply] *dramatic effects, emergence and unpredictability"*. As optimizing any type of strategy in a complex environment is not an easy task (Hogarth and Makridakis, 1981), this study assumes that the organizations intend to prepare emergency collaboration through inter-organizational learning processes. This could have led to the development of ECEs, in which the personnel of different organizations must interact within complex environments.

Based on the research question and the presented theories, we have developed an analytical model to illustrate the relationships between ECEs and the inter-organizational learning process in a complex environment. Figure 14.1 presents the main elements of this study, where the Arctic context − in the form of an unpredictable and harsh environment with scarce resources and limitations in communication infrastructure − influences collaborative exercises and may affect inter-organizational learning. Additionally, ECEs themselves could influence inter-organizational learning processes.

Methods

Studying learning in real emergency incidents with intensive human interaction is very challenging. We focus on emergency exercises that are more accessible to gather data and study learning processes. In line with a wide range of previous empirical research within emergency management, a case study approach was chosen (Bharosa et al., 2009; Schmied et al. 2017; Sommer and Njå, 2012; Woltjer et al., 2006). ECEs usually produce heterogeneous data in terms of the type of source, the extent of sources and the intended consignee. Moreover, data can sometimes be "classified" or closed to the public. Consequently, a fully embedded case study design is not attainable, owing to incomplete units of analysis in each case (Yin, 2013). Hence, in accordance with Yin (2013), and in contrast to single-case studies in emergency management (Sommer and Njå, 2012), a larger number of similar cases (likely producing similar results) was chosen to overcome this potential

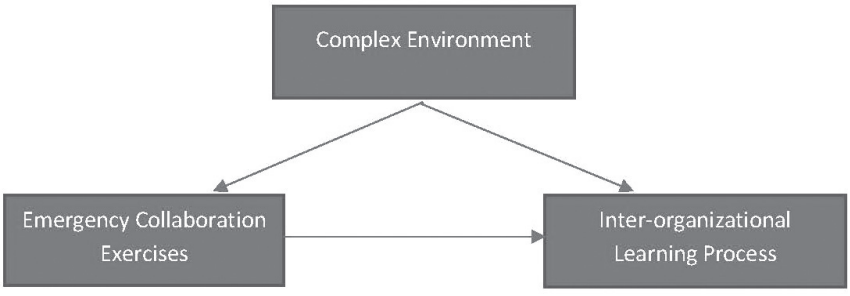

Figure 14.1 Main Elements of the study

weakness with the aim of conducting a more generalizable study (Herriott and Firestone, 1983).

Data Collection

The study focused on four cases of emergency management exercises in the Arctic. Particular focus was given to examine available information on recent full-scale and table-top exercises. The study consists of exercises derived from several large research and development (R&D) projects endorsed by research groups and practitioners in the Arctic (see Table 14.1). The four cases have been selected from a preliminary study of 11 cases.

Choices related to which data to generate and collect were based on how well the ECEs resembled emergency management scenarios in a relevant complex environment. Selection criteria included that the exercises were recent, large scale, multi-organizational, connected to maritime issues, and developing Arctic emergency management competence. A pool of researchers in the area of emergency management used their contacts to search for and gather obtainable data. The remaining four exercise cases are rich in data and focus on collaboration within a complex environment.

The study uses methodological triangulation, with data collection consisting of a set of qualitative methods including archival data from emergency organizations, such as logs and reports, publicly available reports, and presentations. However, the main pillar comprises observation reports, observations, background conversations, and unstructured in-depth interviews related to important exercises. The interviews left room for further questions and detailed inquiries to elaborate on specific elements of the story (Bryman and Bell, 2015).

The study contains data from between 2016 and 2019, when a focus was on maritime exercises located in the Arctic. The data represent mostly complex incident types with a large number of resource requirements and agencies. The exercises included two full-scale exercises − Exercise Nord in 2016 to 2019 and SARex in 2016 − and two simulated table-top exercises: Arctic SAR in 2016 and the Association of Arctic Expedition Cruise Operators (AECO) SAR (Iceland) from 2016 to 2018.

Data Analysis

In line with suggestions regarding qualitative inductive research such as by Van Maanen (1979), a first- and second-order approach to data analysis was chosen. The intention was to follow Gioia, Corley, and Hamilton (2013) and their request for rigour as an interplay between the sources/informants and the researcher.

During data analysis, we intended to follow the primary criteria of validity as presented by Whittemore, Chase, and Mandle (2001). As a multiple case study approach was chosen instead of a single-case study, this helped to

Table 14.1 Description of cases

Name of exercise	*Type of exercise*	*National/ International*	*Years*	*Source types*	*Description*
Exercise Nord	Full-scale	National	2016 to 2019	Observation report, background conversation, storybook, interviews	Exercise Nord by Nord University is an annual full-scale exercise that has been taking place for almost 25 years. Every year, the organizers have been able to change the exercise scenario. In 2016, 2018, and 2019 the scenario was connected with an explorer cruise ship dealing with a fire in the engine room and requiring evacuation. In 2017, a terrorism scenario at the university campus was the topic of the exercise. Participants have included Nord University, Salten Fire Brigade, Salten Police District, civil protection, joint rescue, co-ordination centre, Bodø Commune, Nordland Hospital, Coast Guard, Norwegian Society for Sea Rescue RS, Norwegian Air Ambulance, observers, and others.
SARex Exercise	Full-scale	National	2016	Interviews, observation reports, brief and debrief	SARex 2016 was the full-scale exercise in Svalbard connected to testing the implications of the Polar Code on national policies. In addition, practical implications were observed. Participants were University in Stavanger, Norwegian University of Science and Technology, St Olavs Hospital, Nord University, Memorial University of Newfoundland, Arctic University of Norway, Viking Life Saving Equipment, Norsafe, Petroleum Safety Authority Norway, Norwegian Public Authorities, American Bureau of Shipping, and Eni Norge. The goals were to investigate the adequacy of the rescue programme required by the Polar code to study the adequacy of the standard equipment and improve winterization. In addition, the Norwegian Coast Guard personnel were able to share experiences on training on emergency procedures in icy waters, with particular reference to evacuation and rescue from cruise ships.

(*continued*)

Table 14.1 (*continued*)

Name of exercise	*Type of exercise*	*National/ International*	*Years*	*Source types*	*Description*
AECO SAR TTX	Table-top	International	2016 to 2018	Brief and presentation, Observation reports, Interviews	The Association of Arctic Expedition Cruise Operators (AECO) and partners organize annual table-top exercises. Participants have included cruise operators and vessel owners, captains working as masters on different cruise vessels, SAR responders from different entities (in the USA, Canada, Greenland/Denmark, Iceland, Norway, and Finland), the Arctic Coast Guard Forum, observers from universities and research institutions, etc. The exercise has had mostly a workshop character; however, smaller side-workshops have been organized. They were small table-top exercises with simulation elements. Each year, the exercise has been evaluated with a standardized form.
Arctic SAR	Table-top	International	2016	Observation reports	ArcticSAR 2016 was a single-event exercise connected to the seventh work package of the SARINOR project. Participants were mostly from education and research institutions of the SARINOR project, including the Admiral Makarov State University of Maritime and Inland Shipping, Memorial University of Newfoundland, Nord University Business School, and the University of Stavanger. Unique to ArcticSAR was that the exercise participants gathered exercise data from different previous exercises and interview data with professionals and used ArcticSAR as a TTX on a meta-level. This fact meant that observed challenges from previous exercises influenced the scenario of the table-top exercise.

increase the likelihood of decreasing the misinterpretation of "outlier" opinions − hence the increase in *credibility*. Moreover, an in-depth literature review backed the research. Likewise, it was important to juggle the emic perspective of sources − *authenticity* (Whittemore et al., 2001) − related to their own and their organizations' culture with the intended etic perspective of observation and the ultimate aim of this research being applicable − or at least relevant − beyond the culture of the research subjects (Harris, 1976). It helped that the researchers generating the data were from the same project group, which improved the possibility for a comparison of the cases by homogenizing understanding on what to focus on.

The existing literature on 5I learning processes provided the main structure while the data was coded. However, the data itself was the driver for analyzing where the structure from the literature could be extended. Multiple screenings of the coded data and the elimination of non-relevant cases should ensure *criticality*. For example, some of the cases (initially 11, of which four were chosen for the present study) provided data on learning. However, they could either not sufficiently be connected to a complex environment or were not observed by any of the researchers in the closer project team.

Connecting our findings to previous research frameworks and checking back and forth was performed as rigorously as possible as part of the validity control process (*integrity* (Whittemore et al., 2001)). Notably, some aspects of learning (e.g. individual learning) can happen subconsciously and are difficult to articulate (Crossan et al., 1999). Hence, the researchers had to be alert during their observations and then be critical and rigorous to make sense of the coded data.

As previously indicated, the findings were categorized into the processes of intuiting, interpreting, integrating, institutionalizing, and intertwining (Jones and Macpherson, 2006). However, it should be noted that some of the data fit several learning levels and processes. In order to preserve a good overview of the main input from exercises to learning processes, the decision was taken to present the findings in the order of the 5I processes. As a result, the analysis was performed by assessing how the represented data for each processes at each level of learning represented a facilitator or impediment to learning. This is presented in Table 14.2 on "Organisational learning and indicators from ECEs (extended and adapted from Crossan et al. [1999]; Jones and Macpherson [2006]; Dewi, Dwiatmadja, and Suharti [2019])". As a final step, findings giving possible extensions to the 5I framework were stipulated in a separate section (Learning beyond the 5I learning framework). While the first section (Facilitators/impediments) was more empirically driven, the latter (Possible extension of the 5I framework by internalising and interconnecting) emerged while dissecting the concept and the structure of the 5I framework, which was then observed also in a few examples in the empirical data (see sub-chapter "Learning beyond the 5I learning framework").

Findings and Discussion

ECEs and the Arctic

For all the exercises in the present study, the aspect of environmental complexity is omnipresent, if not even the main reason why the exercises are deemed important. All exercises were designed to suit the Arctic environment, and the existence of unpredictability determined the scenarios, owing to a set of unique conditions. These included climatic conditions and social environment, as well as the geographic environment. For example, sources from SARex exercise stated that "*installations can be hundreds of kilometres from shore. At the same time, few or no vessels may be close enough to respond within hours or days*". AECO (2016) added to this information by stating that "*performing these operations in extreme weather conditions, such as in Polar Regions, presents unique additional challenges, e.g. extremely low temperatures, rapidly changing weather conditions, [the] sparseness of rescue resources, unpredictable presence of sea ice and glacial ice, etc*".

Particularly in the table top-exercises (TTX), briefs and preparation were used to paint an image by explaining the complexity of the environment. Painting this image was part of the learning process regarding the reality of the context. This included presenting the necessary contextual background information to ensure increased learning effects. Additionally, visual support such as models, pictures, maps, and a movie were used to increase awareness of the complexity of the environment among TTX participants. For the full-scale Exercise Nord, which was designed for students to achieve learning effects, live-streaming and real-time observation information were presented live to students and external observers in order to gauge the multiple challenges which appeared at the same time.

Intuiting and Interpreting

As previously mentioned, intuiting occurs subconsciously and is difficult to observe (Crossan et al., 1999). Discussions with exercise participants before and after Exercise Nord 2019 provided insight into how well the existing collaborative emergency exercises fostered personal competence and skill development. It showed that this large-scale emergency collaboration exercise was mostly accepted as a field to study personal competence at the strategic and political levels. Some of the exercise participants stated that smaller exercises would be able to provide the same or better learning outcomes with fewer resources being required. This could be due to Exercise Nord only happening once a year, during which resources are available than in a realistic scenario for some positions. However, learning on an individual level through an ECE with scenarios that might not be as common as those of smaller exercises can bring benefits to the group, organizational, and inter-organizational levels as well. An example of this was risk management connected to the full-scale ECEs.

Risk management and exercise safety were core topics in the preliminary stages of the exercise and required a good understanding of the challenges of the ECE. Ultimately, participants had to experience a trade-off regarding what would be a completely realistic scenario and ensuring safety. Nonetheless, Exercise Nord 2018 gave indications that exercise participants in education (students) had "good learning" effects. This situation especially relates to practising under time pressure, making difficult decisions, and experiencing a lack of support resources. Also, they actively gathered some tacit knowledge in a largely organised environment specifically designed for them.

During Exercise Nord (2018), we observed the bridge of a distressed vessel and other areas. We observed how the captain and officers had to rely on hand-held telephones for some communication. This was because other information was shared over the loudspeakers and created difficulty in gaining shared information/situational awareness. For individuals, this experience created familiarity with technology and communication tools (Nord, 2018). However, a question remains regarding whether the experienced difficulties from such exercises would create further learning processes on the other learning levels; for example, learning whether another technology (hands-free) was going to be implemented for increased personnel efficiency in vessels of the participating and affiliated organizations. We observed implications for learning processes on communication tools at the group level. The observation revealed that familiarity with technology and communication tools help to establish personal comfort during group interactions. This related to a surprising/stressful experience for individuals. However, there are also reports of overly scripted and easy aspects of the exercises that might be less beneficial for learning at some levels.

On the one hand, the data indicated that the large full-scale exercise type in a complex environment might have some limitations related to intuiting. Several experienced positions from all levels expressed that their role had not contributed to learning on an individual level; for example, "*Captains know [… the] scenario and procedures [rather well before the exercise]*" (Nord, 2017). On other occasions, learning limitations were mostly related to safety reasons and risk management activities. However, challenging activities from a safety perspective could also bring interesting learning effects. Activities such as handling airborne or seaborne resources and transporting casualties must be performed with the utmost care and with knowledge about it from everyone (individuals, groups, organizations, and across organizations). This contribution is noteworthy, as it suggests that in many cases it is not possible to isolate learning effects on one level and instead requires a string of processes connected to learning at all stages.

On the other hand, some interviewees mentioned that the exercise was mostly defined to increase the learning effect for students (in education) and to increase learning effects at the inter-organizational level. This type of statement was mostly connected to when there were roles that were designed

to "drill" certain standard operating procedures by the book, which meant limited room for improvization. Some of the more experienced positions actually saw themselves serving support functions in order to make the ECE run smoothly and to reach the exercise goals for students. While this may increase the learning effects for some, others were confronted with inadequate task difficulties. For example, some tasks were too simple for emergency personnel.

Regarding the observed full-scale exercises, exercise support teams were used. These teams were people who would not participate in the actual exercise but would help to facilitate the best learning effects for participants. They had different types of roles to facilitate individual learning processes. While SARex was set up quite strictly before the exercise, the individuals were not guided or steered by the support team during the exercise. During Exercise Nord (2019), this was different for some positions. Some individuals in the exercise had specifically assigned controllers who would be in constant dialogue with each other. The individuals participating in the exercise could come up with questions on what was best, and the controller provided recommendations and feedback to the participants (Nord, 2019). The role of controller facilitated the acquisition of information and the interpretation process, which are the conscious elements of individual learning within group during exercises (Crossan et al., 1999). However, the controllers can additionally be seen as the facilitators of connection between different levels. The controller would bring in knowledge from the group and organizational level, while also being seen as the ambassador feeding back knowledge to the group and organization on how well trained the participants were.

All the exercises in the study provided feedback about how some participating organizations had clear objectives that would influence learning on several levels. Particularly, the two full-scale exercises provided several examples of testing and learning the application of new and innovative equipment. The design of SARex was to test survival equipment. Exercise Nord, however, used a drone, even though feedback showed that further learning on how to operate drones during co-operation was needed. A helicopter pilot stated, "*We are not happy to operate in the same airspace as drones. [We can't] see them because of their size. [However,] clearly, drones have potential and can be used during emergencies*" (Nord, 2019). The pilot was speaking from an organizational perspective, being aware that drones were a risk but had learned and articulated that the benefits should be taken seriously. This type of statement gave further indication of how an individual learning process might also be directly connected with group, organizational, and inter-organizational interests and delivering feedback towards the other levels.

Integrating

Learning on the group level was mostly represented via activities connected to communication and creating mutual understanding during exercises. At

AECO 2016, an interview partner stated that communication personnel were tested, and the whole group level could see how certain staff were best suited for the task at hand. The example was as follows: "*When this guy took over, the information stream was much more clear. That is something that we say to pick your best communication guy on the communications line*". This statement shows how the group learned about certain abilities of one group member. Exercise Nord in 2018 provided further evidence for learning at the group level. It consisted of co-operation between individuals testing their roles. They also learned how to incorporate non-professionals into the exercise. This problem was, in no small degree, at the tactical level. Participants believed that this enabled them to have an idea about the non-professional capabilities of their individual members and organizations. Another example is from the AECO 2018 exercise. The scenario integrated both professionals and non-professional to establish shared views. The following statement shows how the interaction of the participants was intended, although it became clear that some roles had more power to express their opinions than others. One participant said:

> A play board [was] used to visualise the vessels in distress during the TTX. The captains were placed around the table with the board. The rest of the group listened to their discussion about what action to take [at] the beginning of the exercise. Afterwards, we were grouped based on what organisation we represented. I played out the role of a passenger. Two persons were running the exercise. It was a good experience for me, although the role of the passengers was not so active; we became more observers of the discussion.
>
> AECO

While room for a constant dialogue with others was slightly limited in the aforementioned set-up (likely owing to people not feeling empowered to participate in the discussions), a good overview of the group's capabilities was created at the individual (interpretation) and group levels (integration). The Data from AECO indicates that group-level learning might always be connected to challenges in providing a framework that enables the active involvement of all individuals in a way that intuition and interpretation are both archived. These examples demonstrate that incorporating members from another background (and from other organizations) also enables organizational learning via evolving an understanding of each other's organizations and creating the necessary trust and predictability.

