Team Decision Making in the Emergency Units: Exploring the Relevance of Checklists and Expertise

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Abstract

Operational commanders have to collaborate across emergency units and make several time-critical decisions in order to quickly and effectively handle emergency incidents. The purpose of this study was to empirically test whether a domain-specific joint checklist and a theoretical team decision-making model were able to account for reflections shared by operational commanders regarding decision-making in Incident Command Post (ICP). Based on a mixed models design, semi-structured interviews were first conducted with 17 operational commanders from the three emergency units in Oslo and the surrounding districts in south-east Norway. The interviews were then unitized into 1626 statements and coded into categories in the FORSTÅTT checklist (Vigerust, Andersen & Vollebæk, 2009) and the Intuitive team Decision Making (ITD) model (Kline, 2005). The results indicate that neither of these two models could account completely for reflections shared by operational commanders on decision-making in ICP. The two models combined could account for 86.6% of all the statements. A thematic analysis of the statements not captured by either models uncovered six themes relevant to decision-making. An alternative model combining the two models and the residual themes was suggested. This study contributes to an increased understanding of which elements affect the decision-making process in ICP, and has both theoretical and practical implications.

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Emergency incidents today are caused by accidental system failures and intentional man-made acts, such as terrorism. Modern society functions as a socio-technical system, with several connected and interdependent social (human behavior) and technical (e.g. complex infrastructure) elements (Fredholm & Göransson, 2010). Emergency incidents are inevitable in complex sociotechnical systems, as the systems are too intricate and tightly coupled to be able to prevent all types of accidents with catastrophic potential outcomes (Amalberti, 2001; Perrow, 1999). In addition to such accidents, society is vulnerable when it comes to intentional acts of terrorism, as was the case in Oslo and Utøya the summer of 2011. Both system failures and intentional terrorism are emergency incidents which can cause harm to either human beings, property, nature or all three (Slovic & Weber, 2002), and are characterized by a surprise element, lack of control, time-pressure, insecurity, and lack of information (Dekker, 2002; Vicente, 1999; Politidirektoratet, 2011). The three emergency units, that primarily operate separate of each other, have to collaborate in order to handle the consequences of such emergency incidents.

The management of complex incidents puts several requirements on the decision-making skills of the people in charge (Crichton, Lauche, & Flin, 2008). In Norway, these are primarily the operational commanders from the three emergency units. They have to make several decisions together which affect how well the response is executed during an emergency response. The decision-makers need to diagnose, consult, decide, delegate and monitor the situation with limited information, under shifting conditions and extreme time-pressure (Flin, 1996). The decisions have to be made in order to minimize the damages on human lives, property, nature or all three, all the while considering the other leaders' tasks and goals. The demanding contextual factors are accompanied by society's greater demands on the emergency response units to effectively handle the emergency incident (Fredholm & Göransson, 2010). Even with standard operating procedures to guide their decisions, the complexity of such incidents makes it nearly impossible to form a procedure for every eventuality. Therefore, a better understanding of what mechanisms affect the decision-making process in such emergency incidents is needed. In addition, the laws and regulations that affect the operational commanders' decisions and collaboration in the Norwegian context have to be taken in consideration. Next, the thesis with central elements will be outlined.

This thesis will be structured as follows. First, a brief introduction of the Norwegian emergency response will be outlined in order to understand how the emergency units collaborate to handle an incident. Then, a practical inter-agency checklist (FORSTÅTT) for incident management will be described. This is a standard operating procedure which has been developed so that the operational commanders have a better basis for making the necessary decisions (Flin, 1996). However, it is important for decision-makers not only to know what decisions have to be made, but also what mechanism affect their decision-making abilities to ensure quick and effective decision-making (Rasmussen, 1997). A theoretical understanding of how experience and knowledge guide decision-making in these teams of operational commanders might give a better basis for optimizing the decision-making process. Therefore, a psychological perspective on the role of expertise in team decision-making in natural environments will be depicted next. Finally, how the domain-specific checklist and a theoretical decision-making model might complement each other will be summarized, and then tested empirically.

The Norwegian Emergency Response Service

The following section will describe how the emergency response service is organized in Norway. The Norwegian Emergency Response Service (Redningstjenesten) is an integrated set of services based on collaboration between government agencies, voluntary organizations and private enterprise (st.meld. nr. 22 (2007-2008), 2012). The services are coordinated by the Ministry of Justice and Public Security, with help from the Directorate for Civil Protection and Emergency Planning (DSB). The Norwegian Emergency Response Service is maintained through two main rescue centers (HRS) on the national level and 28 local rescue centers (LRS) responsible for emergency response in their respective police districts (st.meld. nr. 22 (2007-2008), 2012).

The police, the emergency medical service and the fire and rescue service are the main parties involved in handling emergency incidents, even though the emergency response is a collaborative effort. All three emergency units are required to participate in the emergency response with available and appropriate resources (st.meld. nr. 86 (1961-1962), 2012). They all have as number one priority to save lives, even though they handle different areas of the emergency response (Politidirektoratet, 2011; Vigerust, Andersen, & Vollebæk, 2009). To ensure an efficient emergency response when the three emergency services cooperate on site, they form an incident command team which coordinates the three emergency units' efforts.

The Incident Command Post (ICP) is formed on the incident site during emergency responses that require efforts from all three emergency units (Politidirektoratet, 2011). It is led by the incident commander from the police, and usually consists of the operational commander from the emergency medical service and operational commander from the fire and rescue service, together with other relevant stakeholders. They share common goals and have distinct roles which are determined by their agency, rank and type of incident (Smith & Dowell, 2000). Although the incident commander is responsible for organizing, leading and coordinating the work at the incident site (Politiloven, 1995), he or she does not have the mandate to manage the professional work of the other emergency units. The emergency medical service, coordinated by their operational commander, is responsible for the health-related efforts, including health care assessments, prioritizing, treatment and patient transport (Prehospital divisjon, 2007). The fire and rescue service, led by their operational commander, is mainly responsible for the technical incident management and security at the incident site (Brann- og eksplosjonsvernloven, 2002). The operational commanders have to keep in contact with the operational level, represented by the operations commander of their respective dispatch centers. The decisions made by the operational commanders in ICP have to be rooted in the overall strategies of the operation. The operations commander will be supported by a staff and replaced as the leader of the operational level by a chief of staff during larger rescue operations (see Politidirektoratet, 2011). The emergency units may require more resources to handle emergency incidents, and may call on resources from voluntary organizations, the Civil Defense guard and the Norwegian Armed Forces, among others (Ministry of Justice and Police, 1999).

The role of operational commander differs in Oslo and the districts, even though the organization of Incident Command Post is common throughout Norway. Operational commanders in Oslo have this position as a permanent role, while the operational commanders in the districts have this role as an “ad hoc” position. This means that that they can be called upon to function as operational commanders by the strategic level if a given incident escalates.

The Norwegian emergency response is mainly led by operational commanders from the three emergency units, who together establish the Incident Command Post. The Incident Command is an interdependent team which needs to coordinate their separate operations in order to efficiently manage the emergency incident. Next, a practical, joint checklist will be introduced, to see how it may assist operational commanders when they make decisions in ICP.

A Practical Perspective: FORSTÅTT

Vigerust and colleagues (2009) introduce FORSTÅTT, a joint checklist for the three emergency units developed by the Norwegian Air Ambulance. To maintain control of the incident management in time-constrained situations, each operational commander should work with the same plan in mind, and know what actions are appropriate. The FORSTÅTT checklist is a standard operating procedure which lists items that need to be remembered and followed by the operational commanders when they coordinate their work at an incident (Vigerust, et al., 2009). These types of domain-specific checklists can assist operational commanders when they make decisions (Flin, 1996). This checklist is depicted together with an outline of the six emergency phases of an incident. Both the FORSTÅTT checklist and the emergency phases are based on the police and emergency medical service's original operative procedures, PBS (Politidirektoratet, 2011) and MOM (Prehospital divisjon, 2007). Vigerust and colleagues (2009) emphasize that it is important for the operational commanders to have an understanding of the emergency phases to know which steps to follow in the checklist (see Figure 1), ie. which decisions have to be made, and when. Therefore, the emergency response phases will first be outlined, followed by a review of the FORSTÅTT checklist.