The discussion with exercise participants at SARex raised further potential challenges to learning on the group level via integration. It seemed that follow-up on exercises and deep conversation on concluding remarks could be challenging. In connection to discussions around Exercise Nord 2019, participants stated that they might return to their own organization's routines after the exercise and did not have the time or resources for the further active

integration of learning. They compared their own organization with another organization by stating, "*and I think [the other organisation] […] is very good with that in comparison with us […], we are not as good with this*". By doing so, there is a risk that a learning process could be cut somewhat short at the group- and organizational levels after an ECE, as participants might not further engage with each other in discussions unless follow-up exercises are planned. However, there is often flexibility, in case some participants feel that there is a need for further integration. Data from the SARex exercise revealed that emergency personnel believed that they delivered good results; however, if they thought it was not good enough, they were open to further discussion on how to improve for the next time. This information is based on cognition and only indicates general readiness to follow up.

Although the previous example showed that achieving group learning was difficult, some positions in the Coast Guard gave more insight on potentially successful approaches toward learning. They demonstrated the intention to provide feedback to individuals at the group level. Some people produced reflections regarding what they had experienced before and during the exercise, and then provided recommendations at the group level. One interviewee stated the following:

> The thoughts that I focused on in preparation for the exercise primarily revolved around rationing, distribution of tasks, and watch rotation. Apart from the most obvious challenge related to hypothermia during the exercise, I also became aware of challenges related to socialisation and the importance of including people, maintaining morale, motivation, and communication. Although the most basic physiological needs must be covered in order to survive, I feel that these are also important aspects […] [on which focus should be placed].
>
> SARex

These thoughts were later shared in reports with all other participants. These reports were then made available publicly and were distributed further within the participating organizations, thereby potentially enabling the institutionalizing process.

Institutionalizing

Institutionalizing includes learning effects within an organization's systems, structures, routines, and practices (Crossan et al., 1999). The Association of Arctic Expedition Cruise Operators (AECO) provided insight into the fact that substantial debriefing and sharing of knowledge (including achievements and lessons learned) could be a method to provide organizational learning effects. However, while we observed substantial effort at the tactical and operational levels, only a few materials were provided regarding high-level organizational discussions on the strategic and political/diplomatic levels

(AECO). Concerning organizational learning about capabilities and how resources might be used, a discussion on where and on which vessels helicopters had the opportunity to land and take off was interesting (Arctic SAR). It seemed that some insights regarding some resources were new to some organizations. One example of this was a discussion about detailed background information regarding vessels as part of the military assets for air patrols. However, while the organizational representatives learned about these resources, it also depends on what the network of the organization could learn from this in the long run and if other individuals and groups from these organizations would be able to access this information if necessary.

The previous example was from a table-top exercise. In terms of debriefing, owing to their tacit character, full-scale exercises can provide an increased potential for learning on tacit experiences compared with table-top exercises. The full-scale Exercise Nord (2019) provided good insights on this topic, as it was a complete exercise in terms of debriefing. It consisted of several debriefing steps at the individual, group, organizational, and inter-organizational levels. Directly after the exercise, professionals had hot wash-ups within their group. (Hot wash-ups are short meetings to discuss the immediate feelings and thoughts after the exercise.) On the same day of the exercise, representatives of all participating organizations met for a joint debriefing and to provide feedback from their organizations to the other organizations. However, the next step in how further learning was distributed afterwards within the institutions could not be assessed. Interviews with participants indicated that this could be more case-to-case oriented and could depend on the available time and resources. However, this also indicates that the total potential for intuiting, interpreting, integrating, and institutionalising would not be available in cases with little time and resources available after exercises.

Data from the SARex exercise suggest that such a commitment to long-term exercise evaluation, learning implementation, and improvement could still be improved. A captain stated the following:

> With the lesson learned here, this phenomenon, as they call it in the Navy is hot wash-up. When they have major naval exercises, no matter how long it takes, they always have such a hot wash-up where they gather all the strengths that have been involved in this exercise/operation, where people give their real opinion on things, and then a report is written afterwards. That is what I say with SAR reporting tools, which I've missed more, that you have to have a way to get a standardised one, where you can go through and take what you did, what you thought was good, what was less good and what you have to learn next time.

The AECO table-top exercises attempted to overcome potential challenges to learning at the organizational level by having exercise participants fill out a form containing questions connected to their perceptions of individual learning, use for organizations, relevance, and recommendations for future

exercises. Although this was somewhat subjective − and without sharing too much detail concerning "perceived learning effects" − it ensured that most participants gave feedback and reflection that would benefit organizational and inter-organizational learning if the AECO table-top exercise network provided in-depth insights with other inter-organizational networks.

In contrast to the periodic recurrent exercises, such as those for AECO and Nord, Arctic SAR TTX was a single event. The exercise produced feedback for both maritime sector-related R&D reports and recommendations for policy and academia. Nonetheless, challenges were still connected to the participating group, such as being isolated from the actual organizations that they were discussing. As a result, the exercise could not guarantee learning at the organizational level. Furthermore, it remained unclear whether the aforementioned reports had sufficient power to potentially change the organizational structure, routines, and procedures according to the exercise outcomes and evaluation to produce long-term learning effects.

Intertwining

Learning on the inter-organizational level was connected to intertwining, which is an active engagement between the organization and its external knowledge network (Jones and Macpherson, 2006). Notably, AECO 2016 provided a great example for active engagement across organizations. They established a resilient inter-organizational trust aspect in their exercise goals, stating that "*the objective for this workshop and TTX is to strengthen the cooperation and exchange of knowledge between the Arctic cruise industry and various Arctic SAR responders*" (AECO Reykjavik 2016). Already, the sheer participation of a broad group of organizations at the AECO exercise could be seen as an indicator for increased intertwining. However, the data from AECO indicated that exercise participants from a meta-organizational level (the Arctic Coast Guard Forum in this case) demanded further "*sharing information and best practice [as well as to] encourage more exercises and the systematic sharing of lessons learned*" (AECO 2018). Hence, this seems to be an indication that inter-organizational learning depends on the increased professional collaboration of competent exercise participants who can then contribute to the inter-organizational level of learning.

If these competent people are not participating, this was a factor that was raised as an impediment to learning. Certain stakeholders who were deemed necessary to create further inter-organizational learning did not participate in the exercise. For example, one exercise participant highlighted that "*there were few participants from the industry*" (AECO 2016).

The international TTX set-up of AECO 2018 demonstrated the importance of participation and exchange by a wide variety of actors to provide learning on the inter-organizational level. Participants were eager to learn about tasks and restrictions connected to co-operation with different organizations. The participation of different coast guards, different institutions, and different

nationalities represented an example of what the actual challenges and hindrances of a real case could look like. For example, everyone wanted to know "*What role does* [the Joint Rescue Coordination Centre of country A] […] *play at this stage?*" in a scenario presented by AECO.

Another factor that can be connected to "intertwining" is how far learning at the inter-organizational level can be spread beyond the organizations participating in the exercise.

For example, during the table-top exercises and particularly at the META TTX Arctic SAR, the setting gave room for participants to discuss and be exposed to different views and approaches. This situation was due to the design of the exercise, where experience from observations of previous exercises, findings from interviews, previous work packages, and analyzed incidents were used to investigate gaps in training, education, and collaboration across institutional borders (Arctic SAR). However, while this produced the potential for learning at the inter-organizational level connected to the "intertwining" of organizations, the learning effect at the individual and group levels remained limited. How much the learning effect would spread among the discussed organizations was not assessable, as it was a once-off event.

In contrast, an aspect that seemed to provide an additional inter-organizational learning effect was the periodic recurrence of Exercise Nord. Each year, stakeholders participate in a discussion to organize the next exercise based on the learning gaps from the previous year, as well as on what their organizations wanted to be trained on. Similarly, the AECO exercises also produced recurrent feedback, owing to similar stakeholders gathering every year. In addition, press releases contained lessons learned and recommendations, such as AECO's report that made learning outcomes available beyond the participating organizations; however, what effect these materials have had cannot be measured.

Analysis of the 5I Framework

The analysis was performed by assessing how the data for each 5I process represented a facilitator or impediment to learning. In the process of data analysis, the secondary data and coded qualitative data from the observations and interviews were merged and analyzed as a whole (Mays and Pope, 2000; Miles, Huberman, Huberman, and Huberman, 1994). Similar to the approach taken by Dewi et al. (2019), Table 14.2 represents an adaptation to Crossan et al. (1999). However, it is extended by the inter-organizational level and intertwining process related to the 5I learning framework (Jones and Macpherson, 2006). Also, through the data, we were able to determine the value for "input/output" at the inter-organizational level.

In contrast to Dewi et al. (2019), who established *"determination"*, Table 14.2 is extended by two columns representing the codes related to indicators from the data. In line with the terminology in other case studies such as Zietsma et al.

Table 14.2 Organizational learning and indicators from ECEs (extended and adapted from Crossan et al., 1999; Jones and Macpherson, 2006; Dewi et al., 2019)

Learning level	*5I process*	*Input/outcomes*	*Learning facilitators*	*Learning impediments*
Individual	Intuiting	Learning through experience, images, metaphors	Opportunities to make mistakes Ability to test different strategies in exercise The possibility to be exposed by an alternative view Personal competence and skills development Practice taking action under pressure during exercise Familiarity with technology and communication tools that helps to establish personal comfort Exercises allow you to get your hands dirty	Acting in isolation and passively Individuals tend to focus on their own issues The task difficulties are not adequate. Some tasks are very simple Predefined roles and tasks with limited improvization Challenges in transferring the experience to colleagues Lack of structured self-evaluation
	Interpreting	Learning through the cognitive map, dialogue, reflections	Openness to divergent view Testing innovative approaches Not shy to ask for guidance Constant dialogue among individuals Practice professional language of emergency response	

Learning level	*5I process*	*Input/outcomes*	*Learning facilitators*	*Learning impediments*
Group	Integration	Group confirms or changes individual learning Learning through shared understanding, mutual adjustment, interactive system, and reflections	Discussion after exercises Realistic scenario makes exercise participant learn the most Application of systematic approach and guideline facilitates learning Joint-sensemaking during exercises Learn how to co-operate and follow the command in the exercises Exercises establish shared view in temporary groups Interactive dialogue within the group	Following up the exercises and a deep conversation on concluding remarks is a challenge, as participants get back to their own organization's routines after the exercise
Organization	Institutionalizing	Learning through organisation change or confirmation of group learning and making decisions on redefining existing procedures, routines, rules, and structures	Very few high-level organizational discussions Each organization has its own hot wash-up, so personnel who did not involve in joint preparation phase activities will hear about other organizations' competence	Isolation of the group that attended exercises within the organization Lack of commitment to change in organizational structure routines and procedures according to exercise outcomes and evaluation Poor incorporation of debriefing and low priority of evaluative learning Resistance towards changing organizational culture

(*continued*)

Table 14.2 (*continued*)

Learning level	*5I process*	*Input/outcomes*	*Learning facilitators*	*Learning impediments*
Inter-organization	Intertwining	Learning through inter-organizational response facilitation, networking, and inter-organizational trust	Developing competences through inter-organizational collaboration, especially regarding international rules and regulations Developing relationship across institutions and organizational borders Organizations establish resilient inter-organizational trust by involvement in exercises	Different organizational culture or restrictions in the military, civilian, and volunteer organizations Lack of continual evaluation and reassessment of developed relationships

(2002), we called those indicators facilitators and impediments. Each of the facilitators and impediments in the table have a code corresponding to what is described in the findings and analysis in the 5I process. The analysis of 5I the framework in this study confirmed that the processes are possible to recognize at an inter-organizational level. However, we observed the potential to expand the framework by adding two more processes at the group and inter-organizational level based on the empirical data (this is explained in the next section on "Learning Beyond the 5I Learning Framework").

Learning Beyond the 5I Learning Framework

The approach of this study was to explore the processes of the 5I learning framework in the context of ECEs in a complex environment. However, the study was able to identify learning effects that could go beyond the 5I framework. Table 14.3 illustrates the elements that the 5I framework has covered across learning levels and to what extent they have been covered. Several of the connections beyond the 5Is (suggested with dashed lines in the 5I model) are possible. As the main example, the effects of periodical recurrence (introduced in the findings on intertwining) indicate that the other levels (individual, group, and organization) could also benefit from the periodic recurrence of the exercises.

The yellow boxes in Table 14.3 reveal that the 5I framework covers learning among the group levels only to a minor degree (Jones and Macpherson, 2006). At this level, we recognized the potential to expand the framework by adding a process.

We observed that groups from the same organizations from different levels and departments learned how to co-operate and communicate. This learning was real, based on response groups from different organizations as well. For example, the on-scene personnel from the fire brigades closely interacted with the Coast Guard personnel during the Nord Exercises (Nord 2016, 2018, 2019). Notably, a form of inter-group collaboration enabled participants to learn efficient ways of working together by establishing mutual understanding over a short time period for emerging temporary organizations (including groups from different organizations or the same organizations). The data in this study support the learning occurring between groups to some degree; however, further quantitative data will be required to fully support this idea. We called this an *internalizing* process because the group established a swift understanding and transferred information internally between themselves during the emergency response in the context of the exercises.

The yellow boxes in Table 14.3 also reveal that the 5I framework covers learning among the inter-organizational levels to only a minor degree. At this level, we recognized the potential to expand the framework by adding a process. Our literature review on previous studies had suggested that the inter-organizational level was only a sub-group of the organizational level, to some

Table 14.3 Potential for expanding the 5I framework

Learning level	*Individual*	*Group*	*Organization*	*Inter-organization*
Individual	Intuiting (5I)	Interpreting (5I)	Suggested with dashed lines within the 5I learning framework but not discussed in detail	Suggested with dashed lines within the 5I learning framework but not discussed in detail
Group	Suggested with dashed lines within the 5I learning framework but not discussed in detail	Not suggested as one of the 5I	Integrating (5I)	Suggested with dashed lines within the 5I learning framework but not discussed in detail
Organization	Suggested with dashed lines within the 5I learning framework but not discussed in detail	Suggested with dashed lines within the 5I learning framework but not discussed in detail	Institutionalizing (5I)	Intertwining (5I)
Inter-organization	Suggested with dashed lines within the 5I learning framework but not discussed in detail	Suggested with dashed lines within the 5I learning framework but not discussed in detail	Suggested with dashed lines within the 5I learning framework but not discussed in detail	Not suggested as one of the 5I

extent. However, within the context of environmental complexity, it was shown that there is potential for inter-organizational-level learning to be fostered through ECE. Some research from the area of a sociocultural approach to learning could provide a conceptual background to this learning level. However, this is missing empirical support (Mozzato and Bitencourt, 2014). The data revealed that in some exercises (such as those by AECO), participants were from different networks, meaning that different emergency management networks gathered together to learn from each other. This learning facilitates communication and familiarizes them with other structures and working procedures. In other words, they learn from being connected to a larger network. We called this the *interconnecting* process – the learning process that occurs between inter-organizational networks. Figure 14.2 presents our extension to the framework with the addition of internalizing and interconnecting processes.