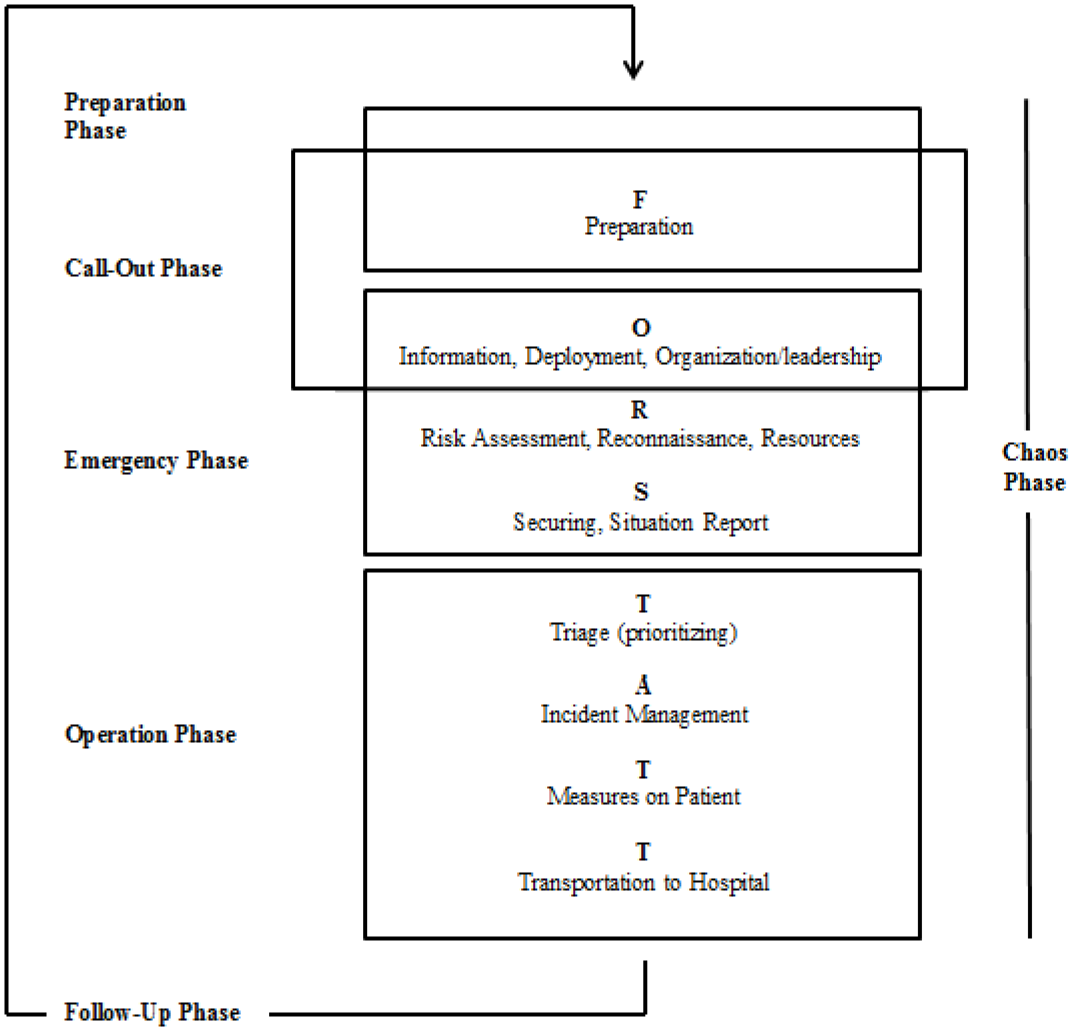

Figure 1. An illustration of how the emergency response phases and the FORSTÅTT checklist interact, based on Vigerust and colleagues (2009).

The Emergency Response Phases

Vigerust and colleagues (2009) first outlined a set of six phases that constitute the emergency response, which now will be described. The preparation phase through the follow-up phase is described as a linear process. The *preparation phase* includes all relevant knowledge of resources, procedures and roles that the operational commander has obtained throughout their lives up to an emergency incident is reported. The more each individual reads, participates in training, and discusses with others, the more prepared he or she will be. The *call-out phase* starts when the emergency incident is reported and the alarm is set off, and concludes when the emergency units have arrived at the incident. In this phase it is important to obtain as much information about the incident as possible. The *emergency phase* starts as soon as they have arrived at the incident, and lasts until leadership has been established and they have gained a good overview of the situation, the crew has been dispersed and the rescue work has been initiated. The *operation phase* is characterized by the the emergency units having a good overview of the situation and sufficient resources at hand, or at least on the way. Communication with the medical dispatch center is important in this phase, to better disperse the patients to the hospital. The *follow-up phase* starts when medical work on site is over and other tasks are being finalized in order to quickly return to preparedness and thus be ready to handle other emergency incidents. Criminal investigation, debriefs, and food and rest are included in this phase.

As can be seen in Figure 1, the first five phases follow each other in chronological order. On the other hand, the *chaos phase*, as defined by Vigerust and colleagues (2009), is the uncertain element which can occur at any time during the operation, when something unexpected happens. This may result in chaos and stress for the operational staff involved. The more experience and training the operational commander has, the better equipped he or she is to get out of this phase.

With this knowledge of the emergency response phases, Vigerust and colleagues (2009) propose that the operational commanders are better equipped to know which steps in the FORSTÅTT checklist are appropriate to implement at a given time during the emergency response.

The FORSTÅTT Checklist

Vigerust and colleagues (2009) introduce the FORSTÅTT checklist after giving an outline of the emergency response phases. Just like the emergency phases, the FORSTÅTT checklist outlines the elements in chronological order. Therefore, the FORSTÅTT checklist has to be followed in light of the present emergency response phase (see Figure 1).

The FORSTÅTT checklist is comprised of eight items which will be described in the following section. First, *preparation (F)* includes being prepared for all types of events by using existing professional knowledge and experience. It comprises knowledge of existing equipment and resources, taking weather conditions and environment into account and considering safety issues. Also, the operational commanders must formulate plans and strategies for further performance through established standard operating procedures. It is also important to establish contact with the other leaders in ICP.

Second, *information, deployment, and organization/management (O)* involves gathering and providing information and details en-route to the incident. Also, it is important to think big and request sufficient resources. On the way to the incident, it is important to communicate with the dispatch center. A deployment plan must be followed, which must include the appropriate placement of vehicles and resources, and ensuring an escape route. The ICP and other management functions must be established. Finally, it is crucial to communicate clearly in the initial phase of the operation.

Third, the *R* stands for *risk assessment, reconnaissance and resources.* It is essential to make a risk and safety assessment for oneself and others, as well as to obtain an overview of the situation. The operational commanders must do a reconnaissance together with the operational commanders and other possible leaders in ICP to understand each other's needs and not lose contact. A proactive resource assessment is crucial in order to acquire enough resources for the present situation and future. Other emergency units and stakeholders must be alerted in due time, keeping in mind their response time.

Fourth, *securing and situation report (S)* includes ensuring the safety of oneself and personnel, and securing against present and future threats. It is important to consider future aspects and be pro-active, not reactive and incident driven. The operational commanders must also remember to give and receive good, accurate and time-critical information, and adjust resources if needed.

Fifth, *T* stands for *triage (prioritizing).* Patients must be prioritized so that everybody gets the appropriate treatment in the right order at the right time. Priorities of the operation must follow the order of life first, then environment and critical assets (Politidirektoratet, 2011). A clearly stated prioritization has been found to be crucial in order to ensure an effective emergency response (Thévenaz & Resodihardjo, 2010).

Sixth, during *incident management (Å),* the emergency units must continue with the operative work at the incident (Vigerust, et al., 2009). It is important to maintain a good overview of the situation, with clear roles and responsibilities. Communication, coordination and control are key words. Also, handling the media is part of incident management.

Seventh, the second *T* stands for *measures on patients.* Ensuring life-saving measures is the main priority for all agencies (Politidirektoratet, 2011). After the triage, all who are affected must be given physical and psychological first aid (Vigerust, et al., 2009).

The final *T* stands for *transport to the hospital*. It is important to start the transportation of critical patients to the hospital as soon as possible. The medical dispatch center must be contacted regarding the transportation. Here, it is also important to establish collaboration between the patient assembly area and the evacuation control point.

The FORSTÅTT checklist is a tool which aims to facilitate the operational commanders' ability to handle an emergency incident. However, it has its limitations. Next, a critical view of the FORSTÅTT checklist will be presented.

Limitations of the FORSTÅTT Checklist

The FORSTÅTT checklist can mainly be criticized on two aspects: what elements are included in the checklist, and the fact that it is a prescriptive, linear model. First, the checklist was developed to outline tasks which were relevant for all the three emergency units when handling an emergency incident. However, the three T's in FORSTÅTT include tasks which are mainly carried out by *one* of the emergency units, the emergency medical services. Even though the main focus of the checklist is to better coordination in order to *save lives*, it does not seem appropriate to include tasks that are not equally relevant to all three emergency units in a joint checklist.

Second, FORSTÅTT is described as a linear and prescriptive checklist. It outlines the different steps the operational commander must go through in order to efficiently handle an incident, but it does not state how these steps relate to each other. Even if they do list the emergency phases as a supplement tool to guide the use of the checklist, they do not state what processes in the phases affect the execution of the steps. It is common for practical procedures and checklists to be formulated as linear models, without an overview of the relationship between its elements (Rasmussen, 1997). While this simple outline can be easily remembered and thus be a good starting point for handling an incident (Crichton, 2003), it does not draw a complete picture of an emergency incident. Linear checklists give a simplified and rational view of reality (Hollnagel, Nemeth, & Dekker, 2008), and do not reflect the complexity of incidents in dynamic contexts (Perrow, 1999). In conclusion, even though FORSTÅTT is a practical checklist which may support decision-making, it is limited by what elements it includes and the fact that it is a linear model.

FORSTÅTT is a joint checklist, and such checklists may guide decision-making and prevent stalling (Flin, 1996). However, people's ability to make sound decisions based on the checklists is dependent on contextual factors as well as their experience from past events (Crichton, 2003; Rasmussen, 1997). The fact that decisions have to be made together in the team also requires the team members to come to an agreement. An outline of Naturalistic Decision Making will follow, with special attention on research context and units of analysis, in order to put the model in the context of psychological research on decision making.

A Theoretical Perspective: Naturalistic Decision Making

Decision making is described as "the process of reaching a judgment or choosing an option, sometimes called course of action, to meet the needs of a given situation" (Flin, O'Connor, & Crichton, 2008, p. 41). There has been a development in how to understand the process of decision-making in psychological research. Early decision-making research focused on normative and prescriptive theories of decision-making (Lipshitz, Klein, Orasanu, & Salas, 2001; Rasmussen, 1997; Vicente, 1999). Later, a descriptive approach entered the field of decision-making research where the focus shifted from how decision-making should be done to how decision-making was actually done.

Within this descriptive approach there is another division, between the Heuristics and Biases (HB) approach (Tversky & Kahneman, 1974) and the Naturalistic Decision Making (NDM) (Lipshitz, et al., 2001) approach. They vary both when it comes to research purpose and research setting (Kahneman & Klein, 2009). The HB paradigm describes decision-making in laboratories under controlled circumstances. They describe how decision-makers are prone to make errors because of different heuristics and biases, and therefore seek to study decision-making by comparing it to a given norm (e.g. Tversky & Kahneman, 1974).On the other hand, NDM researchers are more interested in studying expert decision-making behavior in their natural environments, that usually are complex, dynamic and time constrained (Omodei & Wearing, 1995). When making decisions in such dynamic and uncertain contexts, there is no one, optimal solution (Shanteau, 2001).

Expertise has been found to be essential in order to make decisions in uncertain contexts (Kahneman & Klein, 2009). Even though the central characteristics of expertise are debated, researchers nonetheless agree that expertise is context-bound and domain-specific (Cellier, Eyrolle, & Marine, 1997; Farrington-Darby & Wilson, 2006). Expertise is characterized by a high ability of skill and/or and knowledge within a domain (Salas, Rosen, & DiazGranados, 2010). Operational commanders can be characterized as experts in their specific emergency units. Even though experts often deliberate when they make decisions, they also make expertise-based intuitive decisions which do not occur on a conscious, analytical level (Klein, Calderwood, & MacGregor, 1989; Lipshitz & Strauss, 1997; Salas, et al., 2010). Expertise-based intuition, also called recognition-primed decision-making (Kahneman & Klein, 2009), is the rapid, automatic generation of single decision options, rooted in extensive domain-specific knowledge and the recognition of patterns from past events (Salas, et al., 2010). Novices are not able to make these skilled judgments because these judgments are based on extensive knowledge and experience. Expertise-based intuitive decisions allow experts to make faster decisions, rather than comparing several alternatives, in contexts characterized by time-constraints (Lipshitz, et al., 2001). A description of naturalistic decision-making and how individual experts can make skilled intuitive decisions has been described. In the following, the NDM paradigm’s research on teams will be introduced so as to understand how a *group* of experts can make intuitive judgments together.

Research on naturalistic decision-making has also been conducted on real teams performing real tasks in real settings (Kline, 2005; Lipshitz, et al., 2001; Salas, et al., 2010). There is an increased dependency on teams in both organizations and the emergency domain as the complexity of work places increases. A team is defined as two or more individuals who are interdependent and must cooperate and adapt to each other in order to accomplish a mission (Salas, Cooke, & Rosen, 2008). The NDM paradigm focuses on which processes characterize team decision-making, and how team members communicate and coordinate information between each other (Lipshitz, et al., 2001). In contrast with individual decision-making, routine team decision-making cycles are longer and more time-consuming (Ellis & Fisher, 1994) because information on the team level usually is processed through communication between the team members (Salas, et al., 2008). Expertise is essential in order to bypass the routine team decision-making processes (Kline, 2005). The following decision-making model illustrates what role experience and knowledge plays when expert teams make rapid and intuitive decisions in natural settings. It will be introduced in order to better understand what processes affect operational commanders when they make intuitive decisions together in ICP.

Intuitive Team Decision Making

The Intuitive Team Decision Making (ITD) model is a naturalistic team decision making model which focuses on what processes characterize intuitive team decision making. It is based on studies of coherent expert teams from an organizational context (Kline, 2005). In order to speed up the decision-making process, Kline (2005) proposes that team decision-making processes sometimes do not follow the routine decision-making process, but are made rapidly and intuitively by the team as a whole.

Certain contextual and team variables have to be present in order for the intuitive team decision-making process to function. Situations that are characterized by uncertainty, limited "facts", and time pressure, among others (Agor, 1989), puts a pressure on the teams' decision-making process in organizations, which again promote intuitive team decision making. Second, certain characteristics of an expert team also affect the intuitive decision-making process, enabling them to make skilled intuitive decisions. This is illustrated in Figure 2. In the following, the expert team and its characteristics will be described in order to understand what mechanism affect the intuitive team decision-making process.

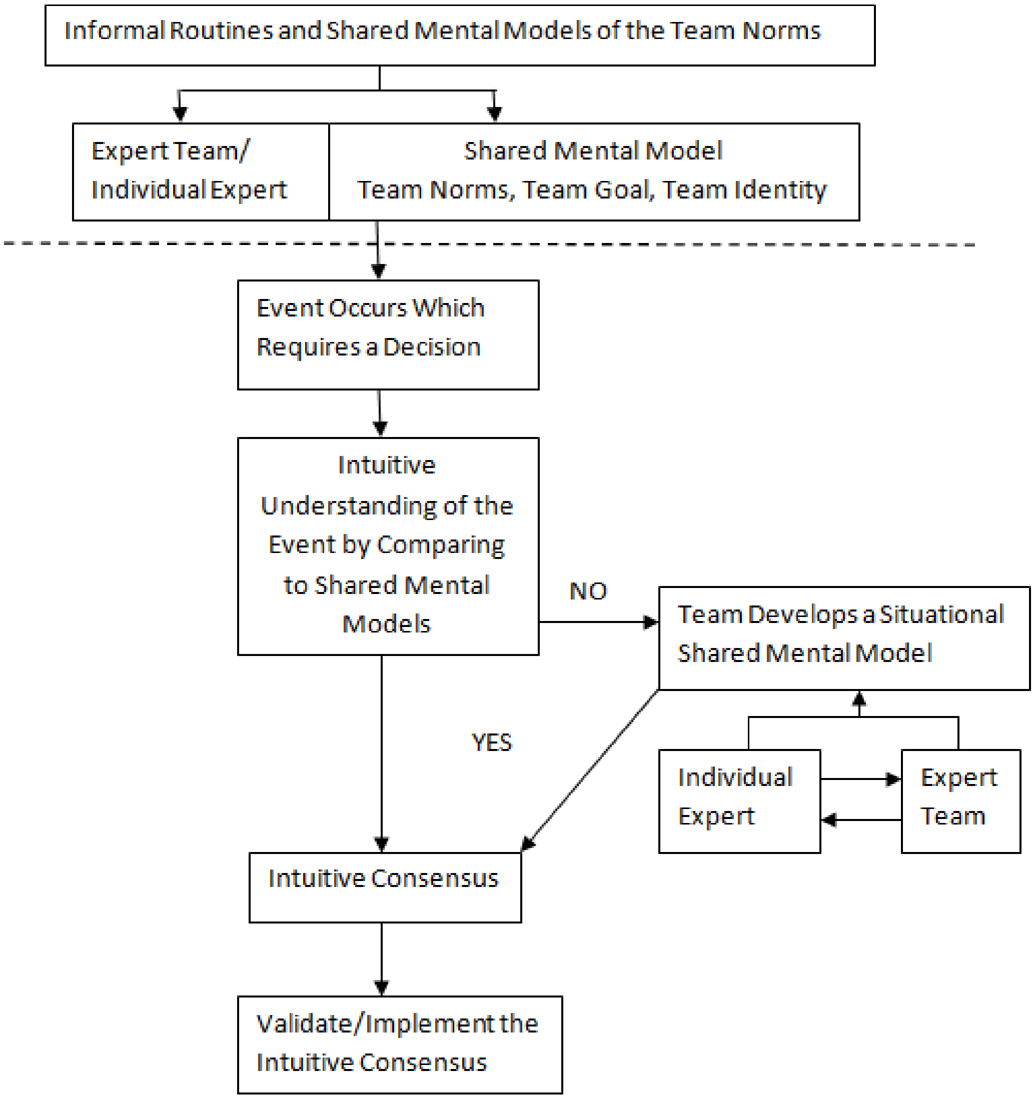

Figure 2. An illustration of the Intuitive Team Decision Making process, based on Kline (2005).

The team has to be an expert team in order for teams to make intuitive decisions. A team becomes an expert team when all individuals in the team are considered experts, ie. have broad domain-specific knowledge and experience. Expert teams operate fairly independently, but know their role in the organization. They also share a common goal and are able to reach consensus on most decisions (Kline, 2005). Teams tend to develop shared mental models, described as shared knowledge and expectations between the team members, which create a similar understanding of a situation, guide how team members interact, and facilitate decision-making (Cannon-Bowers & Salas, 2001; Mohammed, Klimoski, & Rentsch, 2000). Stout, Cannon-Bowers, Salas and Milanovich (1999) found that teams which possess shared mental models are better at coordinating, communicating and planning, which again improved their team performance. All shared mental models are developed through communication and shared experiences within the team (Salas, et al., 2010). However, scholars argue that it is important to distinguish between shared mental models which are shaped by the team's past experience and knowledge (ie. schemata), and shared mental models which they develop together in a given situation, because they are two different constructs (Flin, 1996; Kline, 2005; Lipshitz & Shaul, 1997). The first kind of shared mental model is strengthened through informal procedures, such as discussing scenarios and asking for advice (Kline, 2005; Salas, et al., 2010), and through training and job experience (Flin, 1996). Kline's (2005) ITD model includes shared mental models of team goals, team identity and team norms. The other kind of shared mental model, the *situational* shared mental model, is created by the expert team when the team members share information to better understand a specific situation (Lipshitz & Shaul, 1997). Characteristics of an expert team, and the difference between two types of shared mental models, have been described. The decision-making process will be presented next so as to see how the two types of shared mental models come into play when the team has to make a decision.

In the following, the intuitive team decision-making process will be outlined. For an illustration of the process, see Figure 2. The team compares the situation with the information in their shared mental models when they have to make a decision (Kline, 2005). If they recognize relevant patterns or characteristics in the situation, the team is able to implicitly coordinate their activities (Flin, 1996), and "implicitly knows the solution and is able to reach intuitive consensus" (Kline, 2005, p. 172). However, in natural environments, experts almost always have to make decisions based on limited information (Lipshitz & Shaul, 1997), which leads to separate interpretations of the situation. Therefore, if the team experts are uncertain or have differing views, they develop a shared mental model of the situation by suggesting alternative courses of action and sharing relevant expertise (Salas, et al., 2010). When the appropriate course of action is suggested, the team immediately agrees (Kline, 2005). Information shared by the most knowledgeable or experienced team members are perceived as more salient. The team members validate the decision after it is taken, to one another and others, by collecting more information that supports their decision after it is made (Agor, 1989). Simultaneously, they plan how the decision will be implemented (Kline, 2005). In conclusion, under uncertain and time-constrained conditions, the expert team uses both their past shared mental models as well as new shared metal models created by the experts in a given incident to make intuitive decisions.