Conclusion

In this study, we used the 5I framework to analyze the learning process in the context of collaborative exercises. We assessed the suitability of the 5I framework for understanding inter-organizational learning processes in emergency management in general and collaboration exercises in particular. The 5I

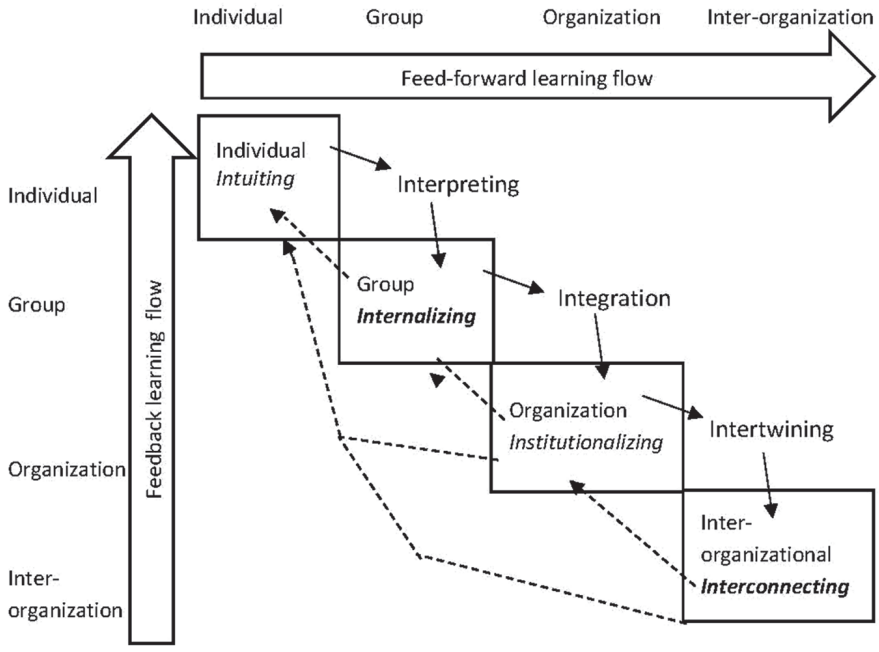

Figure 14.2 The 7I learning framework adapted from Jones and Macpherson (2006).

framework was initially developed in the context of small and medium-sized enterprises that operate in mature manufacturing sectors. Notably, the application of this framework to emergency collaborative exercises can be considered as an innovative approach to understand learning at the inter-organizational level more generally. We contributed to the framework by proposing two new processes: *internalizing* and *interconnecting. Internalizing* occurs between groups of the same organization or different organizations, while *interconnecting* occurs at the inter-organizational level. Apart from extending the framework, our study identified preliminary learning facilitators and impediments in the complex environment of the Arctic during ECEs. Overall, this study shed light on how the complex environment of the Arctic influences ECEs, as well as learning processes.

Moreover, the study illuminated how ECEs can affect inter-organizational learning processes to some degree. Notably, this study has several practical implications. For example, the results can be useful for exercise organizers, those who invest in exercises, and the emergency personnel who participate in exercises. Owing to the qualitative research design and the heterogeneity of the data, the generalization of these results must be done carefully.

On the one hand, the full-scale Exercise Nord, with over 1,000 participants, had a vast participant field ranging from tactical and operational to strategic and political levels, which went through the learning processes. On the other hand, exercises such as Arctic SAR had a much smaller participant group from strategic, political, and academic perspectives. Although the scopes of the exercises are different, they could still contribute to the goal of this study. It is evident that for organizations to maximize learning outcomes, they must develop a more sophisticated approach to collaboration exercises. In this study, we did not focus on how what was learned ultimately changed the strategies and routines of the organizations involved. As a result, further research is required to examine this crucial next step, which is determining the effect of learning on the organizational effectiveness in managing emergencies. As this was an exploratory study, we did not fully test the framework empirically. As a suggestion for further studies, we propose the application of the framework and its empirical testing in the context of collective networks such as clusters, joint ventures, and other arrangements.

The present study concluded that periodical recurrence of the exercises could provide wide-reaching effects both for intertwining and the other learning processes. Although the background effects of this remain veiled, future studies must examine what processes follow within the individual, group, and organizational levels during the period following emergency response exercises, to promote improved collaboration. We suggest a longitudinal study to assess whether inter-organizational learning leads to increased collaboration or the potential for collaboration after an exercise, as well as what processes are enabled by periodic response exercises.

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ORIGINAL ARTICLE

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Outcome of collaborative emergency exercises: Differences between full-scale and tabletop exercises

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Abstract

The degree to which exercises improve the collaboration among different organizations during an emergency is under debate. This study aims to contribute to the scarce research on this topic by giving insight into the perceived effects of exercises on collaboration, learning, usefulness and interorganizational trust. In particular, this quantitative study looked into the differences between the effects of tabletop and full-scale exercises. A questionnaire assessing collaboration, learning, usefulness and trust—the CLUT instrument—was developed. Data were collected from 173 full-time emergency management personnel in Norway and Canada. Usefulness, learning and collaboration outcomes were perceived to be high for both types of exercises, but full-scale exercises were perceived to have greater learning and usefulness outcomes than tabletop exercises. Stronger relationships were identified between the perceived effects on learning and usefulness, collaboration and trust in tabletop compared to full-scale exercise, whereas the relationship between the perceived effects upon collaboration and trust was stronger in full-scale exercises. Multiple regression analysis showed that the variables used to measure exercise usefulness can better predict tabletop exercise outcomes.

KEYWORDS

collaboration, collaboration exercises, emergency exercises, full-scale, learning, tabletop, trust, usefulness

1 | INTRODUCTION

Evaluations of successful and failed emergency responses highlight the importance of effective collaboration and detailed plans (Curnin & O'Hara, 2019; Metallinou, 2018; Wilkinson et al., 2019). In particular, interorganizational collaboration has been emphasized as a critically important task that organizations should train on (Andreassen et al., 2020; Skr, 2009/2010). In collaboration exercises, multiple organizations participate and aim to integrate and improve their collaboration to handle emergency situations together (Berlin & Carlström, 2015). Such exercises are assumed to include not only command and control, technology and emergency plans and procedures but also enhanced collaboration between organizations at all levels (Sørensen et al., 2019). They are, moreover, expected to increase the ability of organizations to help each other, to test cross-organizational collaboration, and to prepare participating organizations to react to emergencies in a coordinated manner (Kim, 2013). The outcome of such exercises is, however, under debate. Some researchers claim that emergency collaboration exercises on land (Berlin & Carlström, 2008, 2009, 2015) and at sea (Kim, 2013, 2014; Kristiansen et al., 2017; Magnussen et al., 2018; Sørensen, 2017; Sørensen et al., 2018, 2019) tend to produce results with limited collaboration-related outcomes and usefulness in real emergency responses (Borell & Eriksson, 2013; Kristiansen et al., 2017). Some reasons for these outcomes include unsatisfactory attention to variation (Borell & Eriksson, 2013), dominance of mechanistic behaviour (Berlin & Carlström, 2013), insufficient focus on learning aspects (Berlin & Carlström, 2015) and overdependence on standardization (Kim, 2013).

Research into the outcomes of collaboration exercises at different levels is scarce, though there are some notable contributions (e.g. Berlin & Carlström, 2013, 2014, 2015; Carlström et al., 2019, 2020; Helsloot, 2005; Kim, 2013; Perry, 2004; Skryabina et al., 2020). Most of these have focused on the implementation, significance and effects of the exercises on participants (Coombs, 2007; Drennan et al., 2014; Fink, 1986; Mitroff & Anagnos, 2001). While these contributions are important, they commonly concentrate on national, land-based, full-scale single exercises (FSEs). FSEs are demanding and costly, and participants rarely meet face-to-face. In tabletop exercises (TTEs), participants meet and discuss emergency scenarios. One matter that has yet to be understood is whether the findings for FSEs apply to TTEs.

Interorganizational trust is identified as an important factor in collaborative emergency operations (Roud & Gausdal, 2019). Even if some studies of trust in emergency management (e.g. in Roud & Gausdal, 2019; Seppänen et al., 2013) exist, studies of the trust outcomes of emergency exercises are very rare. The aims of this study are therefore as follows: 1) to develop an instrument to measure collaboration, learning, trust, and usefulness in collaboration exercises and 2) to investigate the outcomes of emergency collaboration exercises in general, and the possible outcome differences between TTEs and FSEs in particular.

2 | THEORETICAL FRAMEWORK

The possible outcomes of emergency exercises include enhanced collaboration, learning, trust and usefulness.

2.1 | Learning and usefulness

Learning, "the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p. 38), is one of the key potential exercise outcomes (Smith & Elliott, 2007). The goal of learning is not only to gain knowledge, it also represents development and change (Sommer et al., 2013). Learning from collaboration exercises may lead to changes and development and reveal gaps in interorganizational collaboration. These gaps can be filled by redefining existing procedures, routines, rules, etc., which is denoted as experiential learning (Stein, 1997). Learning as such is not sufficient; it needs to be relevant. It is therefore argued that collaboration exercises are ineffective when they do not contribute to learning that may be useful in an actual event (Berlin & Carlström, 2014; Carlström et al., 2020). The overall goal of exercises is to improve the capacity to handle critical incidents or emergencies, which is denoted as usefulness (Andersson et al., 2014). Our first proposition (P1) is therefore that *learning positively influences the perceived usefulness of emergency collaboration exercises*.

2.2 | Collaboration and learning

In exercises, individuals develop their core competencies and use their capacities interactively and complementarily (Magnussen et al., 2018). To inspire and facilitate collaboration among participating organizations, "participants have to develop a clear understanding of participating organizations' priorities, ways of communicating, and use of sector-specific terms and abbreviations" (Sørensen et al., 2018, p. 2). Discussions are intended to facilitate collaborators generating productive conflict resolutions and eventually achieving effective interorganizational collaboration (Carlström et al., 2019). This can be achieved through collaboration exercises where participants are involved in work-related activities and discussion through active participation, which contributes to learning (Sommer et al., 2017). Our second proposition (P2) is therefore that *in emergency collaboration exercises, interorganizational collaboration positively influences individual perceived learning*.

2.3 | Collaboration and trust

Interorganizational collaboration is identified as a key factor to develop interorganizational trust in the context of networks (Gausdal, 2012) and might have the same effect in collaboration exercises. To build trust across sectors, exercise designers can focus on joint problem-solving that allows for improvisation and implementation of new strategies that enhance learning (Christensen et al., 2016). Having the ability to improvise and generate alternative solutions also helps emergency organizations better respond to and manage incidents with a low probability that occur relatively unexpectedly (Torgersen et al., 2013). Our third proposition (P3) is therefore that *interorganizational collaboration in emergency collaboration exercises positively influences interorganizational trust*.

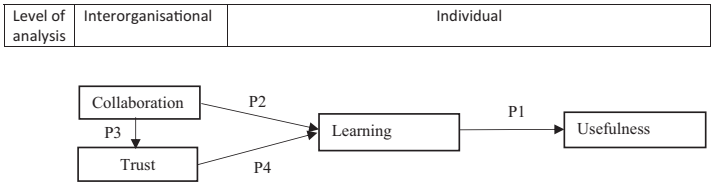

FIGURE 1 Conceptual model for the outcomes of emergency collaboration exercises

2.4 | Trust and learning

In the emergency context, interorganizational trust is recognized to offer more opportunities for learning during collaboration exercises (Lane & Bachmann, 1998). Moreover, interorganizational trust positively influences the sharing of evaluation reports among emergency organizations, which may also improve the learning effects of exercises (Roud & Gausdal, 2019). Our fourth proposition (P4) is therefore that *in emergency collaboration exercises, interorganizational trust positively influences individual learning*. According to the literature and propositions, a conceptual model has been developed (Figure 1).

2.5 | Types of exercises

Five types of emergency management exercise have been defined: orientation, drill, TTEs, functional and FSEs (Ministry of Civil Defence and Emergency Management, 2008). The types of exercises evaluated in this study are TTEs and FSEs.

A *tabletop exercise* (TTE) may be referred to as a "discussion exercise" (Daines, 1991). A TTE allows emergency management officials to practise the full activation of emergency response plans within confined, controlled and low-stress discussion scenarios (Coppola, 2006), where they often meet face-to-face. Participants sit together and have a dialogue on how they would intend to act in a given scenario (van Laere & Lindblom, 2019). This type of exercise is used to practise problem-solving and the coordination of services generally reserved for the management level. The effectiveness of a TTE is derived from the energetic involvement of participants and their assessment of the recommended revisions to current policies, procedures and plans (Drabek & Hoetmer, 1990).

A *full-scale exercise* (FSE), the most complex type, tests all or a major portion of the functions specified in an emergency response plan (Daines, 1991). Such exercises are extremely demanding and face several constraints due to funding and time limitations (Daines, 1991). FSEs are usually conducted in a real-time, stressful environment that is intended to mirror a real incident (Haddow et al., 2013). They often involve long waiting times and limited opportunities to examine different strategies (Berlin & Carlström, 2013). Moreover, different organizations have different roles, work at different locations and communicate mostly by radio and phone, rarely interacting face-to-face. FSEs mostly aim to identify resource gaps in an operational environment rather than to develop relationships (Roud & Gausdal, 2019).

A variety of TTEs and FSEs exist; however, this study refers to TTEs or FSEs in general and not to specific exercises. Because participants in TTEs from different organizations meet face-to-face and take more leadership of the session, they can try alternative solutions and have more ability to assess options. Thus, we expect some differences between TTEs and FSEs in the level of interorganizational collaboration that they foster. Moreover, less pressure and fear of failure may also result in a more creative discussion that enables more learning in TTEs. In FSEs, there are short decision times and comprehensive simulated life-and-death situations (Waller et al., 2014), and the level of face-to-face contact is lower. In addition, the collaboration is remote and not as interactive. It is therefore expected that the conceptual model (Figure 1) works differently in the two types of collaboration exercises.

3 | METHODS

A survey instrument was developed to measure collaboration, perceived learning, usefulness and trust (CLUT). The CLUT survey was distributed to emergency personnel involved in collaboration exercises in Norway and Canada during the spring of 2018. All full-time emergency personnel who participated in this study were from the Coast Guard, police, municipalities, private rescue companies, shipping companies, fire brigades, ambulance personnel and joint rescue centres. The intention of this study is not to compare the two nations but to compare the two types of exercise: TTE and FSE. The participants' responses are based on their experiences with all previous collaboration TTEs and FSEs.

3.1 | Instrument

The survey instrument is an extended version of the CLU instrument (Berlin & Carlström, 2015) with a specified scale from Sørensen et al. (2018) that measures perceived collaboration learning and usefulness based on a Likert scale ranging from 1 to 5, where 1 is "strongly disagree" and 5 is "strongly agree." The extension consists of adding trust. To select items to measure trust, the emergency management literature was reviewed, with very sparse results. Two exceptions were identified. The first, Longstaff and Yang (2008) used three items to measure trust derived from Gillespie and Mann (2004), which are included as items 24 to 26 in the CLUT instrument. These items are used to measure trust that participants display towards the collaborating organizations through words and behaviour (Longstaff, Yang, & Society, 2008).

The second, Paton (2007), was not used because it studies community trust, which is somewhat different from trust in collaborating organizations.

Because of the sparse trust measures in the emergency management literature, the general trust literature was approached. A recent critical review of trust measures (McEvily & Tortoriello, 2011) concluded by ranking the work by Gillespie (2003) as one of five noteworthy measures of trust. As one of two measures of trusting behaviour, Gillespie (2003) found that behavioural expressions of trust are largely captured by a model of trust that emphasizes two dimensions: reliance and disclosure (Zand, 1972). *Reliance* represents one domain of trusting behaviour, wherein an individual depends on "another's skills, knowledge, judgements or actions, including delegating and giving autonomy" (Gillespie, 2003, p. 10). *Disclosure* involves "sharing work-related or personal information of a sensitive nature" (Gillespie, 2003, p. 10). Since disclosure is not identified as important for the response phase in emergencies, we used the

reliance items only. These items are numbers 18–22 in the CLUT instrument. Item 23 is taken from Scheer et al. (2003).

The authors adjusted all items to fit the emergency management context. The final CLUT instrument, which consists of four variables and 26 items, was used twice in the questionnaire, once for TTEs and once for FSEs. The questionnaire (Appendix A) also contains questions regarding the respondents' experiences, backgrounds and demography.

3.2 | Data collection and analysis

A combination of two nonprobability sampling techniques, convenience and purposive sampling, was used. The survey included 173 full-time, publicly hired emergency personnel having different positions, for example, operational staff in the field, staff officers and officers at command posts. The majority of data (120) were collected via an online version of the survey, while the remaining data (53) were collected using hard copies. The questionnaires were distributed on multiple occasions, and we ensured that individuals did not answer the questionnaire multiple times.

To describe the data distributions, the means and standard deviations were calculated (Bennett et al., 2003). Four bivariate regression analyses tested the effects of the exercises on collaboration, trust, learning and usefulness (propositions). To measure the validity of the CLUT instrument and the homogeneity of the variables, subscales were analysed by calculating Cronbach's alpha value, and the result was 0.88, which is considered satisfactory (Brace et al., 2016).

4 | RESULTS

4.1 | Respondent demographics

Altogether, 173 professional emergency personnel from Norway and Canada agreed to participate in the survey. Their ages ranged from 25 to 74 years (M = 49.46, SD = 10.96). The majority of the respondents were male and had university degrees. Within the last 10 years, 79% of the respondents had been involved in an emergency response. Their professional experience was from 1 to 45 years (M = 15.98, SD = 10.28). There were 66 (40%) from the tactical level, 36 (21.8%) from the operational level and 63 (38%) from the strategic level. All respondents had been involved in TTEs and FSEs. Table 1 summarizes the demographics of the respondents.

4.2 | Usefulness

The percentages reported in this section refer to the percentage of participants who indicated values greater than 3 on the measure. Most of the survey respondents answered that the exercises were useful for their real-life roles and responsibilities as well as during actual emergency operations. However, the percentage was significantly higher for FSEs 87,5% than for TTEs (77,5%). More than half of the emergency professionals believed that the FSEs were more useful to the ordinary operative staff than to the commanding officer at the strategic level, while TTEs were seen as similarly useful at both levels. Furthermore, they regarded the FSEs to have a greater influence on their daily work than the TTEs. The mean of all items within the usefulness variable was 3.88 for FSEs and 3.79 for TTEs.

4.3 | Learning

Respondents felt that they learned more new things from the FSEs than from the TTEs. Most of the respondents felt that they learned a lot about the organizational structure and culture of the participating organizations in both types of exercises. Moreover, they considered themselves to have learned more about communication patterns among the participating organizations during the FSEs than the TTEs. More than half of the respondents stated they learned more about the concepts and abbreviations used by the collaborating organizations during the TTEs than the FSEs. Of all respondents, 64.2% considered themselves to have learned something from FSEs and 58.2% from TTEs about how the participating organizations prioritize their activities (p = .01). The mean of all items within the learning variable was 3.82 for FSEs and 3.74 for TTEs.

4.4 | Collaboration

Most of the respondents believed that exercises did focus on collaboration; however, in their opinion, the FSEs seemed to focus more on collaboration than the TTEs. Most respondents believed that they performed specific known roles and were active during the exercises. This believe was stronger for the FSEs than the TTEs. More than half of the respondents believed that sufficient feedback was provided immediately after the exercises; however, the waiting time was shorter for the TTEs than the FSEs. Moreover, 56.1% considered that the FSEs provided opportunities to improve and try alternative

TABLE 1 Respondent demographics

Country	Gender	Age	Experience	Education
Norway: 35.3%	Male: 62.3%	Up to 30: 4.5%	1–5: 16.6%	High school: 7.9%
Canada: 64.7%	Female: 28.6%	31–40: 17.2%	6–10: 22.1%	Undergraduate: 51.5%
	Unknown: 9.1%	41–50: 32.5%	11–20: 32.5%	Graduate: 40.6%
		More than 51: 45.9%	More than 21: 28.8%	

strategies with the participating organizations during the exercise, compared to 64.4% for the TTEs ($p = .09$). Most of the respondents felt that the collaboration was initiated without unnecessary waiting time; nevertheless, TTEs started faster than FSEs. Most of the respondents considered that the personnel who needed to practise collaboration were engaged in the exercises. This percentage was higher for the FSEs than the TTEs. About 73.8% and 63.7% of respondents agreed that clear instructions for collaboration practice were presented in the FSEs and TTEs, respectively ($p = .00$). A vast majority of respondents considered that their points of view were considered by other participants and training staff during the exercises, indicating that a collaboration-developing element was present (Kim, 2014); however, TTEs were assigned a higher percentage than the FSEs. The mean of all items within the collaboration variable for FSEs was 3.28 and that for TTEs was 3.82.

4.5 | Trust

Over half of the respondents felt that after the exercises, they were more willing to rely on the participating organizations based on their work-related judgement. However, the TTEs were assigned a higher percentage than the FSEs. More respondents believed that after participating in an FSE, they were more willing to rely on participating organizations' task-related skills and abilities in comparison with after a TTE. Slightly more than half of the survey respondents answered that, based on the exercises, they were now more willing to rely on the participating organizations to handle an important issue on their behalf. There was no significant difference between the FSEs and TTEs in this question. More emergency personnel agreed that based on what they learned in the TTEs, they were more willing to rely on participating organizations to represent their work accurately to others in comparison to after the FSEs. Many respondents also considered that, based on what they had learned from the TTEs, they were now more willing to depend on the collaborating organizations to back them up in difficult situations than after the FSEs. For both types of exercises, most of the respondents considered that they learned through the exercises that participating organizations are willing to offer them assistance and support if requested. Overall, most of the respondents agreed that their trust in participating organizations increased because of the exercises (FSE: 72.5%; TTE: 70.3%); however, the percentage was slightly higher for the FSEs than for the TTEs. The majority of emergency personnel considered that the development of trust towards the collaborating organizations within FSEs is exhibited more in their behaviour than that developed within TTEs. This was also true for the development of trust towards the collaborating organizations that is exhibited in their statements. The mean of all items within the trust variable was 3.76 for FSEs and 3.72 for TTEs. Figure 2 summarizes the results from the questionnaire according to the four variables (see Appendix A).

4.6 | *T* test

To test the hypothesis that there was a statistically significant mean difference between the TTE and FSE, a paired sample t test was performed. The visual diagram of collaboration, learning, usefulness, and trust histograms and the normal Q–Q plots (not shown) indicated that the output of each group was approximately normally distributed with a skewness value less than 2.0 and kurtosis <9.0 (Schmidler et al., 2010). The paired sample *t* test was associated with a nonstatistical effect for collaboration ($t = -0.97$, $p = .33$), which indicates that the mean score between the groups was not significantly different. When it came to trust, the paired sample *t* test was also found to be not statistically significant ($t = -0.43$, $p = .66$), which means that the mean trust scores between the two groups were not significantly different. Unlike collaboration and trust, the *t* test for learning found a statistical significance of $p = .03$ ($t = 2.13$), meaning that the means of the two groups were significantly different. The paired sample *t* test for usefulness was also found to be statistically significant ($t = 2.01$, $p = .04$).

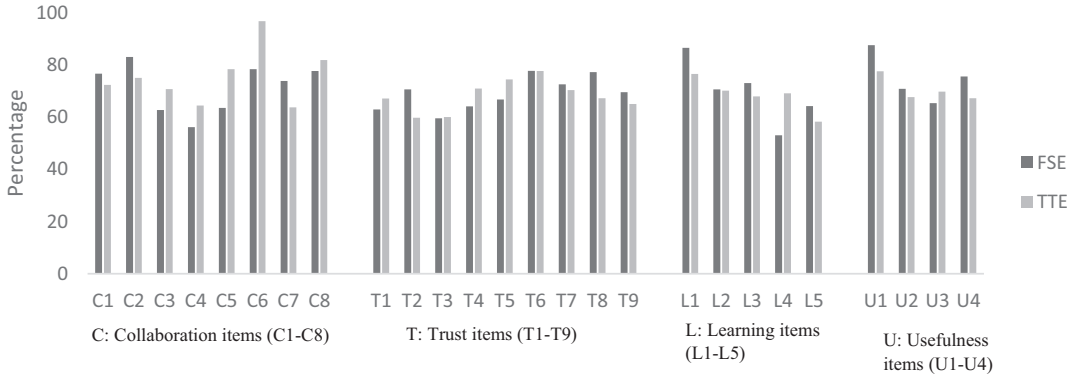

FIGURE 2 Summary of scores for each item

TABLE 2 Bivariate regression of items in learning variable correlated with the mean score across all usefulness measures P1 (sig. = $p < .05$)

Code	Learning characteristics of exercises Dependent variable: Usefulness Independent variable:		*R*	R^2	*F*-Value	*T*-Value	Sig.
L1	I learned new things from the exercises that I participated in.	FSE	0.27	0.08	13.98	3.74	.00
		TTE	0.38	0.15	28.16	5.30	.00
L2	I learned a lot about the organizational structure and culture of the organizations participating in the exercises	FSE	0.31	0.10	18.81	4.33	.00
		TTE	0.25	0.06	11.77	3.42	.00
L3	I learned a lot about the communication patterns among the participating organizations	FSE	0.32	0.10	19.26	4.38	.00
		TTE	0.31	0.10	18.19	4.26	.00
L4	I learned a lot about the way that participating organizations prioritise their activities	FSE	0.30	0.09	17.29	4.15	.00
		TTE	0.41	0.18	34.76	5.98	.00
L5	I learned new concepts and abbreviations used by the collaborating organizations	FSE	0.33	0.11	20.33	4.51	.00
		TTE	0.51	0.27	59.01	7.68	.00
	Mean of learning variables for both types	FSE & TTE	0.52	0.27	64.14	8.01	.00
	Mean of learning variables for FSE	FSE	0.40	0.16	32.18	5.67	.00
	Mean of learning variables for TTE	TTE	0.50	0.25	55.31	7.43	.00

4.7 | Bivariate analyses of correlation between items

The four propositions were tested using a series of bivariate regressions to explain the causal effects of the four variables (collaboration, trust, learning and usefulness). All of the learning items were significantly correlated with the mean score across the items connected to usefulness. These correlations explain P1. The findings indicate that stronger correlations exist between item L4 and usefulness and between L5 and usefulness for TTEs than for FSEs. A somewhat weaker but still significant correlation was also found for item L1. In contrast, for item L2, a stronger correlation was found for the FSEs than the TTEs.

Collaboration was correlated to the mean learning score across the learning items for FSEs and TTEs, which refers to P2. Slightly stronger correlations were found between most collaboration items and the mean learning score for TTEs than for FSEs, explaining a significant proportion of the variance in the mean learning score. Items C8, C6 and C7 represented a significant proportion of the variance in the mean learning in general and particularly within TTEs. However, a stronger correlation was found for FSEs than for TTEs for item C3.

Most items in the collaboration variables were significantly correlated to the mean trust score across the items associated with the trust measurements. These correlations test P3. Significant correlations were found between item C3 and the mean trust score in general, particularly for FSEs. The same was found for C4 and C5. For the following items, the results represented a significant proportion of the variance in the mean trust score but were rather stronger for TTEs than FSEs: C7 and C8.

Most of the items in the trust variable were significantly correlated to the mean perceived learning score across the items associated with the learning measurements, which relates to P4. Moreover, the data showed a slightly stronger correlation between the trust variable items and the mean learning score for TTEs than for FSEs. Significant correlations were found between item T1 and the mean learning score for TTEs. The same was found for the following items: T2 and T3 (Tables 2–5).

4.8 | Multivariate regression analyses

Multiple regression analyses were used to find factors determining various variables for the two types of exercises. The multiple regression results for usefulness (dependent variable) and learning (independent variables) are presented in Table 6 (P1). The results show that the items of perceived learning together predicted 16% ($R^2_{FSE} = 0.16$) of variation for the FSEs and 37% ($R^2_{TTE} = 0.37$) for the TTEs. For the TTEs, "learned new things," "learned about organizational structures," "learned how activities are prioritized," and "learned new concepts" were found to be significant. Only two variables, "learned new things" and "learned new concepts," were found to be significant for the FSEs.

Table 7 presents the results of the multiple regression analysis between learning (dependent variable) and collaboration (dependent variable) (P2). While the models for the two exercise types have very similar R^2 values, significant differences exist between them in terms of the significant values of the explanatory variables. Except for C6 and C8, which are significant for both TTEs and FSEs, all other

TABLE 3 Bivariate regression of items in the collaboration variable correlated with the mean score across all learning measures P2 (sig. = $p < .05$)

Code	Collaboration characteristics of exercises Dependent variable: Learning Independent variable:		*R*	R^2	*F*-Value	*T*-Value	Sig.
C1	The exercise focuses on collaboration	FSE	0.22	0.05	8.38	2.90	.00
		TTE	0.35	0.13	23.53	4.85	.00
C2	Sufficient forms of exercise feedback mechanisms (discussions, seminars, after action reports, hot wash, etc.) were provided immediately after the exercises	FSE	0.18	0.04	5.96	2.44	.01
		TTE	0.25	0.07	11.33	3.36	.00
C3	During the exercises, there were opportunities to improve and try alternative collaboration strategies with participating organizations.	FSE	0.41	0.17	35.31	5.94	.00
		TTE	0.31	0.09	17.38	4.17	.00
C4	During the exercises, collaboration between the participating agencies was initiated immediately without unnecessary waiting time	FSE	0.30	0.09	16.51	4.06	.00
		TTE	0.38	0.15	28.33	5.32	.00
C5	I performed well-known roles and activities during the exercises.	FSE	0.19	0.04	6.16	8.99	.01
		TTE	0.32	0.11	20.27	4.50	.00
C6	Personnel in need of collaboration exercise participated in the exercises.	FSE	0.36	0.13	25.55	5.05	.00
		TTE	0.45	0.21	42.38	6.51	.00
C7	Clear instructions of collaboration practice were presented in the exercises.	FSE	0.34	0.12	22.66	4.76	.00
		TTE	0.50	0.25	54.60	7.39	.00
C8	My points of view were taken into consideration during the exercises	FSE	0.34	0.12	21.92	4.68	.00
		TTE	0.48	0.23	47.10	6.86	.00
	All collaboration variables for both types	FSE & TTE	0.61	0.37	102.97	10.14	.00
	All collaboration variables for FSE	FSE	0.52	0.27	61.81	7.86	.00
	All collaboration variables for TTE	TTE	0.61	0.37	99.90	9.99	.00

variables are either not significant or significant in only one of the models. The findings revealed some differences between the FSE and TTE models. It was found that "exercise feedback," "immediate collaboration started" and "performed well" were not significant contributors to perceived learning for either of the exercise types. The items "focused on collaboration" and "clear instructions" were found to be significant variables only for TTEs, while "improve and try alternative collaboration strategies" was only significant for the FSE model.

The multiple regression results between trust (dependent variable) and collaboration (independent variables) are presented in Table 8 (P3). The multiple regression shows relatively low R^2 values for both types of exercises ($R^2_{FSE} = 0.21$; $R^2_{TTE} = 0.20$). It was found that two explanatory variables were only significant for the FSEs: C3 and C4. The variables C7 and C8 were only significant for the TTEs. Only one variable was significant for both: C6. Other variables had lower *t*-values and were not significant.

Table 9 presents the multiple regression results between learning (dependent variable) and trust (independent variables) (P2). Both models show relatively low R^2 values ($R^2_{FSE} = 0.24$; $R^2_{TTE} = 0.30$). It is found that T1 was more significant for the FSEs than the TTEs, while item T6 was only significant for the FSEs. Other variables had lower *t*-values and were not significant.

5 | DISCUSSION

The results indicate that the focus on collaboration, trust and learning in FSEs and TTEs leads to increased perceived usefulness in real emergencies. From the learning point of view, most respondents considered the exercises to be educative. The mean scores of all learning items on the five-point Likert scale were high for both the FSEs (3.82) and TTEs (3.74). The overall learning about collaborating organizations was fairly acceptable since it was above the average score of 2.5, but a deeper knowledge of how collaborating organizations prioritize their activities was weaker for FSEs, and the use of new concepts was, to a certain extent, weaker for TTEs. Moreover, the bivariate regression shows stronger correlations between the two items "how collaboration organizations prioritize their activities" and "learning new concepts and abbreviation" and usefulness. The reason for this needs to be tested and explored in another study, but a potential reason might be the deeper communication and face-to-face interactions in TTEs, where respondents can reflect on and ask questions more freely than in FSEs. Moreover, a low priority placed on the evaluation phase and cold debriefing could also hinder a useful discussion that contributes to learning new things in both types of exercises (Paton et al., 1998; Roud & Gausdal, 2019; van Laere & Lindblom, 2019).

TABLE 4 Bivariate regression of items in the collaboration variable correlated with the mean score across all trust measures P3 (sig. = p <.05)

Code	Trust characteristics of exercises Dependent variable: Trust Independent variable:		*R*	R^2	*F*-Value	*T*-Value	Sig.
C1	The exercise focuses on collaboration	FSE	0.16	0.03	3.98	2.01	.04
		TTE	0.13	0.01	2.87	1.69	.09
C2	Sufficient forms of exercise feedback mechanisms (discussions, seminars, after action reports, hot wash, etc.) were provided immediately after the exercises	FSE	0.17	0.03	4.67	2.17	.03
		TTE	0.16	0.03	4.45	2.11	.03
C3	During the exercises, there were opportunities to improve and try alternative collaboration strategies with participating organizations	FSE	0.31	0.10	17.66	4.20	.00
		TTE	0.22	0.05	8.29	3.01	.01
C4	During the exercises, collaboration between the participating agencies was initiated immediately without unnecessary waiting time	FSE	0.32	0.11	19.93	4.46	.00
		TTE	0.22	0.05	8.49	2.91	.00
C5	I performed well-known roles and activities during the exercises.	FSE	0.21	0.04	7.56	2.75	.01
		TTE	0.17	0.03	5.20	2.28	.02
C6	Personnel in need of collaboration exercise participated in the exercises	FSE	0.31	0.10	17.06	4.13	.00
		TTE	0.30	0.10	16.06	4.00	.00
C7	Clear instructions of collaboration practice were presented in the exercises.	FSE	0.21	0.04	7.45	2.73	.01
		TTE	0.32	0.11	19.67	4.43	.00
C8	My point of view was taken into consideration during the exercises	FSE	0.21	0.04	7.51	2.74	.01
		TTE	0.29	0.10	15.47	3.93	.00
	Mean of collaboration variables for both types	FSE & TTE	0.43	0.18	37.31	6.11	.00
	Mean of collaboration variables for FSE	FSE	0.42	0.18	35.66	5.97	.00
	Mean of collaboration variables for TTE	TTE	0.40	0.16	28.71	5.37	.00

Correlation analyses showed stronger correlations between learning items and usefulness in TTEs than in FSEs. Similarly, multiple regression results explained the stronger relationship between learning and usefulness in TTEs compared to FSEs. This is an important finding because it identifies a better connection between learning and perceived usefulness in TTEs than in FSEs. Overall, the discussion supports our first proposition (P1) that learning positively influences the usefulness of collaboration emergency exercises.