This model was based on studies of expert teams in an organizational setting. In the following, parallels will be drawn between the ITD model and another NDM model developed in the emergency response domain. This will be done so as to show the relevance of the ITD model for describing team decision-making in the emergency response domain.

The Recognition-Primed Decision-Making Model

There are several characteristics shared between the ITD model and the most widely recognized NDM model, the Recognition-Primed Decision Making model (Klein, Calderwood, & Clinton-Cirocco, 1986). The RPD model is based on a study of firefighters and how they make decisions. The study found that firefighters mainly made recognition-primed decisions (RPD): “decisions for which alternatives are directly derived from a recognition of critical information and prior knowledge”(Klein, et al., 1989, p. 463) This model has been tested on expert chess players, stock market brokers and nurses, and found that 80-95% of the decisions made were recognition-primed decisions. Lipshitz and Shaul (1997) found that several NDM models bear a strong resemblance to the RPD model. Therefore, they adapted the RPD model by substituting the recognition process with schemata (past experience and knowledge which form mental models) and mental models (specific representations of situations). Thus, the ITD model may be seen as an alternative RPD model, on the team level. The ITD model was seen as more appropriate for the study of the operational commanders making decisions together in ICP because the RPD model focuses on the individual decision-maker.

In conclusion, the Naturalistic Decision Making paradigm seeks to describe and improve decision-making in real settings (Salas & Klein, 2001). The main focus in these studies is on expertise and how it affects decision-making in the real world characterized by time constrains and uncertainty. People that have expertise, in the form of knowledge and experience, can make skilled intuitive decisions because they recognize patterns from past events (Kahneman & Klein, 2009). Even though much focus has been devoted to studying individual experts, research has also been done on expert teams (Lipshitz, et al., 2001). The Intuitive Team Decision Making model illustrates how expert teams use shared mental models to make intuitive decisions in contexts characterized by uncertainty and time-constraints (Kline, 2005). In order to see whether a theoretical and practical model describe different aspects of team decision making, how the ITD model and the FORSTÅTT checklist differ will be discussed.

Checklists and Expertise

This paper has introduced examples of complex emergency incidents which emergency units have to handle together. The purpose of this study is not to uncover elements that may prevent such incidents from happening, but to gain a better understanding of which factors may prevent or facilitate the emergency units' ability handle such emergency incidents. An overview of how the Norwegian Emergency Response is organized was first depicted in order to understand how the three emergency units collaborate on an emergency incident in Norway. Then, both a domain-specific checklist and a theoretical model were introduced in order see what aspects of decision-making in ICP they could describe.

The two models seem to cover different aspects of decision-making. The FORSTÅTT checklist outlines domain-specific tasks which operational commanders need to follow when making decisions in ICP, while the ITD model illustrates how contextual factors and team characteristics affect the decision-making process in teams. The checklist may ensure that operational commanders do not hesitate in implementing the necessary actions to handle a time-constrained incident, but it does not show *how* the complexity of incidents and team characteristics may affect the decision-making process. The ITD model does not account for domain-specific tasks, but it describes how an expert team is able to make fast, intuitive decisions during non-routine incidents, based on their collective expertise and affected by time constraints and uncertainty. A better insight into all factors which affect decision-making is needed in order to improve decision-making in ICP.

This section has described a domain-specific checklist and theoretical team decision-making model. The next section depicts how these two models will be tested in the emergency response domain.

The Present Study

The purpose of this study is to empirically test whether model a domain-specific checklist and a descriptive decision-making model can account for reflections shared by operational commanders regarding decision-making in Incident Command Post. The present study is an exploratory, case study of operational commanders from the emergency units in Oslo and the surrounding districts in south-east Norway. It uses a mixed-models design, by first collecting data qualitatively, then unitizing and coding the statements according to the given models, and finally analyzing the results quantitatively. The quantitative analysis will center on statements and their fit into either two models. The semi-structured interviews were formulated with exploratory, open-ended questions based on the SWOT framework (Helms &

Nixon, 2010), which probed reflections on the topic decision-making without leading the participants in any specific direction.

As previously mentioned, the domain-specific checklist FORSTÅTT and the theoretical decision-making model ITD both contain elements which might be relevant for decision-making. Vigerust and colleagues (2009) argue that the domain-specific FORSTÅTT checklist outlines relevant tasks that have to be completed by the three emergency units in order to ensure an efficient incident management. If the checklist accounts for the same topics that the operational commanders find relevant in relation to decision making in ICP, this model should capture the majority of statements generated from the interviews. The following null-hypothesis will test this notion:

H0-1: There will be no significant difference between the number of statements captured by the FORSTÅTT checklist and the total amount of statements from the interviews.

According to Kline (2005), the Intuitive Team Decision Making model described central elements in team decision-making. If intuitive decisions are central in ICP, the model should account for the majority of statements formulated in response to the interview questions. Thus, the following null-hypothesis will be tested.

H0-2: There will be no significant difference between the number of statements covered by the Intuitive Team Decision Making (ITD) model and the total amount of statements from the interviews.

As previously discussed, the FORSTÅTT checklist outlines what domain-specific tasks have to be completed during incident management, while the ITD model describes the processes which characterize intuitive team decision-making. Therefore, they might cover different aspects of decision-making in ICP. Consequently, if neither of these frameworks/models are able to account for the majority of reflections on decision-making in ICP, they might be able to complement each other and capture most of the statements together. The following null-hypothesis will explore this notion.

H0-3: There will be no significant difference between the number of statements covered by the FORSTÅTT checklist and the ITD model combined and the total number of statements from the interviews.

Even though the two models are hypothesized to cover the majority of statements, the operational commanders might reflect upon issues not relevant to decision-making in ICP. Therefore, the following hypothesis is formulated.

H-R: Residual statements covered by neither the FORSTÅTT checklist nor the ITD model will not contain any statements relevant to decision making in CP.

Method

The Research Project

This thesis was written for SINTEF and is part of a four year long (start date April 1st, 2011) EU-funded project called BRIDGE. BRIDGE (http://www.bridgeproject.eu) seeks to bridge resources and agencies across European countries to better interoperability during large scale emergencies. They seek to develop methods and technology to improve national and European cooperation. Data was collected by the three master students from the Institute of Psychology, at the University of Oslo, for the BRIDGE project, but will result in three different master theses.

Understanding the Domain and Choice of Participants

Participants for this thesis were chosen after reviewing relevant documents, participating in workshops with emergency personnel, and performing field observations. Operative manuals which are relevant to the emergency units, such as the police's PBS I (Politidirektoratet, 2011), the emergency medical service' MOM (Prehospital divisjon, 2007), and the information brochure about the Norwegian Search and Rescue Service (Ministry of Justice and Police, 1999), were reviewed, in addition to relevant laws and regulations (Brann- og eksplosjonsvernloven, 2002; NOU 2001:31; Politiloven, 1995; St.meld. nr. 22 (2007-2008), 2012; St.meld. nr. 86 (1961-1962), 2012). This was done in order to achieve a better understanding of the emergency units and how they operate. Next, BRIDGE hosted a workshop with emergency unit personnel. The workshop revealed central roles and responsibilities in the emergency units and gave a better understanding of work in ICP. Participation in this workshop formed the basis for choosing operational commanders from the three emergency units as participants in this study. Thereafter, after participating in an international oil-spill exercise (BOILEX 2011, https://www.msb.se/boilex) in Nynäshamn, Sweden, a better understanding of inter-agency collaboration was achieved. Finally, field observations were conducted by joining an operational commander from the emergency medical services in Oslo at work as visiting students. Field notes were taken and audio was recorded to get a better understanding of how operational commanders function on a day to day basis.

Participants. Seventeen operational leaders from the emergency units in Oslo (n = 7) and the surrounding districts in south-east Norway (n = 10) were recruited and interviewed. Six of these were incident commanders (innsatsleder) from the police department, five were operational commanders (operativ leder helse) from the emergency medical service, and six were operational commanders (fagleder brann) from the fire and rescue service. All had experience with collaboration in ICP, and had an average of 11.5 years (R = 2 – 33) of experience as operational commanders. Their overall experience from their respective units was averaged at 22. 6 years (R = 13 – 34). All the participants were male. Their ages ranged from 36 to 60 years (M = 47.7).

The interviews were conducted between the 7th of November and the 14th of December, 2011. The interviews lasted on average 30 min and 7 s (R = 18 min 14 s – 44 min 38 s, SD = 8 min 5 sec).

Mixed Model Design

The thesis used a mixed model design (Johnson & Onwuegbuzie, 2004; Lund, 2012; Tashakkori & Teddlie, 1998), collecting qualitative data and then unitizing it into quantifiable units in order to analyze the data statistically. First, data was gathered using open-ended, exploratory questions in order to uncover the participants' view of a particular topic in a context-specific setting (Kvale, 1996; Patton, 2002), in this instance decision making in ICP. Second, the interviews were transcribed and unitized into quantifiable units using content analysis (Krippendorff, 2004; Neuendorf, 2002; Weber, 1990). Third, the units of text were coded into separate categories in an established practical (FORSTÅTT) and theoretical (ITD) framework. Finally, the quantification of the interviews made it possible to run statistical analysis in order to test the given hypotheses (Lund, 2012).

Qualitative Data Gathering Procedure

Preparing for the interview. All the interviews were conducted using the PEACE interview technique (Clarke & Milne, 2001), after having gone through a 35 hours long interview course. A pilot interview was conducted of a volunteer with operative background from the military fire services, with one interviewer and two observers present. An information sheet explaining the background for the project, what questions would be asked at the interview, and included information on how the interview would be conducted was sent to the participants before meeting them. The information sheet is included in Appendix A.

Conducting the interview. The three master students conducted all the interviews, but only two were present at each interview. One asked the questions, while the other observed and asked potential follow-up questions. The interviews took place at a location of the participant's choice, usually at their work place. The participants were given a short introduction to the study, and were informed that the audio from the interview would be recorded. They were then asked to sign a consent form (see Appendix B) before the interview was initiated.