These results indicate that a more open and collaborative environment during TTEs, in particular, may provide room for reflection and improvisation (Gredler, 1992). A success factor for emergency management is the ability to combine organizational stability and preparedness with flexibility and rapid response in a time of emergency (Christensen et al., 2016). In this study, 64% of respondents agreed that there was room for improvisation in TTEs, whereas it was slightly lower for FSEs (56.9%). However, correlation analyses

TABLE 5 Bivariate regression of items in the trust variable correlated with the mean score across all learning measures P4 (sig. = $p < .05$)

Code	Trust characteristics of exercises Dependent variable: Learning Independent variable:		*R*	R^2	*F*-Value	*T*-Value	Sig.
T1	I am now more willing to rely on the participating organizations' work-related judgements.	FSE	0.43	0.19	38.88	6.23	.00
		TTE	0.49	0.25	53.79	7.33	.00
T2	After participating in the exercises, I am more willing to rely on participating organizations' task-related skills and abilities	FSE	0.36	0.13	25.83	5.08	.00
		TTE	0.44	0.20	41.33	6.43	.00
T3	Based on these exercises, I am now more willing to rely on the participating organizations to handle an important issue on our behalf	FSE	0.29	0.08	15.94	3.99	.00
		TTE	0.41	0.17	33.66	5.80	.00
T4	Based on what I learned, I am more willing to rely on participating organizations to represent our work accurately to others.	FSE	0.23	0.05	9.41	3.06	.00
		TTE	0.32	0.11	19.86	4.45	.00
T5	Based on what I learned, I am now more willing to depend on the collaborating organizations to back us up in difficult situations.	FSE	0.29	0.09	15.66	3.95	.00
		TTE	0.39	0.15	29.35	5.41	.00
T6	Through these exercises, I learned that the participating organizations are ready and willing to offer us assistance and support.	FSE	0.35	0.12	24.37	4.93	.00
		TTE	0.39	0.15	29.43	5.42	.00
T7	Overall, my trust in the exercise participating organizations increased during the exercises.	FSE	0.34	0.11	22.24	4.71	.00
		TTE	0.47	0.23	48.18	6.94	.00
T8	The development of trust towards the collaborating organizations is exhibited in their behaviour.	FSE	0.22	0.05	8.60	2.93	.00
		TTE	0.36	0.13	25.21	5.02	.00
T9	The development of trust towards the collaborating organizations is exhibited in their statements.	FSE	0.06	0.00	0.57	0.75	.05
		TTE	0.19	0.04	5.50	2.34	.02
	Mean of trust variables for both types	FSE & TTE	0.61	0.37	60.26	7.76	.00
	Mean of trust variables for FSE	FSE	0.44	0.19	40.11	6.33	.00
	Mean of trust variables for TTE	TTE	0.50	0.25	56.60	7.52	.00

TABLE 6 Multiple regression between usefulness and learning variables

Code	Usefulness variables		*Stand. Beta*	*T*-Value	Sig.
L1	I learned new things from the exercises that I participated in.	FSE	0.19	1.96	.03
		TTE	0.30	4.17	.00
L2	I learned a lot about the organizational structure and culture of participating organizations in the exercises	FSE	0.06	0.57	.56
		TTE	-1.69	-1.83	.07
L4	I learned a lot about the way that participating organizations prioritise their activities	FSE	0.12	1.46	.14
		TTE	0.22	2.69	.00
L5	I learned new concepts and abbreviations used by the collaborating organizations	FSE	0.18	1.88	.04
		TTE	0.40	5.43	.00
	FSE: $R^2 = .17$, TTE $R^2 = .37$				

show a stronger correlation between room for improvisation and learning in FSEs than in TTEs. In contrast with Kim's (2013) findings, the collaboration exercises in this study did not seem to only focus on sector-specific exercise-script controlled elements; there were also collaboration elements included, but the results indicate that there is still room for improvement. Tentatively, the results indicate that slightly more standardized behaviour might be exhibited rather than testing new strategies in FSEs in comparison to TTEs. A reason for this could be that around 30% of respondents did not consider the instructions about collaboration during the FSE to be very clear and mostly found themselves repeating well-known activities, which is more similar to a drill type of exercise (Berlin & Carlström, 2015).

TABLE 7 Multiple regression between learning and collaboration variables

	Collaboration variables		Stand. Beta	*T*-Value	Sig.
C3	During the exercises, there were opportunities to improve and try alternative collaboration strategies with participating organizations	FSE	0.28	3.49	.00
		TTE	0.04	0.62	.53
C6	Personnel in need of collaboration exercise participated in the exercises	FSE	0.19	2.56	.01
		TTE	0.20	2.59	.01
C7	Clear instructions of collaboration practice were presented in the exercises	FSE	0.05	0.64	.51
		TTE	0.25	3.41	.00
C8	My point of view was taken into consideration during the exercises	FSE	0.13	1.76	.08
		TTE	0.34	5.29	.00
	FSE: $R^2 = .50$, TTE: $R^2 = .47$				

TABLE 8 Multiple regression between trust and collaboration variables

Code	Collaboration variables		Stan. Beta	*T*-Value	Sig.
C3	During the exercises, there were opportunities to improve and try alternative collaboration strategies with participating organizations	FSE	0.28	2.68	**.00**
		TTE	0.06	0.74	.45
C4	During the exercises, collaboration between the participating agencies was initiated immediately without unnecessary waiting time.	FSE	0.18	2.33	**.02**
		TTE	0.02	0.27	.78
C6	Personnel in need of collaboration exercise participated in the exercises	FSE	0.17	2.15	**.03**
		TTE	0.20	2.11	**.03**
C7	Clear instructions of collaboration practice were presented in the exercises	FSE	−0.02	−0.29	.76
		TTE	0.22	1.90	**.04**
C8	My point of view was taken into consideration during the exercises	FSE	0.03	0.43	.66
		TTE	0.23	2.88	**.00**
	FSE: $R^2 = .21$, TTE: $R^2 = .20$				

TABLE 9 Multiple regression between learning and trust

Code	Trust variables		Stand. Beta	*T*-Value	Sig.
T1	I am now more willing to rely on the participating organizations' work-related judgements	FSE	0.308	2.73	**.00**
		TTE	0.26	2.31	**.02**
T6	Through these exercises, I learned that the participating organizations are ready and willing to offer us assistance and support	FSE	0.22	2.49	**.01**
		TTE	0.06	0.51	.60
T7	Overall, my trust in the exercise participating organizations increased during the exercises	FSE	0.04	0.46	.64
		TTE	0.21	1.83	**.06**
	FSE: $R^2 = .24$, TTE: $R^2 = .30$				

Yet, the results for FSEs and TTEs are very close; therefore, further testing is required in another study.

The mean values of the collaboration variable were higher for TTEs than for FSEs. The bivariate correlation results from Table 3 demonstrate that TTEs ($R^2 = .37$) show a strong significance at the 95% confidence level and a stronger correlation with learning for all collaboration variables than FSEs ($R^2 = .27$). This may suggest that the discussions and design of hot wash in TTEs provide a better arena for increased learning in terms of shared experience and joint problem-solving than in FSEs (Sommer & Njå, 2012). Overall, the results of this study and the above discussions support our second proposition (P2) that interorganizational collaboration in emergency

collaboration exercises positively influences individual learning about collaboration, in general and particularly in TTEs.

The comparison of the bivariate correlations from Table 4 illustrates that R^2 for the FSEs ($R^2 = 0.18$) is significant at the 95% confidence level. Moreover, it shows a slightly stronger correlation with trust for FSEs than for TTEs for all collaboration variables ($R^2 = 0.16$). One reason for this could be the intensive and more realistic nature of FSEs, which highlights the limitations to the competence of the other parties and could lead to developing competency-based trust. Relatively stronger correlations of "providing clear instruction for collaboration during exercises" and "considering the points of view of the participants" with the mean trust score were identified for TTEs. This might be due to the physical presence of the actors in the same room at the same time and the lack of time pressure, which facilitate trust development, enable joint problem-solving and allow further improvisation (Christensen et al., 2016).

Overall, the analysis of the results identified trust as a factor that has some influence on the collaboration exercises and found that it may be developed during exercises, which is in line with the findings of Gausdal (2012) in the context of networks and those of Roud and Gausdal (2019) in the context of interorganizational emergency response. In line with the literature, the findings support our third proposition (P3) that collaboration in emergency exercises positively influences interorganizational trust. This study also found that FSEs and TTEs contribute almost equally to interorganizational trust development.

The results are in line with the findings of Mishra's (1996) study and indicated that both types of exercises contribute to competence development, openness and reliability during collaborative responses. When it comes to trust, the results indicate that exercises contribute to trust-building among the organizations. As Perry (2004) found earlier, the majority of respondents agreed that their overall trust in the organizations participating in the exercise increased during TTEs, and that through the exercises, they got convinced that the participating organizations are willing to offer them support and assistance. However, they expressed that they relied on participating organizations to handle an important issue on their behalf more after TTEs than after FSEs. This suggests that the TTEs seem to function as trust-building arenas, and most emergency personnel believe that the exercises can be very helpful in terms of face-to-face collaboration without intensive stress. Such exercises also provide the opportunity to give comments and obtain feedback. Moreover, having in-depth conversations on challenges that emerge during TTEs can contribute to establishing a shared view among the organizations and their collaboration exercises and training programmes (Roud & Gausdal, 2019). More than half of the respondents agreed that after participating in FSEs, they were more willing to rely on respondents' task-related skills and abilities and that they believed that trust towards the collaborating organization was exhibited in their behaviour more during the FSEs. The bivariate correlations showed stronger correlations between trust and learning items for TTEs in comparison with FSEs.

The multiple regression results show, though, that the trust and collaboration items cannot fully explain the learning outcomes of the FSEs and TTEs. A reason for the lower explanatory power of these regression models for trust could be that during interorganizational collaboration, some form of language problems or differing values, internal cultures and competences could exist (Möllering, 1997). These "cultural differences" might create misunderstandings in joint operations, which may prevent trust-building and its contribution to learning (Möllering, 1997). Therefore, collaboration in emergency collaboration exercises positively influences interorganizational trust, which in turn positively influences individual learning. Thus, the fourth proposition (P4) is somewhat supported by the results.

Overall, both types of exercises got a decent score. Learning and usefulness correlate better for TTE, perhaps because participants lead the session more themselves and can try alternative solutions and have more ability to assess options. Less pressure and fear of failure may also result in a more creative discussion that enables more learning. Since TTE (normally reserved for the management level) and FSE (for the management and practical levels) were studied, it is possible that there are some differences in the answers between those who worked "in the contingency management room" and those who worked in the field. However, this has not been measured in this study. Across all respondents, though, the four propositions P1, P2, P3 and P4 are supported.

The study has some limitations. The greatest limitation concerns perceived usefulness, which does not necessarily correlate with actual usefulness in real life. Moreover, the study could benefit from a larger sample size. Nevertheless, due to the relatively few organizations involved in emergency response, the data collected from Norway and Canada may give a good indication of the perceived level of learning and usefulness of the exercises. The sample also consists mostly of full-time emergency personnel, and the results might be different in contexts dominated by volunteer personnel. It is important to note that the situational awareness of each other's needs, communications and responsibilities (and people's mental models of these) could have significant effects on how participants assess and perceive the outcomes of an emergency exercise. Thus, the participants may have interpreted the meaning of exercises differently, which may have influenced their answers and resulted in somewhat lower term validity. Although it was beyond the scope of this study, future research can consider these factors in the study design. The levels of analysis also created some limitations, particularly because learning and usefulness are measured only at the individual level. Although a quantitative survey design provides valuable information and good indicators, it cannot cover each item in-depth or consider possible linguistic or cultural nuances. Cooperation and trust are prevalent features in Scandinavian culture (Metallinou, 2018), whereas Canada has a slightly more competitive culture, which may have played a role in the results.

6 | CONCLUSION

The descriptive findings revealed that the usefulness, learning and collaboration outcomes of both types of exercises are perceived to

be high. However, it was found that FSEs are perceived to have higher learning and usefulness outcomes than the TTEs. Bivariate regression analyses between the outcome variables for both types of exercises revealed that learning had stronger relationships with usefulness, collaboration and trust for TTEs compared to FSEs, while a stronger relationship existed between collaboration and trust for FSEs. Multiple regression analyses showed that TTE outcomes can be better predicted by the variables used to measure exercise usefulness.

The study has theoretical and practical implications. *Theoretically*, it contributes to emergency management and collaboration literature in several ways. It identified and confirmed the existence of significant relationships between collaboration, trust, learning and usefulness in TTEs and FSEs. If exercises are followed up with in-depth debriefings, respondent seminars and opportunities to improvise, they can be more educational and useful in real-life emergency situations. On the other hand, exercises that lack collaboration and trust-building elements can have a weak influence on learning and usefulness. The study highlighted and confirmed the role of trust in emergency preparedness. *Practically*, the study implications underline the importance of these variables for those who plan and fund exercises. It also suggests that reflection seminars that focus on unsolved problems and that let the respondents identify the problems that may lead to changes in structures, behaviours, working methods and confirmation of existing knowledge and procedures might contribute in this respect.

For further research, the CLUT instrument needs to be developed further to more closely reflect the real outcomes of exercises and to measure learning and usefulness also at the organizational level. The impact of exercises on real world emergency response is often based on perceived data from questionnaires. In order to validate the effect of exercises outcome, variables of emergency response who are dependent on exercises have to be identified and measured. The low number of participants in this study limited the transferability of the results when separating managerial-level and on-site respondents. Thus, we decided to present the data for a nondifferentiated study population. We suggest that further studies include this in their research design and analysis to investigate the differences in the answers at each level. In this study, we also had to choose a number of parameters to limit the task, but other parameters within the dataset may also correlate. For example, learning may create trust, and trust may create collaboration. This would provide two new assumptions for further research. The survey should be confirmed and tested in other contexts that are dominated by volunteer personnel (e.g. in the United States) to verify the causality and generalizability of the results. Moreover, studying specific TTEs and FSEs with similar scenarios would provide additional insight and important information. Finally, to identify the deeper meaning and connections underlying the study and findings, an exploratory study should be performed.

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APPENDIX A

Collaboration, Learning, Usefulness, and Trust (CLUT) Instrument

1	C1	The exercises focus on collaboration.	1	2	3	4	5
2	C2	Sufficient forms of exercise feedback mechanisms (discussions, seminars, after action reports, hot wash, etc.) were provided immediately after the exercises	1	2	3	4	5
3	C3	During the exercises, there were opportunities to improve and try alternative collaboration strategies with participating organizations.	1	2	3	4	5
4	C4	During the exercises collaboration between the participating agencies was initiated immediately without unnecessary waiting time.	1	2	3	4	5
5	C5	I performed well my roles and activities during the exercises.	1	2	3	4	5
6	C6	Personnel in need of collaboration exercise participated in the exercises.	1	2	3	4	5
7	C7	Clear instructions of collaboration practice were presented in the exercises.	1	2	3	4	5
8	C8	My points of view were taken into consideration during the exercises.	1	2	3	4	5
9	L1	I learned new things from the full-scale exercises that I participated in.	1	2	3	4	5
10	L2	I learned a lot about the organizational structure and culture of participating organizations in the exercises.	1	2	3	4	5
11	L3	I learned a lot about the communication patterns among the participating organizations.	1	2	3	4	5
12	L4	I learned a lot about the way that participating organizations prioritise their activities.	1	2	3	4	5
13	L5	I learned new concepts and abbreviations used by the collaborating organizations.	1	2	3	4	5
14	U1	The exercises were useful to my real-life roles and responsibilities during actual emergency works.	1	2	3	4	5
15	U2	Based on what I learned, the exercises were useful for higher level (command) officers.	1	2	3	4	5
16	U3	Based on what I learned, the exercises were useful for ordinary operative staff (command officers not included).	1	2	3	4	5
17	U4	Participating in these exercises has been useful in my daily works.	1	2	3	4	5
18	T1	Learning from these exercises, I am now more willing to rely on the participating organizations' work-related judgements.	1	2	3	4	5
19	T2	After participating in the exercises, I am more willing to rely on participating organizations' task-related skills and abilities.	1	2	3	4	5
20	T3	Based on these exercises, I am now more willing to rely on the participating organizations to handle an important issue on our behalf.	1	2	3	4	5
21	T4	Based on what I learned, I am more willing to rely on participating organizations to represent our work accurately to others.	1	2	3	4	5
22	T5	Based on what I learned, I am now more willing to depend on the collaborating organizations to back us up in difficult situations.	1	2	3	4	5
23	T6	Through these exercises, I learned that the participating organizations are ready and willing to offer us assistance and support.	1	2	3	4	5

24	T7	Overall my trust towards the exercise participating organizations increased during the exercises.	1	2	3	4	5
25	T8	The development of trust towards the collaborating organizations is exhibited in their behaviour.	1	2	3	4	5
26	T9	The development of trust towards the collaborating organizations is exhibited in their statements.	1	2	3	4	5

Variables: C = Collaboration, L = Learning, U = Usefulness, T = Trust.