The interview guide was developed using the SWOT framework (Dyson, 2004), a semi-structured interview technique where open-ended questions about *Strengths, Weaknesses, Opportunities and Threats* are asked concerning a certain topic. Within the framework lies a positive/negative and present/future dimension. The answers given by the participants were not influenced by any theory, as the framework is theory-neutral and the questions asked were open-ended (Helms & Nixon, 2010). For further information on SWOT, see (Helms & Nixon, 2010).

The following questions were asked*:*

What strengths do you see in the way you make decisions in ICP today?

What weaknesses do you see in the way you make decisions in ICP today?

What opportunities do you see for making better decisions in ICP in the future?

What threats do you see that may affect the way you make decisions in ICP in the future?

The questions encompass the necessary information of who (operational commanders), what (decision making) and where (ICP) to frame the questions enough so that a context is set for the participant. The questions were asked in the same manner at all interviews, with supplementary questions such as "Can you tell me more about.." , and "You mentioned…, can you elaborate on that?" (Kvale, 1996). These are content-free, generic follow-up questions which do not cue the participant into answering something rather than other (Patton, 2002). The complete interview guide is enclosed in Appendix C.

Two sets of questions were asked during each interview session. To avoid a priming effect, we asked one set of questions before the other set for half of the interviews, and vice versa. In between the two sets of questions we had a 10 minute break. If the participant had mentioned something of interest at the former interview, we encouraged him or her to elaborate on it in the latter interview.

Data Manipulation and Content Analysis

Transcription. The interviews were recorded and then transcribed verbatim by the master student who was an observer at the given interview. Hesitations were transcribed (ie. “eeh..”), but laughter, coughing and similar verbal expressions were not. As Flick (2009) notes, it is only necessary to transcribe as much and as exact as to give added value to answering the research question. The audio records were replayed until the transcribed interviews matched the recordings word for word.

Unitizing. The transcribed interviews were unitized into quantifiable units of text, using content analysis (Neuendorf, 2002). The transcribed interviews were unitized into three different units of data collection (Neuendorf, 2002): meaningful statements (Hoff et al., 2009), example statements and junk statements.

Meaningful statements were defined as “as large as is meaningful (adding to their validity) and as small as is feasible (adding to their reliability)” (Krippendorff, 2004, p. 102). When there was a thematic shift, or nuances within a specific theme, these were unitized as separate meaningful statements. These units of text varied in length, from half a sentence to several sentences long. It was important to avoid large portions of text as units, as these would be more difficult to code and contain a greater variety of topics (Weber, 1990).

On the other hand, if a theme was exemplified or elaborated, without adding any new meaning, the unit of text was unitized as an example unit. These units were connected to meaningful statements to give them more clarity, functioning as context units. Parts of sentences were also sometimes replicated and used to represent the context unit of several meaningful statements. As Krippendorf (2004) noted, as long as the recording units are different, i.e. the same meaning is not replicated, context units can be used to describe several recording units.

Finally, the meaningful statements and example units were imported to SPSS in chronological order, to retain the reconstructability of the interviews. This strengthens the validity of the subsequent coding, as the focus on what context gave rise to the data, i.e. the participants’ answers, is maintained (Krippendorff, 2004). Statements that were clearly not related to the topic decision-making in ICP, and words that were mere fillers at the beginning or end of statements and example units (ie. “Eeh” and “But you see that..”) were unitized as junk statements, and omitted from the analysis (Flick, 2009).

A procedure was agreed upon by the unitizers and followed in order to strengthen the reproducibility of the resulting unitized interviews (Krippendorff, 2004; Neuendorf, 2002; Weber, 1990) and can be found in Appendix D.

Unitizing reliability. To ensure reproducibility of the unitizing process (Weber, 1990), inter-judge reliability of unitizing was assessed. As Neuendorf (2002, p. 141) stated, “given that a goal of content analysis is to identify and record relatively objective (or at least inter-subjective) characteristics of messages, reliability is paramount. Without the establishment of reliability, content analysis measures are useless”. To ensure consistent units, one interview was unitized by all three students, and tested for inter-judge reliability of unitizing early in the unitizing process. This test was based on Zarghooni’s (2011) adaption of Boyatzis’ (1998) percentage of agreement of presence (P.A.P.), to account for inter-judge reliability of unitizing between two unitizers. However, it was modified in order to account for the inter-judge reliability between three unitizers. This was done by calculating the inter-judge reliability between student A and B, student A and C and student B and C, and then adding the three results together and calculating the mean value. After three repetitions of this process, the resulting inter-judge reliability of unitizing stabilized at 68 %. For further description of inter-judge reliability for unitizing, see Zarghooni (2011).

Coding. The statements were coded according to the FORSTÅTT checklist and ITD model in SPSS. In the FORSTÅTT checklist, each statement was coded in only one category in the checklist. All the categories were considered value free, so both positive and negative statements were coded into the given category. If the statement did not fit a category, it was coded as a residual. The emergency response phases were taken into considerations when coding the statements in the FORSTÅTT checklist. The operationalization of the FORSTÅTT categories can be found in Appendix E. The ITD model was divided into three parts based on the understanding of the model. The ITD model encompasses categories which are either part of the actual decision-making process, elements which are characteristics of the team or elements which characterize the context. They were divided into three parts because the team and context characteristics are constant elements and affect the decision-making process in separate ways. Each statement was coded in only one category in each one of the three parts of the model. One statement could thus either: (a) be coded in a category in one part of the model, and as a residual in the two others, (b) be coded in a category in two parts of the model and as a residual in the final one, or (c) be coded as a residual in all three parts of the model. When analyzing the results, though, a statement was only valid as one hit on the ITD model, regardless of whether the statement was coded in one, two, or three parts of the model. All the categories were considered value free, except for some categories in the context part of the ITD model.

The example statements were not coded, and thus excluded from the analysis. The statements from one interview were coded on the FORSTÅTT categories together with the other master students in order to ensure a common understanding of the different categories. The rest of the statements were coded without this support into the FORSTÅTT categories. All the statements were coded according to the ITD model, and later recoded when a better understanding of the categories and overview of the material was achieved. The coding scheme for the different variables in the ITD model can be found in Appendix F.

Statistical and Thematic Analysis

Two types of analysis were performed in order to analyze the coded statements and thus test the hypotheses.

First, the coded statements on ITD and FORSTÅTT formed the basis for further statistical analysis. The statements were aggregated on a subject level (N = 17) before further analysis in SPSS. Descriptive statistics such as frequency, standard deviation, median and range were performed in order to describe the data set, while inferential statistics, in the form of several paired sample t-tests, were carried out in order to test the hypotheses. The effect size was calculated (Field, 2009) and evaluated using Cohen's d (1988) to assess the magnitude of the results. A Bonferroni adjustment was considered because more than one statistical test was performed, to decrease the chance of producing a type I error. However, while it decreases the probability for type I error, it simultaneously increases the probability of a type II error (Perneger, 1998). In order to avoid this, the Bonferroni adjustment was not administered. Instead, what statistical tests were done and why will be described in detail to ensure verifiable results (Perneger, 1998).

Second, a thematic analysis of the residual statements, statements coded as residuals in both the ITD model and the FORSTÅTT checklist, was done in order to see if there were any statements relevant to decision-making not covered by the models. Similar to the SWOT framework, a thematic analysis seeks to describe patterns of meaning within qualitative data, independent of any theoretical framework (Braun & Clarke, 2006). The focus of the analysis was on semantic themes discovered in the residuals, and not any implied meaning. For a description of the thematic analysis process, see Braun and Clarke (2006).

Ethical Considerations

Following the terror attacks in Norway the summer of 2011, there has been considerable focus on the preparedness of the emergency units. In order to not interfere with the official 22nd of July committee, SINTEF has been in contact with the committee with regards to the BRDIGE project. SINTEF was also granted permission from the Norwegian Social Science Data Services (NSD) to gather and store data connected to the BRIDGE project (project number 28066). These permissions apply to data gathering for this thesis as well, as it is connected to the BRIDGE project.

It was ensured that the participants were treated with respect, and that their integrity was preserved, in accordance with the Norwegian Work Environment Act. Prior to the interviews, the participants were informed that the audio recordings from the interviews, as well as the transcribed interviews, were confidential, only to be shared with other members of the BRIDGE team. They were also informed that the data would remain anonymous, and could not be traced back to any single participant. Finally, the participants were notitified that the study was voluntary, and that they could withdraw from it at any time. If this were the case, all data would be deleted, as far as was possible. The information sheet can be found in Appendix A, and the voluntary consent form in Appendix B.

Results

The purpose of the study was to test whether the ITD model and the FORSTÅTT checklist would capture the majority of statements, both separately and together. Also, the purpose was to study whether the residuals contained no themes which were relevant to decision-making in ICP.

Descriptive Statistics

The interviews (N = 17) concerning decision making in ICP were divided into 2258 units of text. Of these, 632 (28%) were example statements which were omitted from the analysis. The remaining 1626 meaningful statements (M = 95.65, SD = 29.87) were coded in the FORSTÅTT and ITD categories and aggregated on subject level (N = 17), and serve as the basis for further analysis.

FORSTÅTT. As seen in Table 1, the FORSTÅTT checklist captured 1075 statements, 66.1 % of the total amount of statements. Although all categories in the FORSTÅTT checklist were touched upon, *preparation* captured most of the statements (27.2 %), while *triage* (n = 25), *measures on patient* (n = 5) and *transportation to hospital* (n = 7) captured the fewest.

Table 1

Frequency of Statements in the FORSTÅTT Checklist

	M	*SD*	Frequency n %
Preparation	26.06	11.84	443 (27.2 %)
Information, deployment & organization/management	5.94	3.91	101 (6.2 %)
Risk assessment, reconnaissance & resources	9.82	5.36	167 (10.3 %)
Securing & situation report	12.12	8.89	206 (12.7 %)
Triage (prioritizing)	1.47	1.55	25 (1.5 %)
Incident management	7.12	3.62	121 (7.4 %)
Measures on patient	0.29	0.59	5 (0.3 %)
Transportation to hospital	0.41	1.00	7 (0.4 %)
Total FORSTÅTT	63.24	22.15	1075 (66.1 %)
Residual	32.41	11.34	551 (33.9 %)
Total	95.71	29.88	1626 (100%)

Note. *N* = 17, *M* = Mean, *SD* = Standard Deviation, *R* = Range.

ITD. Referring to Table 2, the ITD model captured 1127 statements, 69.3 % of the total amount of statements (*M* = 66.29, *SD* = 21.30). Part one of the model, the ITD process, captured 369 statements, 32.7 % of the total amount of statements (*M* = 21.71, *SD* = 10.61), with the category s*ituation shared mental model* covering the highest amount (*n* = 156), and *decision event* (*n* = 33) capturing the fewest amount of statements. The second part of the model, ITD background, covered 854 statements, 52.5 % of the total amount of statements (*M* = 50.24, *SD* = 19.99). Therein the e*xpert team* category captured most statements (*n* = 435), while *informal routines* (*n* = 53) captured the fewest. The third part of the model, ITD context, captured 364 statements, 32.4 % of the total amount of statements (*M* = 21.41, *SD* = 10.04), with *limited facts* (*n* = 78) and *uncertainty and risk* (*n* = 73) covering the highest amount of the statements. Out of all the categories in the ITD model, *alternative solutions* was the one which accounted for the least number of statements (*n* = 7). Although some categories captured more statements than others, Table 1 shows that all categories were touched upon.

Table 2

Frequency of Statements in the Three Parts of the Intuitive Team Decision Making (ITD) Model

ITD model		*M*	*SD*	Sum n %
1. ITD process	Decision event	1.94	2.01	33 (2 %)
	Intuitive understanding	2.35	2.94	40 (2.5 %)
	Situation SMM	9.18	5.67	156 (9.6 %)
	Intuitive consensus	2.71	2.76	46 (2.8 %)
	Validate/implement decision	5.53	3.02	94 (5.8 %)
	Total	21.71	10.62	369 (32.7 %)
	Residual	74.94	24.20	1257 (77.3 %)
2. ITD background	Informal routines	3.12	3.72	53 (3.3 %)
	Expert team	25.59	11.83	435 (26.8 %)
	SMM of team norms	4.41	2.72	75 (4.6 %)
	SMM of team goals	10.18	6.64	173 (10.6 %)
	SMM of team identity	6.94	5.15	118 (7.3 %)
	Total	50.24	19.99	854 (52.5 %)
	Residual	45.41	19.09	772 (47.5 %)
3. ITD context	Uncertainty and risk	4.29	3.95	73 (4.5 %)
	Little previous precedent	2.59	1.58	44 (2.7 %)
	Unpredictable variables	1.35	2.32	23 (1.4 %)
	Limited “facts”	4.59	4.30	78 (4.8 %)
	Ambiguous “facts”	0.59	0.80	10 (0.6 %)
	Time pressure	3.41	3.54	58 (3.6 %)
	Alternative solutions	0.41	0.87	7 (0.4 %)
	New trends	4.18	3.21	71 (4.4 %)
	Total	21.41	10.04	364 (32.4 %)
	Residual	74.24	23.24	1262 (77.6 %)
ITD total	Total	66.29	21.30	1127 (69.3 %)
	Residual			499 (30.7 %)

Note. *N* = 17, *M* = Mean, *SD* = Standard Deviation, *R* = Range.
ITD = Intuitive Team Decision Making, ITD process = the decision-making process, ITD background = the team’s background variables, ITD context = variables in the context which affect the usefulness of intuitive decisions.

As seen in the Venn-diagram in Figure 3, the different parts of the ITD model overlapped. The ITD process overlapped 252 statements with the ITD background part (S1 = 252), and shared 106 statements with the ITD context part (S3 = 106). The ITD context part overlapped 169 statements with the ITD background part (S2 = 169), and shared 106 statements with the ITD process part (F3 = 106). On its own, the ITD background part covered 500 statements of the total amount of statement covered by the ITD model (U2 = 500), while 78 statements where solely covered by the ITD process part of the model (U1 = 78), and 156 statements where uniquely captured by the ITD context part (U3 = 156).

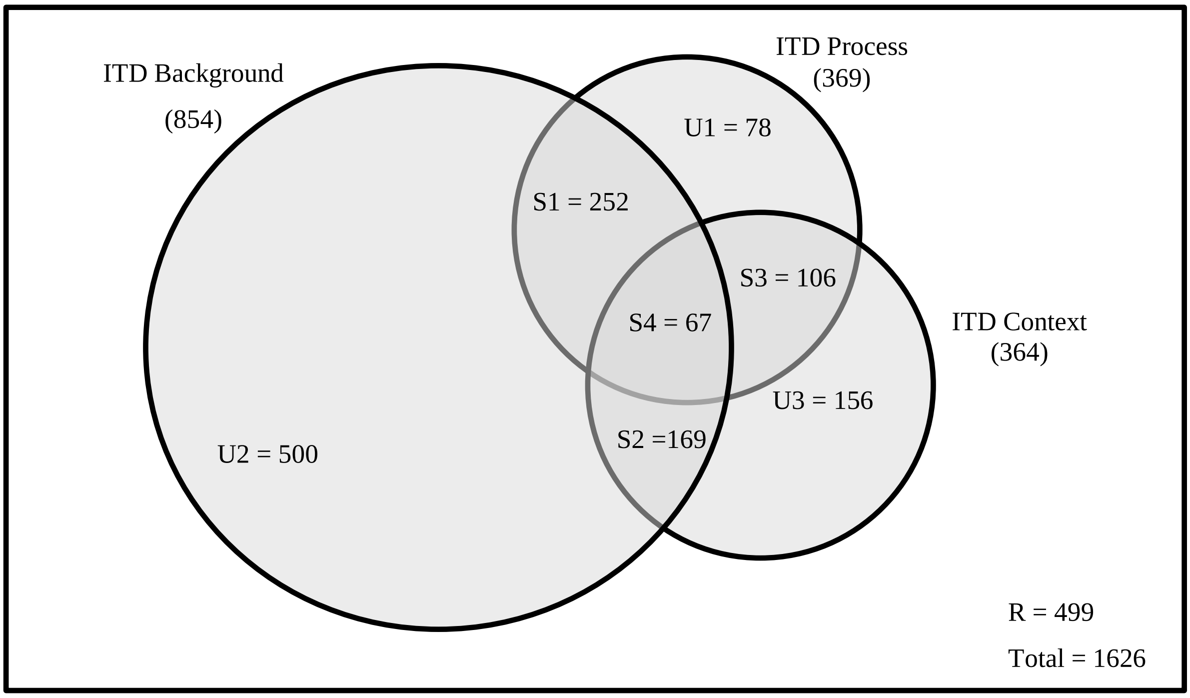

Figure 3. Illustrating the overlap between the three parts of the ITD model

Note. ITD = Intuitive Team Decision Making, ITD process = the decision-making process, ITD background = the team's background variables, ITD context = variables in the context which affect the usefulness of intuitive decisions. S = Shared statements covered by two or three of the parts, U = Unique statements covered by the given part, R = Residual statements not covered by the ITD model.

FORSTÅTT and ITD Combined. As listed in Table 3, the FORSTÅTT checklist (*R* = 34 - 119, *M* = 63.24, *SD* = 22.15) captured 1075 (66.1 %) of the total number of statements, while the ITD model (*R* = 35 – 122, *M* = 66.29, *SD* = 21.30) accounted for 1127 (69.3 %) of the total number of statements. Combined, the FORSTÅTT checklist and the ITD model (*R* = 42 – 143, *M* = 82.82, *SD* = 25.89) captured 1408 (86.6 %) of the total number of statements.

Table 3

Frequency of Statements in the ITD, FORSTÅTT and Combined ITD & FORSTÅTT Model

	R	*M*	*SD*	Sum n %
FORSTÅTT	34 - 119	63.24	22.15	1075 (66.1 %)
ITD	35 - 122	66.29	21.30	1127 (69.3 %)
FORSTÅTT & ITD	42 – 143	82.82	25.89	1408 (86.6 %)
Total	49 – 153	95.65	29.87	1626 (100%)

Note. *N* = 17, *R* = Range, *M* = Mean, *SD* = Standard Deviation.

As illustrated in the Venn-diagram shown below (Figure 4), the FORSTÅTT checklist and ITD model overlap, with 794 statements covered by both models (S = 794). Of the total 1408 statements covered by the models combined, 1075 of the statements were uniquely covered by the FORSTÅTT checklist (U2 = 281), while 1127 of the statements were solely covered by the ITD model (U1 = 333), while. Residual statements covered by neither the FORSTÅTT checklist nor the ITD were 218 (R = 218).