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Collective improvisation in emergency response

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ABSTRACT

Emergencies are characterized by ambiguity and high stress. An emergency response typically involves a blend of public, private, and volunteer organizations. Responding to emergencies requires the capability to face unforeseen incidents and adequately adapt to them. The need for improvisation can be imperative for the success of an operation. Moreover, the interconnected nature of emergencies mandates collaboration, and collective improvisation can be a tool for handling challenges under the extreme complexity of an emergency. In this study, joint training is linked to the capability of collective improvisation in emergency response at an interorganizational level. The aim of this semi-conceptual study is to explore how joint training can improve collective improvisation capability in emergency response. To meet this aim, a literature review and pilot study are conducted. The context of this study is the management of emergency response in the Norwegian Arctic Sea region. The Arctic Sea region has a harsh climate with limited resources where involved organizations include both civil and military organizations, which makes the improvisation even more critical. This study shows that organizational memory, interorganizational trust, interorganizational communication, and information sharing are prerequisites and mediating variables that positively influence collective improvisation. Organizational structure and complex context also influence collective improvisation in emergency response.

1. Introduction

Over the past decade, emergencies have become increasingly transboundary (Pramanik, 2015). Correspondingly, today's emergency response organizations operate in an environment characterized by high risk and uncertainty. A series of incidents, such as the 9/11 attack, transport bombings in Europe, Hurricane Katrina, California wildfires, 22/7 Utøya, the Indian Ocean earthquake and tsunami in 2004, the Costa Concordia sinking, and the cruise ship Viking Sky incident in Norway, have confronted national governments around the world. These unanticipated tragedies have far-reaching and profound effects on society in general and emergency organizations in particular (Wang, 2008). Reducing the magnitude of these effects requires an effective emergency response and continuous interorganizational training. Table 1.

This study focuses on large-scale maritime incidents in the Norwegian Arctic Sea region because maritime activities are generally risky due to potential mechanical failure, natural and human-made disasters, scarce resources, and human error (Nielsen, 1999). The context of the Arctic amplifies the challenge related to the abovementioned factors due to extreme climate and weather conditions, combined with long travel distances and sparsely populated areas. Because of this, Arctic maritime emergency response actions are recognized as particularly challenging jobs that demand highly skilled emergency personnel, including those on board the ships that operate in these areas.

Managing maritime incidents in the Arctic increases the need for collaboration between actors from several preparedness institutions. Complicating variables related to the emergency response include the presence of different formal and informal institutions (Van de Ven & Walker, 1984), cultural differences, and a lack of trust between institutions involved in the international emergency response in the region (Curnin et al., 2015; McConnell & Drennan, 2006; Cohen et al., 1999; Kapucu, 2006). Increased environmental volatility may also call for flexibility in the command structure for improvisation and fast reorganization for successful collaboration (Borch & Batalden, 2014; Turoff et al., 2009). Therefore, the need for the capability to improvise can be one of several important factors besides planning, technical communication, and bilateral agreements for the success of an operation (Mendonça, 2001). Likewise, the interconnected nature of emergencies calls for joint training (Roud & Gausdal, 2019).

The importance of improvisation in emergency management has long been recognized by practitioners and researchers (Dynes, 1994;

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Table 1
Overview of exercises.

Name of exercise	Years	Description
Exercise Nord	2016 to 2019	Exercise Nord by Nord University is an annual full-scale exercise that has taken place for almost 25 years. Every year, the organizers have been able to change the exercise scenario. In 2016, 2018, and 2019, the scenario was an explorer cruise ship dealing with a fire in the engine room and requiring evacuation. In 2017, a terror scenario at the university campus was the topic of the exercise.
SARex Exercise	2016	SARex 2016 was the full-scale exercise in Svalbard connected to testing the implications of the Polar Code on national policies. In addition, practical implications were explored. The goals were to investigate the adequacy of the rescue program required by the Polar Code to study the acceptability of the standard equipment and improve winterization. In addition, the Norwegian Coast Guard personnel were able to share experiences on training for emergency procedures in icy waters with particular reference to evacuation and rescue from cruise ships.

Dynes & Quarantelli, 1976; Frykmer et al., 2018; Kendra & Wachtendorf, 2007; Mendonça, 2001, 2007; Webb & Chevreau, 2006). This debate has been initiated by criticizing the command and control structure, generalized as the appropriate normative model for all emergencies (Dynes & Quarantelli, 1976; Dynes, 1994). Regular joint training sessions between emergency organizations imply that they can learn and develop their capabilities in handling and contributing as a rescue resource in real-life incidents. One of the critical capabilities is to cope with uncertainty and pressure in situations characterized by limited access to resources and information. In areas with scarce resources, such as the Arctic, professional emergency organizations may need to develop stronger improvisation capabilities simply because there are fewer skilled resources available. Therefore, the organizations need to mobilize and rely on less-qualified rescue resources, such as random fishing, cruise, and transportation vessels that are coincidentally in the area. Woods and Hollnagel (2006) found that training and exercises increase the abilities of both professional and nonprofessional organizations to contribute to emergency operations in real situations and to improvise if necessary. Training may help organizations develop and improve their capabilities related to collective improvisation in critical situations.

Although some researchers have studied the concept of improvisation in emergency management (Rerup, 2001; Wachtendorf, 2004), few studies have been concerned with the need for joint training for collective improvisation in emergency response within a high-risk context. This study aims to bridge this gap in understanding through the following research question: *How can joint training improve the collective improvisation capabilities in emergency response?*

A semi-conceptual study is conducted to discuss this question and analyze potential answers. This assessment combines a literature review and exploratory interviews with Norwegian emergency response organizations who have been involved in recent emergency exercises in the Arctic. The conceptual perspective to address and structure the phenomenon of collective improvisation in emergency response situations is "interorganizational collaboration."

This study is organized as follows: after an introductory section (Section 1), Section 2 provides the method, and the literature and propositions are presented in Section 3. Section 4 presents the findings and discussion. Finally, Section 5 contains the concluding remarks and implications.

2. Methods

The quality of the data entry and how it has been consolidated and interpreted influence the credibility of qualitative studies (Graneheim & Lundman, 2004). This study was compiled with a sequence of procedures in order to draw valid inferences from the responses provided by the informants. The overall process is illustrated in Fig. 1.

The first part of this study is a literature review to provide an account of the state of knowledge within the research area of joint training and collective improvisation and connect the study to the broader theoretical picture (Gill & Johnson, 2002). The second part of this study is explorative interviews with civil and military organizations in Norway because the phenomenon of improvisation capability in emergency response is understood within the Arctic sea region. The interviews are primarily used for qualitative data collection for the empirical pilot study. The interviews are complemented with secondary data obtained from Nord University and University of Stavanger in Norway. These secondary sources include evaluation reports of Exercise Nord by the Nord University and SARex Exercise by the University of Stavanger. However, the use of evaluation reports is limited in the study and mainly used as background information.

Although this is not a classical hypothesis-testing study, parts of the literature review have been organized as proposition-developing activities that have been applied abductively to the analysis of the interviews. The purposes of the pilot study and supplementary secondary data are to collectively measure the propositions drawn from the literature review, validate the findings, and evaluate the extent to which the propositions are supported. The combination of multiple sources of data provides a more holistic understanding of the phenomenon, strengthen findings through data triangulation, and enhancing credibility and trustworthiness.

2.1. Empirical data collection

The empirical data were collected during 2016 and 2019 through semi-structured interviews and textual analysis of evaluation reports. The interview data were collected from two main Norwegian organizations that respond to maritime emergencies: the Coast Guard from the tactical level and the civil Joint Rescue Coordination Centre (JRCC) from the operational level. In Norway, these two organizations work together closely during maritime search and rescue operations. Six semi-structured, in-depth interviews were conducted with three Norwegian on-scene coordinators (OSCs) from the Coast Guard and three Norwegian search and rescue mission coordinators (SMCs) from the JRCC. The interview guide for the semi-structured interviews was tested via a pilot study on two informants within the emergency field and then was adjusted. The key informants were selected based on their participation in large-scale Arctic maritime exercises. The source of the secondary data is the evaluation reports on two full-scale exercises that occurred in Norway: Exercise Nord (we followed this annual exercise for four years) from 2016 to 2019, and the Search and Rescue Exercise (SARex) in 2016. The JRCC and Coast Guard took part in these exercises, and the informants are those who participated in the two exercises. The reason for this purposive selection of informants and using evaluation reports only from these two exercises was to ensure that they have some common experience from joint training activities in the Arctic.

Reflection on these two exercises served as a point of departure for the interviews. However, during the interviews, informants were asked to reflect on full-scale, tabletop, and simulation exercises that they have participated in within the Arctic Sea region because the aim of this study was not to analyze particular exercises, such as the Nord or SARex. All interviews were face to face and carried out in English, which is the second language for both parties. Each interview lasted approximately 45 min.

2.2. Data analysis

The literature review was performed via a structured search using the Scopus database. Based on the research question, several keywords

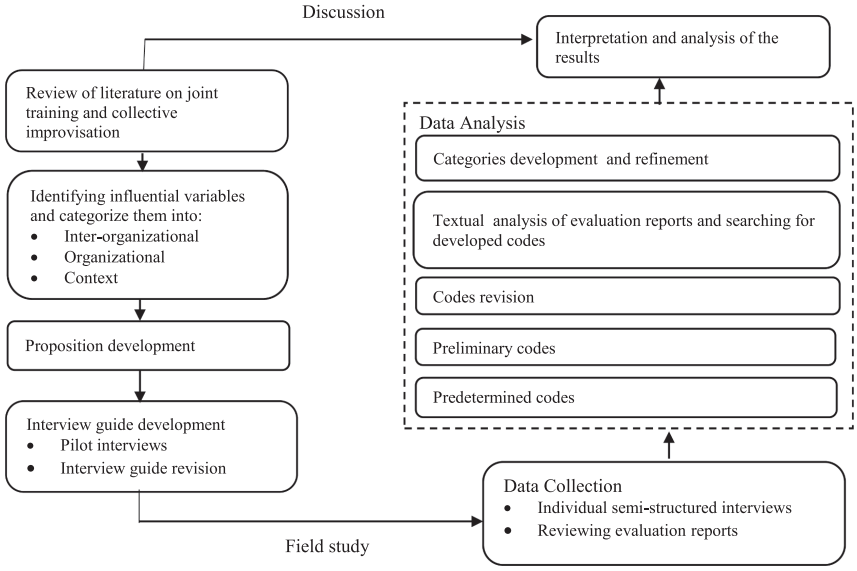

Fig. 1. Methodological approach.

were chosen for search queries. The relevance was based on whether the study covered improvisation as a concept during crises or emergencies and whether it investigated any factors influential on improvisation. Twenty-three studies were identified. Specific influential variables on improvisation were identified from the literature within both organizational and interorganizational studies. The variables were analyzed and categorized deductively under two categories: organizational variables and interorganizational variables. Then, the literature contributions were coded inductively into another category labeled context.

The semi-structured interviews were recorded and transcribed. In order to ensure anonymity and confidentiality of participants, the informants were given codes such as OSC1 or SMC1. The transcribed interviews were first analyzed and coded deductively (Miles et al., 2014) per the interview guide and identified themes from literature review and then were distributed according to the categories. All the findings from the interviews were listed in a table to compare the informants' inputs and the literature (Table 2). Interviews may include "subjective theories," spontaneously mentioned by the interviewees while answering open questions (Flick, 2018). The intention was not to influence the interviewees by asking questions about specific variables that had been identified in the literature but instead to let them discuss their experiences and voice their opinions concerning improvisation in an emergency context. Their responses were then analyzed to determine whether the specific, identified variables were similar to those found in the literature.

3. Literature review

3.1. Collective improvisation

The notion of improvisation arises in varied contexts, and the term "improvisation" has been defined differently within various domains, such as management, music, theater, therapy, and education. Several definitions of improvisation have similar features, such as "just-in-time strategy" (Weick, 1987, p. 229), "real-time composition" (Pressing, 1988, p. 142), "practice without planning" (Embrey et al., 1996, p. 22), creative and spontaneous behavior of managing an unexpected event (Magni et al., 2009), and simultaneous conception and execution (Zheng et al., 2011). In ordinary discourse, the composition of an activity occurs first and is followed by implementation; however, in improvisation, the time gap between these events is narrow so that, in the limited time, composition converges with performance (Moorman & Miner, 1998). Therefore, improvisation is defined as a response to an unexpected or unanticipated situation that is outside the boundaries of organizational preparation (Magni et al., 2009). While other concepts for responding to unexpected situations exist, such as innovation and adaptation, a temporal factor makes improvisation exclusive (Trotter et al., 2013).

Improvisation occurs at multiple levels, and with variable dynamics. This study uses the term "collective" to refer to improvisation at the interorganizational level, which is also the level of analysis. The term "collective" indicates improvisation when more than one actor is involved, and an actor can be either a person from another organization or a group of people from different organizations (Frykmer et al., 2018).

3.2. Importance of collective improvisation in emergency response

One challenging feature of emergencies is their dynamic nature. Although many, if not most, of the emergency cases are similar, emergency responses are nonroutine activities that often require situation-driven behavior in which the involved organizations need to adapt and improvise within the contexts of scarce resources and difficult conditions (Comfort & Kapucu, 2006; Drabek & McEntire, 2003). This adaptation demands creativity, flexibility, and competence to receive, process, and act on orders from external organizations, often referred to as collective improvisation in the literature (Mendonça & Wallace, 2007; Webb, 2004). Although all emergency organizations have their own established procedures and responsibilities, large-scale incidents call for collaboration and joint responses to cope with a demanding situation. Responders may act alone or within *ad hoc* or established organizations, and they might adhere to or depart from their expected roles (Bosworth & Kreps, 1986; Kreps & Bosworth, 1993). The study of improvisation is particularly appropriate in emergency response at different organizational levels in which numerous agencies may need to coordinate their activities to respond effectively (Mendonça & Wallace,

Table 2
Summary of findings.

Variables and propositions	References	Key findings of the pilot study	Supported by pilot study
Role of context Because collective improvisation is more crucial in a complex environment, and joint training positively influences this capability, joint training is more crucial in a complex context.	Mendonça & Wallace (2004), Woltjer et al. (2006), Mendonça & Fiedrich (2006), Van de Walle et al. (2014), Borch & Andreassen (2015), Roud et al. (2016), Roud & Gausdal (2019), Roud and Gausdal (2019)	Complex context requires improvisation. In extreme environments, it is impossible to plan everything. Due to the nature of the emergency response and the vulnerability in an Arctic environment, improvisation is critical. Time constraints in the Arctic are extreme, so improvisation can be a solution for management. It is necessary to constantly train and improvise in harsh environments where survival time is short. The emergency context in the Arctic is life-threatening, so organizations must be prepared and trained regularly. Being capable of improvising must be the focus in complex contexts. Complex contexts require collaboration and collective sense-making because improvisation occurs socially or jointly. Lack of cooperation may hinder collective improvisation. Collaborative training is needed to achieve this. Tailormade training for improvisation is critical to handle challenges.	Supported
Organizational structure Hybrid organizational structures may improve the collective improvisation capabilities in emergency response.	Weick & Roberts (1993), Mendonça & Wallace (2004), Egeberg & Trondal (2009), Ansell et al. (2010), Egeberg (2012), Borch & Batalden (2014), Christensen et al. (2016a)	Different organizations have different hierarchies. Civilian organizations may have a more flexible structure than the military. Improvisation requires a hybrid system to have some structure and flexibility. The structural mechanism that allows responders to decide based on the local situation may tolerate improvisation. Organizations in joint operations need to ensure that they can reconfigure rapidly and generate a new plan to execute. Familiarity with other organizations' structures and decision-making commands helps improvisation emerge. Joint training is necessary, so organizations develop competence on how to act when the structure system changes.	Supported
Organizational memory Organizational memory may mediate the relationship between joint training and collective improvisation capabilities in emergency response.	Moorman & Miner (1997, 1998), Crossan et al. (2005), Vera & Crossan (2005), Mendonça (2007), Størseth et al. (2009)	Logs of exercises and previous incidents should be reviewed to improve improvisation capabilities. Exercises should have clear learning outcomes and be evaluated to determine whether the objectives are met. The trainer should manipulate the factors and evaluate improvised actions or decisions. Improvised actions can be the result of learning. Experience from exercises or real incidents influences future improvisation. Evaluation should be a principal component of exercises. This directly adds to organizational knowledge. If joint training leads to developing new knowledge and competence, then it influences organizational memory. Having a shared database for past exercises and incidents is a proper way to store information in organizations. In seminars and conferences, we share our experience, but there may be a need to store such information properly in the organization.	Partly Supported
Interorganizational trust Interorganizational trust may mediate the relationship between joint training and collective improvisation in emergency response.	Mishra (1996), Lee et al. (2006), Gausdal et al. (2016), Roud et al. (2016), Roud & Gausdal (2019) Christensen et al. (2016b)	Joint exercises can contribute to building trust. Trust is directly linked to reliability, affecting collective improvisation. Trust plays a significant role in emergency management and processing sensitive	Partly Supported

(*continued on next page*)

Table 2 (*continued*)

Variables and propositions	References	Key findings of the pilot study	Supported by pilot study
		information that has a substantial effect on collective improvisation. Too much blind trust may have negative consequences. Some level of control should exist in emergency response. The trust between the individual and their organization and between organizations is a prerequisite for developing collective improvisation capabilities. Experience and face-to-face communication in exercises may help develop interorganizational trust. Having a supportive culture in organizations enables improvisation. Training provides a safe environment for trust development and improvisation. In a trust-based country, such as Norway, improvisation is not sanctioned or interpreted as an error. The trust-based approach potentially increases the accomplishment of improvisation. The physical distance between emergency organizations hinders frequent interaction and trust-building, whereas exercises can contribute to developing a close relationship to overcome the physical distance.	
Interorganizational communication and information sharing Information and communication may mediate the relationship between joint training and collective improvisation in emergency response.	Cooper & Kleinschmidt (1986), Pigeau & McCann (2000), Comfort & Kapucu (2006), Johansson & Hollnagel (2007), Bharosa et al. (2009), Rankin et al. (2013)	Information is critical because incorrect information can have a catastrophic result. Effective communication is the core of successful improvisation. Collective improvisation fails in situations with poor interorganizational communication. Real-time communication is crucial for collective improvisation. Real-time information is vital in complex decision-making.	Supported

Table 2 (*continued*)

Variables and propositions	References	Key findings of the pilot study	Supported by pilot study
		Immediate feedback from the upper level and on-scene is critical for improvisation. The Arctic has limited coverage, so communication in various scenarios in exercises is challenging. Coordinating resources requires stable communication, and in the Arctic, this is a massive obstacle. Familiarity with the communication structure of other organizations facilitates the improvisation process. Exercises and training help overcome communication challenges associated with improvisation. Disseminating and exchanging information in face-to-face meetings during exercises is helpful. Informal contact may lead to smoother and faster improvisation in complex contexts. Informal connections can be established in joint training and programs. Having pre-communication and knowing other organizations facilitates improvisation and prevents compromising response quality.	