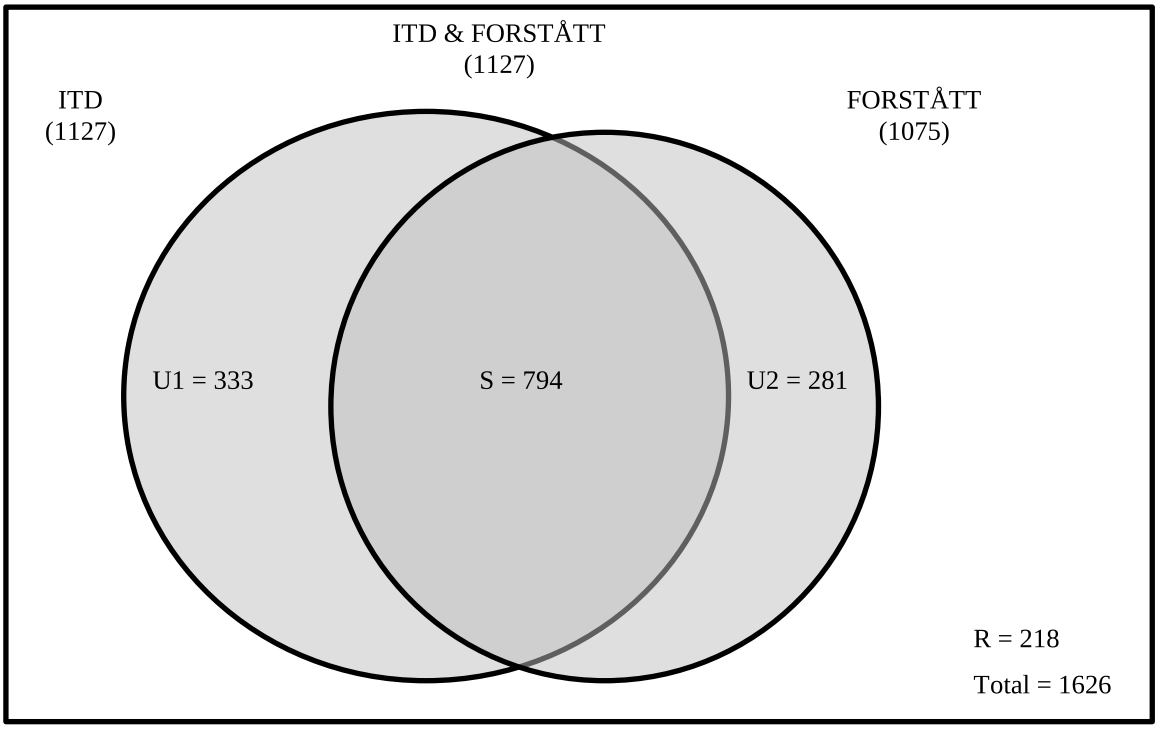

Figure 4. *Illustrates the overlap of statements between the ITD model and FORSTÅTT checklist.*

Note. ITD = Intuitive Team Decision Making, FORSTÅTT = Joint checklist for the three emergency units. S = Shared statements covered by both models, U = Unique statements covered by the given model, R = Residual statements covered by neither the ITD nor the FORSTÅTT models.

Testing of Hypotheses

Inferential statistics. Hypothesis 1 predicted that the FORSTÅTT checklist would account for the majority of statements. A paired sample t-test showed that there was a significant difference between the number of statements accounted for by the FORSTÅTT checklist (M = 63.24, SD = 22.15) and the total number of statements (M = 95.65, SD = 29.87), $t(16) = 11.78$, $p < .001$, $r = .95$. The effect size for this analysis (d = .95) was found to exceed Cohen's (1988) convention for a large effect (d = .80). Thus, the hypothesis was rejected.

Hypothesis 2 stated that the ITD model would capture the majority of the statements on decision making in ICP. A paired sample t-test showed that there was a significant difference between the number of statements captured by the ITD model (M = 66.29, SD = 21.30) and the total number of statements (M = 95.65, SD = 29.87), $t(16) = 9.83$, $p < .001$, r = .94. The effect size for this analysis (d = .93) was found to exceed Cohen's (1988) convention for a large effect (d = .80). Thus, the hypothesis was rejected.

Hypothesis 3 stated that the FORSTÅTT checklist and the ITD model combined would cover all the statements. A paired sample t-test showed that there was a significant difference between the number of statements covered by the combined FORSTÅTT and ITD model (M = 82.82, SD = 25.89) and the total number of statements (M = 95.65, SD = 29.87), $t(16) = 8.12$, $p < .001$, $r = .98$. The effect size for this analysis (d = .80) was found to be medium to large, according to Cohen (1988). Thus, the hypothesis was rejected.

Thematic analysis. Hypothesis 4 predicted that statements residual statements from the combined FORSTÅTT and ITD model would not contain any themes relevant to decision making in ICP. An inductive thematic analysis was conducted of the 218 residuals in order to test the hypothesis. Six themes relevant to decision making in ICP were generated from the analysis. The prevalence of residual themes is documented in Table 4. The themes identified were sorted on the individual or organizational level, according to the IGLO framework, for a simple differentiation of the categories.

Table 4

Frequency of Residual Themes from the Thematic Analysis

IGLO level	Residual theme	Frequency n %
Individual	Personal characteristics and interpersonal knowledge	40 (18.3 %)
	Individual decision-making	17 (7.8 %)
Organization	Organization, legislation and regulations	49 (22.5 %)
	Evaluation	22 (10.1 %)
	Technological resources	53 (24.3 %)
Other	Miscellaneous	28 (12.8 %)
	Not relevant	9 (4.1 %)
	Total	218 (100 %)

As shown in Table 4, three residual themes were identified on the Individual level. Two themes were identified on the individual level of IGLO. First, *personal characteristics and interpersonal knowledge* (*n* = 40) were mentioned in relation to the operational commanders' personal characteristics and personal knowledge of cooperating partners. This included interest for their work, stress, day to day condition, willpower and self-assurance, as well as the ability to perceive others' level of stress and alertness, if they were on first name basis, and the degree of trust and loyalty present. Second, statements covering *individual decision-making* (*n* = 17) included reflections on how they make individual decisions, such as mental simulations of action plans and reviewing alternatives, as well as thoughts on documenting what decisions are made and why.

Three of the residual themes could be placed within the Organization level of IGLO. As seen in Table 1, *organization, legislation and regulations* (*n* = 49) was the theme which covered most of the residuals (22.5 %). It included participants' reflections on the organization within and between emergency units, therein hierarchies, roles and co-location of the emergency units, as well as the organization of municipalities and cooperation with other countries. Also reflections on national legislation, formal and standardized procedures, and strict routines were included in this category. Second, participants mentioned the importance of *evaluations* (*n* = 22), therein reflections on evaluation of actual emergency incidents and the use of these evaluations to improve their work practices. Finally, the second most prevailing theme was *technological resources* (*n* = 53), accounting for 24.3 % of the total amount of residual statements. This included technology they have available today, as well as the interest in technology which in the future may better decisions when handling an emergency incident. The participants' focus was on user friendly, efficient and interconnected tools, and included tools for resource management, electronic maps, live footage, radio communication, and decision support.

Several themes were placed within the *Miscellanous* (n = 28) category. These included reflections on topics such as people's critical retrospective glances on how an operation was handled, their dependency on the crew on site and the strategic level, as well as the tunnel vision of the management who are primarily focused on their own units' deliveries.

In sum, the thematic analysis found nearly all (n = 208, 95.4%) of the residual statements to be relevant to how operational commanders make decisions in ICP. Thus, hypothesis 4 was rejected. As shown in Table 4, only nine statements were categorized as irrelevant to decision making in ICP (4.1 %). The irrelevant statements, reduced R, were either products of the interview questions, e.g. "had I known about a weakness, I would do something about it", or statements of an ironic nature, "maybe we should start driving around in a big bus, the police-, fire-, and ambulance bus". Also, general reflections on the validity of research knowledge and value of leisure time were statements included in the residual statements not relevant to the topic decision making in ICP.

Post-hoc Analysis

Three paired sample t-tests showed that neither the FORSTÅTT checklist, the ITD model, nor the combined FORSTÅTT and ITD model, covered the majority of statements. Also, after a thematic analysis, themes relevant to decision-making in ICP were found in the residual statements. Based on the fact that hypotheses one, two, three and four were rejected, a post-hoc analysis was performed. It was proposed that by adding the residual themes to the combined FORSTÅTT and ITD model, a new alternative model would be adequate to describe decision-making in ICP. When the residual themes were added, only nine statements remained as irrelevant to decision-making in ICP.

Discussion

Summary of Results

The purpose of this study was to empirically test whether two different models, separately and combined, could describe and capture reflections on decision-making in the emergency response domain. These reflections were collected through 17 semi-structured interviews with operational commanders from the emergency units on decision-making in Incident Command Post. Open-ended, exploratory questions were asked, and the answers were sub sequentially transcribed and unitized. A total of 1626 meaningful statements were unitized and coded in the FORSTÅTT checklist and ITD model. Of the total 1626 statements, the FORSTÅTT checklist accounted for 66.1 %, while the ITD model captured 69.3 %, Combined, the two models accounted for 86.6 % of the total amount of statements. As seen in Figure 4, the two models overlap with 794 of the statements. This indicates that the two models capture many of the same reflections on decision making in ICP. In sum, 218 statements were not covered by the combined FORSTÅTT and ITD model.

Hypothesis 1 was formulated to test whether the FORSTÅTT checklist (Vigerust, et al., 2009) would be able to capture the majority of reflections on decision-making in ICP. The FORSTÅTT checklist accounted for 1075 of all the 1626 statements, with statements distributed across all the categories, as seen in Table 1. The category which captured most of the statements was *preparation* (n = 443), while the categories which accounted for the fewest statements were *measures on patient* (n = 5), *transportation to hospital* (n = 7) and *triage* (n = 25). The t-test showed that there was a significant difference between the statements covered by the FORSTÅTT checklist and the total amount of statements, meaning the result most likely is not accounted for by chance. The results also showed that the effect size for this analysis was substantial (d = .95), large according to Cohen's d (1988). However, because of a high correlation (r = .95), this effect size may be artificially high. This result suggests that the FORSTÅTT checklist is not appropriate for accounting for all reflections shared by operational commanders on decision-making in ICP. Thus, hypothesis 1 is rejected.

Hypothesis 2 was formulated in order to test whether the ITD model (Kline, 2005) could be applied to the emergency response domain. Table 2 shows that the ITD model accounted for 1127 of the total 1626 statements. The model was comprised of three parts: the decision-making process, the team's background variables, and context variables which promote intuitive decision making. As seen in Figure 3, the three parts of the ITD model overlapped (S1 = 252, S2 = 169, S3 = 106, S4 = 67). This shows that they cover much of the same reflections shared by operational commanders in the interviews. The team's background variables covered most statements (n = 854). Although statements were distributed across all categories in all the parts of the ITD model, *expert team*, found in the background variables part of the model, was the category which accounted for the highest amount of statements out of all the categories (n = 435). The category *situational shared mental model* covered most of the statements in the decision-making process part of the model (n = 156). The results from the t-test showed that there was a significant difference between the amount of statements captured by the ITD model and the total amount of statements, meaning the result most likely is not accounted for by chance. The results also showed that the effect size for this analysis was substantial (*d* = .93), large according to Cohen's d (1988). However, because of a high correlation (*r* = .94), this effect size may be artificially high. The t-test indicates that the ITD model is not sufficient in accounting for all reflections on decision-making in ICP. Thus, hypothesis 2 is rejected.