2004).

Improvisation can be a matter of survival because, in a dynamic environment, individual and organizational expertise is futile unless it is put to use in creative ways that match situational demands (Rerup, 2001). Even in highly structured organizations, such as the military, improvisation is a well-grounded process that can be leveraged to manage situations where plans, procedures, and methods fail (Ciborra, 1999). Previous literature has highlighted the importance of improvisation and concluded that an emergency with no need for improvisation is probably not a genuine emergency (Kendra & Wachtendorf, 2007). Therefore, improvisation and emergency response are closely related. Without adequate collective improvising, emergency management may lose its flexibility and ability to adapt to the changing environment and, thus, lose its effectiveness (Mendonça, 2007). The outcome of improvisation in this context is survival. Learning by doing is understood as creating or upgrading knowledge, capabilities, and competencies. Improvisation is a capability that fades if it is not exercised regularly (Rerup, 2001).

It is challenging to explore an organization's improvisational capabilities during a real response operation (Rodríguez et al., 2006). Furthermore, it is difficult to document all the experience, human interaction, and human behavior under emergency response circumstances (Killian, 1956). Joint training between organizations is one way to develop improvisational competence and capabilities. Training may be defined as a method for developing knowledge, capabilities, and attitude (Salas & Cannon-Bowers, 2001). Full-scale exercises are one of the methods proposed to study and train for improvisation (Mendonça, 2007; Mendonça & Wallace, 2004; Rodríguez et al., 2006; Trnka et al., 2016; Woltjer et al., 2006). In this study, the term *joint training* refers to tabletop, full-scale, and simulation exercises in which multiple organizations gather and train together to better prepare for emergency response. These are the types of exercises that informants generally reflect on; however, some studies have highlighted the difference between the terms *training* and *exercise* (Green, 2000; Skinner & Hodges, 2006; Bullock et al., 2017; Salas & Cannon-Bowers, 2001; McEntire & Myers, 2004). According to Salas and Cannon-Bowers (2001), *training* has a performance-related purpose with defined needs that may require the individuals and organizations to exercise, whereas *exercise* refers to activities where individuals and organizations develop specialized knowledge, skills, and attitudes to meet training needs (McEntire & Myers, 2004). Nevertheless, in this study, the terms are used interchangeably. Therefore, the proposition (P1) is that *joint training positively influences collective improvisation capabilities in emergency response.*

3.3. Role of context complexity

Organizational theory has treated complexity as a structural variable that characterizes both organizations and their environments. Simon (1996) defined a complex organization as one made up of many parts that have multiple interactions. Likewise, Thompson (2017) described a complex organization as a set of interdependent parts, which together make up a whole that is interdependent with a broader environment. Concerning organizations, Daft (1992) equated complexity with the number of activities or subsystems within the organization.

With respect to the environment, complexity is equated with the number of different items or elements that must be dealt with simultaneously by the organization (Daft, 1992). Njå (1998) asserted that rapid and often unpredictable changes characterize complex environments, whereas Pearson and Clair (1998) claimed that an emergency is a low-probability and high-impact event that threatens the viability and goal of the organization. Although emergency events are unpredictable, they are not unexpected (Massey, 2001).

Large-scale emergency response in the Arctic is considered a complex context. Large-scale incidents, such as a cruise ship sinking, require collaboration between private companies, governmental and local agencies, and volunteers. Therefore, the emphasis of the study is on emergency organizations in the Arctic where multiple organizations operate in a complex environment (Andreassen et al., 2018). The Arctic Sea region has changed in the last century, and the environment has become more complex due to changing ice conditions and an increase in the number of vessels operating there (Borch et al., 2016a; Dalsand & Nese 2016; Kim et al., 2014; Marchenko et al., 2015). This turbulent environment creates high interaction and dependency between actors and activities in the area.

The distinctive characteristics of an emergency in the Arctic makes it unique, and this demands improvisation in emergency response for the following reasons. First, in comparison with other seaways, the Arctic has fewer floating objects (Borch et al., 2016b), and the rarity of maritime incidents in the Arctic limits the chances for learning. Moreover, the time pressure forces the convergence of planning and execution because the survival time in this harsh climate is extremely short. Furthermore, large-scale events have high and broad consequences that are hard to predict; hence, the complexity of events rises. Therefore, interdependencies must be managed among a wide range of physical and social systems. Finally, multiple decision-makers and responding organizations may need to negotiate in the process of responding to the event, which is especially difficult because communication is challenging in remote areas of the Arctic. When more than one Arctic nation is involved, decision-making becomes even more complicated and time-consuming. In emergency response, decision-making challenges are not caused by a lack of planning, but rather develop because, in fact, the major problem in emergency management is that the team often does not exist formally until the emergency occurs (Van De Walle et al., 2014). Consequently, emergencies in the Arctic introduce an acute demand for quick response and resources, and collective action and collaboration are the solutions to access scarce resources (Svedin, 2016). Thus, proficiency in collaboration and collective improvisation can be an effective and efficient way to be more resilient in case of the threat of a large-scale incident in a complex environment. Therefore, the second proposition (P2) is that, *because collective improvisation is more crucial in a complex environment and because joint training can positively influence this capability, joint training is more crucial in the complex context.*

3.4. Organizational structure

Improvising collectively requires an environment that supports creative and spontaneous behavior. Johnstone (2012, p. 118), a theatrical teacher, said, "If I want people to free-associate, then I have to create an environment in which they aren't going to be punished, or in any way held responsible for the things their imagination gives them." Improvisers take signals from their environment and take action with whatever they have at hand (Weick & Roberts, 1993).

An organizational structure is a normative structure composed of rules and roles that specify, more or less clearly, who is expected to do what and how they are expected to do it (Scott & Davis, 2015). Thus, the structure broadly defines the interest and goals to be examined and the considerations and alternatives that should be treated as relevant. Moreover, structure emphasizes how departments are designed and which regulations, policies, and procedures control the activities (Egeberg & Trondal, 2009). Improvisation requires a structure that allows for bottom-up solutions that are sensitive to local conditions rather than imposing top-down rules (Mendonça & Wallace, 2004). Therefore, the organizational structure can influence the environment in a way that provides the opportunity to improvise.

In emergencies, the degree of autonomy of the involved organizations and the quality of the information provided for making major decisions may be crucial. A meaningful vertical relationship exists between central and local authorities that are more frequently faced with practical challenges or the operational side of an emergency (Christensen et al., 2016a). As several organizations are involved in emergency response, an integrated structure is required for all of them. They all have important roles to play in building a resilient society (Parlak & Gunduz, 2015). An emergency underlines the necessity for strong leadership and central control at the strategic level, but an emergency emphasizes the need for local autonomy and flexibility at the operational level. In emergency response in the Arctic, local improvisation may be difficult if central constraints are extreme and allow the local actors only restricted freedom (Christensen et al., 2016a). Thus, local competence, knowledge, and training become crucial factors in the Arctic.

A significant finding in the literature is that emergency management systems should be decentralized at least to some degree, implying that political and administrative executives should facilitate a self-organized response system rather than try to control that system (Ansell et al., 2010; Boin, 2008). Emergency management has many dimensions and layers. The size and abundance of the emergency management layers make it diverse, and many necessary components must be brought together. The multiplicity of components and layers reveals the importance of the mixed structure, called a *hybrid structure* (Parlak & Gunduz, 2015). The common characteristics of a hybrid structure are

independent and generally separate ownership by organizations and individuals, but they execute joint management activities and common services (Moynihan, 2005).

During a large-scale maritime incident, which is characterized by complexity, uncertainty, and ambiguity (Head, 2008), the organizational structure often does not fit the problem structure. Specialization based solely on purpose or specific tasks is not the best solution to transboundary emergencies in general. The high environmental volatility in the Arctic may make the situation even more challenging and calls for dynamic capabilities in the structure for collective improvisation and fast reorganization for further interorganizational collaboration (Borch & Batalden, 2014; Turoff et al., 2009). Accordingly, emergency response may benefit from a loosely coupled organizational structure. Therefore, the third proposition (P3) is that *a hybrid organizational structure may improve collective improvisation capabilities in emergency response.*

3.5. Organizational memory

Organizational memory involves organizational knowledge, capabilities, procedures, and shared assumptions and beliefs (Moorman & Miner, 1997). The literature has emphasized organizational memory —the knowledge stored within an organization, such as routines and prior experience. Organizational memory has been studied within the improvisation concept but, at present, has fallen outside the safety context (Crossan et al., 2005; Moorman & Miner, 1997; Vera & Crossan, 2005). However, both Klein (1993) and Mendonça (2007) related organizational memory to the combined expertise and experience of those in an organization and found a positive relationship with improvisation. Greater expertise provides members of the organization with a larger source of knowledge to draw upon when engaging in pattern recognition and mental simulation. Having a greater pool of events to draw upon increases the likelihood that members of an organization can identify leverage points on which to build improvised solutions. This idea is supported by the recommendation of Størseth et al. (2009) that an organization can prepare for successful improvisation by ensuring members have a wide variety of response options and knowledge on which to base their responses.

According to Moorman and Miner (1997), scholars disagree on whether organizations, similar to humans, store information in memory. However, this may depend on the definition of memory. Thus, it seems that a growing number of scholars (Casey & Olivera, 2011; Moorman & Miner, 1997; Walsh, 1995; Walsh & Ungson, 1991) have realized that organizations reflect the presence of stored knowledge through their processes and physical artifacts. Thus, the nature of the improvisation that can occur is influenced by organizational memory (the past experiences of the groups of actors in the system), and in turn, improvisation modifies that memory. The term "memory" refers to both knowledge stored in nonhuman and human repositories (Crossan et al., 2005). Thus, organizational memory involves expertise and skills that depend on innate cognitive ability and formal and informal training and education (Crossan et al., 2005). Broad and diverse expertise and competence developed via joint training will better prepare the organization to effectively improvise in emergencies (Crossan et al., 2005). The proposition, therefore, aims to incorporate organizational experience and the influence of organizational memory into the relationship between joint training and collective improvisation. Hence, the fourth proposition (P4) is that the *organizational memory level may mediate the relationship between joint training and collective improvisation capabilities in emergency response.*

3.6. Interorganizational trust

Trust is considered a multi-dimensional and dynamic concept (Butler, 1991) and has been defined differently by different scholars. A robust definition of trust with a focus on vulnerability is "the willingness of a party to be vulnerable to the action of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor and control that other party" (Mayer et al., 1995, p. 712). Although this definition was developed at the interpersonal level, it may also work at the interorganizational level because the decision regarding whether to accept vulnerability is made by individuals, even if they do so on behalf of organizations. Mayer et al. (1995) identified three dimensions of trust: ability, benevolence, and integrity. McAllister (1995) distinguished between affective and cognitive-based trust. Similarly, Abrams et al. (2003) distinguished between competence-based and benevolence-based trust. Moreover, Roud and Gausdal (2019) identified that interorganizational cognition-based trust is crucial in emergency response operations. However, their findings did not identify affect-based trust as essential for the response operation (Roud & Gausdal, 2019).

Interorganizational trust is a key factor of collaboration in the context of networks (Gausdal, 2012) and might have the same effect in collective improvisation in emergency response. Trust across sectors and organizations may help the actors to focus on joint problem solving, which allows for improvisation and implementation of new strategies that enhance better performance (Christensen et al., 2016b). Having the capabilities to improvise and devise alternative solutions also helps emergency organizations to manage and respond to incidents better that occur unexpectedly with a low degree of probability and predictability (Torgersen et al., 2013).

The organizations operating in joint emergency response depend on an elaborate body of collective knowledge and diverse skills and have minimal time or no time at all to determine who knows precisely what (Meyerson et al., 1996). The involved organizations function as one temporary collaborative organization under joint command. In such temporary organizations with extreme time pressure, swift trust (Curnin et al., 2015; Meyerson et al., 1996) may emerge. Regarding this, Roud and Gausdal (2019) investigated the concept of swift trust in emergency management exercises and identified that collaborative exercises and training develop trust among involved organizations in the emergency preparedness phase. Thus, joint training can be identified to enhance trust among the involved individuals and organizations (Lee et al., 2006). Because it strengthens interorganizational performance and collaboration (Foulquier & Caron, 2010; Gausdal et al., 2016; Mishra, 1996; Virrantaus et al., 2009; Zucker, 1986), trust is one of the keys to strengthening interorganizational collaboration (Mathieu et al., 2001). On the grounds of substantial uncertainty, a high risk of cognitive and organizational errors (Webb, 1996), and high dependency on other organizations, interorganizational trust is crucially important to improvise collectively to respond to emergencies. Hence, the fifth proposition (P5) is that the *interorganizational trust level may mediate the relationship between joint training and collective improvisation capabilities in emergency response.*

3.7. Interorganizational communication and information exchange

One of the key elements for collective improvisation in emergencies is effective methods of communication (Rankin et al., 2013). Access to information and an appropriate informational infrastructure among emergency organizations in a complex environment is crucial for fast decision-making (Bharosa et al., 2009; Comfort & Kapucu, 2006). The capabilities to coordinate actions and collectively improvise requires well-functioning communication. Organizations experience challenges in a large-scale emergency due to poor communication and unfamiliarity with the communication structure of collaborating organizations (Bharosa et al., 2009). Large-scale emergencies require sharing and coordinating information between numerous autonomous organizations, causing friction in the relief activities (Adrot & Robey, 2008). These findings underline the need for high information quality for the emergency organization. This becomes more critical when response organizations need to take a role for which they lack previous training,

experience, and professional competence (Rankin et al., 2013). During an emergency response, information flows from fixed channels following the chain of command (Boersma et al., 2019). Therefore, the defined roles and functions influence information sharing, and the challenges of information sharing, in turn, influence communication for collective improvisation. Different communication patterns and information systems may hinder collective understanding and may consequently affect collective improvisation in emergency responses (Johansson & Hollnagel, 2007).

Joint training may facilitate communication and resilience, which are essential for collective improvisation in emergencies (Johansson & Hollnagel, 2007). Joint training and exercises may provide a platform for developing communication skills by establishing a common language and professional terminology. Therefore, organizations that need to communicate in future emergencies may obtain a baseline level of literacy in that language and become familiar with each other's communication media and structures (Pigeau & McCann, 2000). Well-practiced organizations that emphasize communication and information may avoid time-consuming mistakes in rapid decision-making in a changing environment (Cooper & Kleinschmidt, 1986). Hence, the sixth proposition (6) is that *the proper communication and information exchange may mediate the relationship between joint training and collective improvisation capabilities in emergency response.*

4. Findings and discussion

The findings from the literature review, interviews, and exercise evaluation reports indicate that, in facing an unexpected event with novel problems, those involved must act quickly. Therefore, improvisational capabilities play a significant role in handling emergencies. Incidents in the Arctic demand decision-making under extreme time constraints. The interviews showed that, after a general discussion on improvisation, almost all referred to the importance and links between training and improvisation capabilities. According to informant SMC1 and SMC3 in Norway: "Even if we have extensive planning, still we have to improvise and train how to improvise in parallel." "In a SAR [search and rescue] operation in the Arctic, it is difficult to have a complete situational report all at once, so improvisation is part of our daily task." A couple of informants mentioned the training aspect of improvisation. Informant OSC3 highlighted, "Even though the improvisation is essential in emergencies, we need proper practice and experience to improvise correctly and not make the situation worse." "In emergency operations, none of the operations is exactly the same as previous ones; that is why we constantly train for more efficient decision making with limited information available."

Nearly all informants agreed that they are not interested in improvisation itself but in the capability to improvise based on a limited analysis, which is crucial. Informant OSC2 asserted, "Before we improvise, we have to able to assess the situation and make sure that our current plan is not applicable; then we can think of improvisation. This is exactly what we need to train for." Following the discussion on the capability to improvise, informant SMC2 said, "In a SAR operation, many actors are involved. Thus, if an organization improvises, the other actors need to be capable of responding and maybe improvise too. This can increase the complexity of the situation." He continued, "That is why we participate in joint exercises to learn how to respond collectively." The interviews revealed that OSCs and SMCs are fully aware of the definition of improvisation and its importance. The findings support Propositions 1 and 2 and show that the informants reflected on joint training and collective improvisation capabilities in the Arctic.

4.1. Organizational structure

The organizational structure and the word "hierarchy" were frequently used by informants, discussing how hierarchy is essential in situations where they must improvise. Informant SMC1 argued, "The nature of our job requires flexibility because each situation is unique, but it all depends on the leader of the operation and the organization in charge, which in Arctic SAR is the Joint Rescue Centre." She continued, "The interdependencies in emergency response where different organizations with their own organizational structure [are] working together, make collective improvisation a real challenge." Informant OSC1 who is usually fully responsible for coordination and decision-making at incident scenes said the following:

I normally execute a predefined task, but in complex situations, the critical decision is taken over by a higher-level organization in a strategic meeting at JRCC. Because a large-scale event is rare and can develop in multiple directions, the organization should develop more flexible plans to be capable of reconfiguring and executing almost simultaneously.

Informants also stated that collective improvisation is dependent on the prior exercises and training that help organizations become familiar with all the hierarchy and decision-making structures of other involved organizations. Informant SMC2 said that, because the emergency response in the Arctic is complex and demanding, organizations could face unpredictable challenges. Therefore, involved actors need to train on how to act if the structure and system change. He said, "We require a system that is not strongly structured because if one component is not at a place, then, the whole organization will collapse. To deal with this, we need a hybrid system, continuous practices, and informal contact." Nevertheless, the need for informal contact as an interplay between formal structure and informal networks might be highly relevant for trust development and interorganizational communication (Lane & Bachmann, 1998; Temby et al., 2017).

The evaluation reports of Exercise Nord revealed that all the organizations had to follow the descriptive scenario based on each organization's plan and procedures without having the opportunity to improvise if needed (Nord, 2016, 2017). Most of the informants agreed that they had to follow the Nord exercise scenario, which was consistent with their organizational structure. Informant SMC3 said, "We understand that we should meet the exercise's objective, but at [the] same time, there is a need for some autonomy both at individual and organizational level[s]. This is more critical in incidents where NGOs [nongovernmental organizations] or private organizations are involved." Further questions were asked about why this is important in collaboration with NGOs, and he continued:

During our collaboration with other governmental organizations like [the] Coast Guard or police, there is a kind of pre-established confidence according to their competence and their familiarity with the strategic structure of communication; however, when it comes to other organizations, we need to be more flexible, especially in the Arctic area, because some local organizations may have more precise knowledge about the area, like fishing vessels. In some cases, they are on scene before [the] Coast Guard, and we need to coordinate and engage them in the operation. That is when we need to have flexibility and, at the same time, follow the major structure."

The evaluation report of SARex showed that the emergency response in the Arctic sea region is very demanding and complicated. A short time of survival and poor communication coverage put extra pressure on emergency organizations. Informant OSC2 addressed these issues as follows:

In [the] case of [a] large-scale incident in the Arctic region, it is not easy to fully follow the command and control structure. We need to exercise more in a realistic environment to practice coordination and improvisation in [a] joint response. Therefore, it is very important for us to have flexibility that enables us to improvise. But this doesn't mean we don't need structure; otherwise, collaboration will turn out to be chaos. The balance of having structure and flexibility can improve our response efficiency as well.

The findings from this section support the critical influence of organizational structure in improvisation in general and collective improvisation in particular. The findings are in line to a large degree

with the literature presented before. Therefore, the pilot study supports Proposition 3.

4.2. Organizational memory

Almost all the informants suggested that improvisation is somehow grounded in organizational memory. Informant OSC3 said, "I can see the link between learning and memory clearly, yet this learning from training or real incidents needs to be encoded into organizational memory. Otherwise, there is no point in training for improvisation." Similarly, informant OSC1 highlighted, "Having a systematic way of storing the logs and evaluations of exercises where all the involved organizations have access can be a solution to collectively improvise in the future and prepare for [a] joint response." Therefore, it can be argued that knowledge stored in organizational memory from the past can be recombined by actors in present or future improvisation. Exercise evaluations were the focus of some of the interviews, and the informants constantly discussed the role of evaluations after exercises. Informant SMC1 said, "Developing improvisation capability needs proper training, but training without detailed evaluation is useless. Not everyone can participate in large exercises that happen once a year, so all the evaluation should be stored in an organization."

Informant SMC3 emphasized that training is not necessarily useful for collective improvisation. He said:

Joint exercises without clear learning outcomes and objectives, this is a waste of money and time. We need tailormade exercises with improvisation in the center, and all the participants should be fully aware of it. Apart from the individual benefit, organizations should learn the most out of exercises to develop organizational and interorganizational improvisation capability.

Informant OSC1 argued that, under stressful conditions, mutual understanding is the core of improvisation. He said:

In a high workload situation where several organizations are working together, only the response team who can anticipate the other's needs and can adapt to changing situations will be successful. If organizations have this awareness coupled with the knowledge of actors' competence area stored in memory, then they have a decent system for collective improvisation. This is one of the reasons that the Coast Guard exercises a lot with JRCC to have [a] better understanding.

The findings of this study are similar to the outcome of two studies that investigated the link and relationship between training, memory, and improvisation (Miner et al., 2001; Vera & Crossan, 2005). The informants discussed learning as more than a memory. The findings also revealed the significant role of rational leadership in an emergency, which means that actors permit different people to take the lead depending on the needs of the situation (Liang et al., 1995). Joint training will lead to developing the competence to work together smoothly and to improvise collectively. People who have been trained together face less need for planning and have greater cooperation, fewer misunderstandings, and less confusion in a situation where they need to improvise collectively (Liang et al., 1995). The findings of this section partly support Proposition 4.

4.3. Interorganizational trust

Informants addressed the need for and development of trust between organizations. Some informants agreed that trust is directly connected to reliability. Informant OSC2 argued, "Trust plays a significant role in emergency management and processing the sensitive information that has a high impact on complex situations." Similarly, informant OSC3 said, "Who to trust in an unfamiliar setting, let's say in [a] large-scale emergency response, is not easy [to determine], but trust is a prerequisite for ad hoc decision-making." Likewise, informant SMC3 said, "The safest data is the one I see with my own eyes or from a trusted party." Pre-existing relationships and good collaboration seem to go hand in hand. This tenet is illustrated by informant OSC1 who said, "The better we know each other, the easier the collaboration will be." "In emergencies, multiple professional organizations are working closely, and in Norway, we trust each other, so collectively improvising is all right and well accepted, while this might not be the case in an international operation." Informant OSC2 said:

Improvisation has a lot to do with how much your organization trusts you and how much you trust the organization. This is the same when we work with JRCC. We have a good connection and working relationship. I am not sure how it should be with a stranger organization if we don't have prior experience with them. I have a direct number to call in JRCC when I am in need. We already had much training together and established a trustworthy relation.

All informants agreed that improvisation requires organizations to support improvisers, and that is how collective improvisation can be successful. Informant SMC3 mentioned, "Our organization is backing us for improvisation, but we have to keep in mind that our improvised decision should not cause harm to anyone." He continued, "Continuous training can be a good solution by providing a safe environment to practice improvisation and develop mutual understanding between the collaborating organizations." Informant SMC3 said, "Participations in recurrent exercises can facilitate the process of trust-building; this is what I experienced after taking a part in Nord exercises for three years." Reviewing the evaluation report of Exercise Nord showed that less time was used, at least in the planning phase, in 2018, which might be due to the establishment of mutual understanding between the actors after several years.

Several informants emphasized the value of joint training and claimed that it is very practical and useful for trust development and future emergencies. Informant SMC1 said, "In the Arctic, the number of huge incidents is limited, meaning the organizations don't have enough experience. Training and exercises between organizations is a good platform to gain experience and meet each other. This gives us a better perspective on other organizations' competence." Some asserted that tabletop exercises might be more useful for trust development because participants sit in a small group and discuss issues without time stress. Informant OSC3 said, "Frequent interaction and exercises influence our level of trust, both personal and organizational. That helps us to share the report and documents more freely." Overall, the informants agreed that trusting relationships and not feeling like strangers were very beneficial in collaboration and particularly in joint decision-making and improvisation. The findings in this section explain the role of trust in collective improvisation and trust development during exercises. The informants did not explicitly focus on collective improvisation but more on individual improvisation. Nonetheless, the finding partly supports Proposition 5.

4.4. Interorganizational communications and information exchange

All informants have addressed the importance of communication and information exchange. Informant OSC2 said, "Most of our decisions are made based on the information we get, so in [the] case of wrong input, we will have catastrophic results in response. Regardless of the need for improvisation, communication and time are the core in emergency operations." Informant SMC2 said, "Improvisation may fail or suffer due to poor communication between organizations and involved personnel." Most of the informants agreed that time is crucial, and real-time information plays a critical role. They expressed that having real-time information can facilitate their decisions in a complex situation and lead to adequate improvisation. Informant SMC3 emphasized, "Immediate updates from the scene can guide me when I should deviate from our standard routine and improvise; also, I need quick feedback based on our improvised action from a higher level of command." Following his statement, others also refer to the real-time factor of receiving information. Informant OSC2 said the following:

In the Arctic, communication is not as smooth as in the Mediterranean. In some areas around Svalbard, communication is extremely poor,

and we need to improvise a lot, but we need to remember that JRCC and other actors need to know what we are doing. So, this poor communication can sometimes create serious problems for those coordinating the resources and other vessels operating in the incident area. It's not easy to decide whether you should improvise or not without [a] proper communication channel.

Several informants agreed that training and exercises could facilitate handling communication and information challenges. The majority claimed that feedback helps to develop competence and act on time accordingly. Informant SMC2 said, "Informal contact is very useful for further information exchange and dissemination. One effective way to establish such contact is participating in collaborative exercises where you actually meet people face to face." A couple of informants (OSC1 and OSC3) discussed the role of informal communication: "Norway is not a big country, and I know the key people in the field; however, improvisation is not always happening in formal form; most of the time, it is a combination of formal and informal ways of communication." "The informal communication and relationship can be developed in joint activities such as exercises, seminars, and conferences." Informant SMC1 partly described the role of training and communication in developing improvisation capability: "Because improvisation in emergency response is happening in a collective setting, improvisers must learn and practice how to communicate and share information within the group to the upper level in a way that they don't compromise the response quality." Reviewing the evaluation reports of Nord exercise from 2016 to 2019 revealed that participating organizations used less time on establishing communication channel and making decisions in 2019 comparing to 2016. This might be due to their annual participation in Nord exercise, which facilitated fast decision-making and may possibly lead to adequate improvisation. This is in line with the findings from interviews.

The findings from interviews confirmed the significance of communication and information exchange in collective improvisation during emergency response. Moreover, these findings highlighted the role of informal communication, which is not covered in the theory presented in this study. However, this can be intricately linked to the influence of trust in collective improvisation. The findings identified that the familiarity with the communication technology of other organizations and the structure of information flow are particularly important for collective improvisation. Therefore, Proposition 6 is supported by the pilot study. An outline of the main findings from the literature and the pilot study about how collective improvisation capability is influenced by joint training is provided in Table 2.

5. Conclusion

This study addressed the challenges and highlighted the importance of collective improvisation capabilities in emergency response. The aim of this study was to explore how joint training can influence collective improvisation capabilities, which was accomplished by drawing upon the literature on emergency management, improvisation, organizational factors, and the role of context. Some aspects of the relationship between joint training and collective improvisation, such as interorganizational trust, interorganizational communication, information exchange, and organizational structure, are identified and considered to be matters that may influence collective improvisation. The findings of the pilot study suggested that organizational memory, interorganizational trust, interorganizational communication, and information exchange are mediator variables. Complex contexts and the organizational structure are independent variables that may influence collective improvisation capabilities. Based on the preliminary findings and the literature, a conceptual model is proposed to illustrate the relationships in Fig. 2.

This study highlighted that the maritime emergency response in the Arctic is more challenging than the emergency response on the mainland. This is due to harsh weather conditions, long travel distances, the lack of communication infrastructure, and limited resources that may subsequently increase the risk of emergency operations in the Arctic sea region compared to the mainland. These contextual challenges, among others, may lead to slow information flow between the involved organization, requiring the involved actors to make decisions and take action based on the limited available information. Collective improvisation in large-scale Arctic Sea emergencies is critical, particularly given their unique contextual challenges. The study has theoretical and practical implications. The theoretical implications include the novel framework indicating how collective improvisation is influenced by joint training, context, and organizational structure. Moreover, the six developed propositions contribute to emergency management and training theories. Practical implications include the acknowledgment of the joint training influencing improvisation capabilities in emergency response and the emphasis on training to improve response team collaboration and performance. While training and exercises are vital tools in all high-risk contexts, the infrequency of maritime incidents makes such practice particularly important in the Arctic.

The study has some limitations. The existing literature on collective improvisation is scarce, and the empirical sample is quite small and did not include some key personnel in the response operation. The interviews were in English, which is the second language of both the interviewer and informants. Moreover, the semi-structured interviews show a lack of standardization for the data-collection process. Norway is considered a high-trust country (Newton, 2001); thus, the data from the pilot study may not be applicable in a low-trust country. There are considerable possibilities for future research. The results from this study are limited in scope and must be corroborated in further studies. The relationships proposed in the basic model must be tested. Each factor that affects collective improvisation requires further qualitative exploration. In this study, the effects and differences between collaboration patterns among professional emergency responders and nonprofessional responders in exercises were not considered. Ideally, a multiple case study from public, private, and volunteer organizations would be preferable to confirm and test the framework. Future research can consider these factors in study design.

This study focused on specific relationships between the chosen

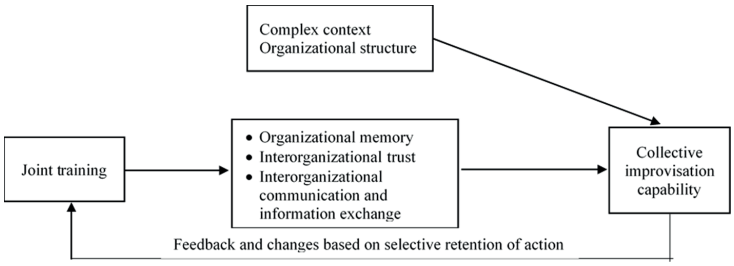

Fig. 2. Conceptual model.

variable, but there might be more relationships between variables. For example, organizational structure and context may influence joint training. Another example is that organizational structure may influence interorganizational trust. These assumptions could offer new approaches for further research.

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The Role of Joint Training in Inter-organizational Collaboration in Emergency Management

Emergency management is a developing discipline. Its significance is steadily increasing as the world becomes more globalized and complex. Emergency situations usually overwhelm local capacity, and it may necessitate national or international levels of assistance. Responding to an emergency situation is challenging given that its consequences are hard to anticipate and because it requires intensive collaboration between multiple organizations and agencies involved in every/ different level (s) of management. Responding to such emergencies can thus depend significantly on effective inter-organizational collaboration. Joint training between emergency organizations is found to minimize the difficulties encountered in inter-organizational collaboration. To understand this connection, this thesis examines how joint training can improve inter-organizational collaboration in emergency management. A case study of the Arctic Sea region is conducted to address this overarching research question.

This thesis consists of an introductory part and four research articles. Utilizing both quantitative and qualitative methods, the thesis delves into different mechanisms underpinning the relationship between joint training and the improvement of inter-organizational collaboration. This is presented across four research articles that offer conceptual and theoretical contributions. The thesis concludes that trust, collaborative learning, and improvisation capability are important elements in the process of improving inter-organizational collaboration in emergency management.

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