Hypothesis 3 was formulated in order to see whether the FORSTÅTT checklist and ITD model could complement each other to better describe decision-making in ICP. As showed in Table 3, a combined FORSTÅTT and ITD model was able to capture 1408 of the total amount of statements. However, as seen in Figure 4, a substantial amount is covered by both models. The statistical analysis shows a significant difference between the amount of statements covered by the combined FORSTÅTT and ITD model, and the total amount of statements, meaning the result most likely is not accounted for by chance. The results also showed that the effect size for this analysis was substantial (*d* = .80), large according to Cohen's d (1988). However, because of a high correlation (*r* = .98), this effect size may be artificially high. This result indicates that even though they cover more statements together than separate, they are still not able to account for the majority of reflections shared by operational commanders on decision-making in ICP. Thus, hypothesis 3 is rejected.

Following the logic behind hypothesis one, two and three, *hypothesis 4* predicted that statements not covered by the FORSTÅTT checklist or the ITD model would contain only themes which were irrelevant to decision-making in ICP. A thematic analysis of the 218 residual statements resulted in 209 statements which were relevant to decision making in ICP, divided into six themes. Most residual statements fell into the categories *personal characteristics and interpersonal knowledge* (*n* = 40), *organization, legislation and regulations* (*n* = 49), and *technological resources* (*n* = 53). A full overview of the residual themes can be found in Table 4. Only nine statements were found to be irrelevant of the topic. In conclusion, the residuals contained themes relevant to decision-making in ICP, and thus hypothesis 4 is rejected.

Based on the fact that hypotheses 1-4 were rejected, a *post-hoc analysis* was performed. The thematic analysis of residuals uncovered themes relevant to decision-making in ICP. Therefore, a new model adding these themes to the combined FORSTÅTT and ITD model was generated. After adding the themes, only nine irrelevant statements were left.

Comments on the Models

In this section, the results from testing the theoretical model and practical checklist will be discussed and connected to relevant theory. This will be done by discussing the categories which stand out because of the high and low number of statements they capture in the two frameworks. Some theoretical implications will also be addressed.

FORSTÅTT. The domain-specific FORSTÅTT checklist model is developed as a guideline to better handle an emergency incident which requires all three emergency units to cooperate (Vigerust, et al., 2009). The introduction presented some limitations connected with the FORSTÅTT model, both the inclusion of steps mainly relevant to one emergency units and the lack of mechanisms illustrated in the checklist. Next, how the results are linked to these observations will be discussed.

First, the fact that FORSTÅTT aims to be a checklist for inter-agency collaboration makes some of the categories less adequate. The results show that categories specific of patient care, such as *triage*, *measures on patients* and *transportation of patients to the hospital*, captured by far the fewest statements. As mentioned in the introduction, these types of tasks mainly carried out by the emergency medical services do not seem appropriate to include in a joint checklist, even if the checklist is intended for emergency incidents where lives are at risk (Vigerust, et al., 2009), and saving lives is the main priority for all three emergency units (Politidirektoratet, 2011; Vigerust, et al., 2009). Thus, the results from the study support this notion. Alternatively, the fact that the operational commanders did not comment much on this issue might be explained by their assumption that this is common knowledge which they did not feel the need to elaborate. However, if the FORSTÅTT checklist is to account for tasks relevant to all emergency units, it could be revised to exclude specifically medical categories.

Second, the *preparation* item is particularly emphasized in the procedure, which states that previous professional experience and knowledge are key elements to efficiently handle an emergency incident (Vigerust, et al., 2009). Coincidentally, the results show that most reflections on decision-making in ICP concern the *preparation* category of FORSTÅTT. This supports the validity of the model. However, since the FORSTÅTT is a checklist formulated as a linear sequence, it does not illustrate the complexity of incidents in sociotechnical systems (Hollnagel, et al., 2008; Perrow, 1999; Rasmussen, 1997). It does not state how this previous experience may affect the operational commanders' ability to implement the tasks set forth by the checklist. Theoretically, this line of thought might be followed to improve the model. However, the purpose of a standard operating procedure is practical, to outline an explicit set of instructions to successfully handle an emergency incident. If the procedure is not readily recalled, it will not enhance decision-making (Crichton, 2003). Therefore, during incidents characterized by high degrees of uncertainty, risk and time-pressure, a short, understandable acronym is more adequate as it is more easily recalled than a complex model with boxes and arrows.

In conclusion, even though elements from all items in the FORSTÅTT checklist were mentioned by the operational commanders, some were more prominent than others. The categories specific of patient care were not talked about much, which may imply that they could be removed from a joint checklist. In addition, the prevalence of reflections on the *procedure* category illustrates the fact that operational commanders are interested in previous knowledge and experience. However, the checklist does not illustrate *how* this expertise may come into play and affect the other steps in the checklist.

Next, results from the ITD model, which illustrates the mechanisms which affect team decision-making in teams, will be discussed.

ITD. The Intuitive Team Decision Making model focuses on which processes, both inherent of the team and in the context, affect intuitive team decision-making (Agor, 1989; Kline, 2005). The results show that *expert team* prevailed out of the team background variables, and *situational shared mental models* captured most statements out of the decision-making process variables. These findings will be discussed and linked together, followed by a comment on the relevance of the context variables.

Shared mental models, the team's shared experience and knowledge (Cannon-Bowers & Salas, 2001), play a crucial role in their ability to make intuitive decisions. As mentioned in the introduction, expert teams are both supported by and support the creation of shared mental models (Kline, 2005). The results show that operational commanders talked mostly about characteristics of the *expert team*, ie. sharing domain-specific knowledge and experience between each other in ICP. They talked more about sharing domain-specific experience and knowledge with the other leaders than about using shared mental models of the team's goals, identity and norms. This may be because the situations they encounter differ to such a degree that they do not have similar experiences from training and job experience to draw from their shared mental models (Flin, 1996), and thus have to create a situational shared mental model (Kline, 2005; Lipshitz & Shaul, 1997). The fact that operational commanders talked mostly about creating a *situational shared mental model* when they make decisions together supports this notion, because it is shaped by the team members sharing their situation-specific expertise with each other. The operational commanders might use their time together to share relevant expertise because they first and foremost command their own emergency units' operations (Politidirektoratet, 2011). Therefore, when they meet, they do so to make sure that their separate operations do not impede with the performance of the other units. As an operational commander in this study noted, they no longer "stand on different street corners, glaring at each other". Rather, they come together in the Incident Command Post to coordinate information, plans, and resources in order to handle the emergency incident as efficiently as possible (Stout, et al., 1999).

On an overall level, it is interesting to see whether decision-making in ICP is characterized by intuition. Therefore, context variables which promote intuitive decisions were included in the ITD model. These variables cover the least amount of statements out of the three parts, suggesting that the operational commanders do not reflect much on situational factors typically involved in intuitive decision-making. Still, it does cover some unique statements which the other parts do not account for, making the model in total a better fit to the reflections shared on team decision-making.

In sum, the results from the ITD model imply that the operational commanders are more focused on sharing relevant information, plans and resources in order to make decisions that do not impair with the other units' operations than making intuitive decisions based on shared experience and knowledge. Also, the results show that even though they do not focus much on it, the operational commanders do reflect on situational factors to a certain degree.

Certain themes that are relevant to decision-making in ICP, but were covered by neither the FORSTÅTT checklist nor the ITD model, will be discussed next.

Residuals. The residual themes were expertise-driven and uncovered several themes relevant to decision-making in the emergency response domain. Even though most residuals uncovered themes which were indirectly related to decision-making, these were included as they were mentioned by experts on the field. Only nine statements were found irrelevant to the decision-making in ICP. Out of the six themes uncovered, personal characteristics, organization and laws and regulations, and technology were the themes that captured most of the residual statements. In the following, the three residual categories which captured most of the statements will be discussed.

First, most residuals on the individual level concerned personal characteristics of the operational commanders, such as level of stress and interest in their work, as well as personal knowledge of cooperating partners, both in ICP and the rest of the crew on site. The ITD model included a shared mental model of team norms, and the preparation phase in FORSTÅTT included professional knowledge. But neither includes personal characteristics or inter-personal knowledge of team members in the operation. Flin (1996) noted that the better the incident commander knew his team members, the more likely he or she was to notice behavioral changes as a consequence of stress, which may be a cue that they are not performing their job properly. Also, in a study of clinical decision-making, Pugh (2002) found that knowing their colleagues contributed positively in nurses' decision-making process, as it was easier to make decisions when they knew of each other's abilities and did not have to spend time establishing common ground. This is in accordance with the operational commanders in this study who reflect on knowing, among others, how stress influences their colleagues. Thus, a theoretical team decision-making model which is going to describe decision-making in ICP should include personal characteristics.

Second, most residual themes were identified as laws and regulations that affect their work or how the emergency units and related municipalities were organized. Lack of knowledge of both of these structural elements has been known to hamper how well emergency response is executed (Thévenaz & Resodihardjo, 2010). First, all decisions by the police on the tactical level must be rooted in the strategic level (Politidirektoratet, 2011). Research of past emergency response has stated that if power to make decisions is concentrated on the strategic level, this may hamper the effectiveness of the emergency response (Thévenaz & Resodihardjo, 2010). Second, the organization of municipalities affects decision-making in the sense that in instances where several cities, counties or districts are involved, the emergency response may be negatively affected. Thus, an overview of the emergency units' organization in other municipalities may ensure a better emergency response. This is domain-specific knowledge which could be included in FORSTÅTT if a more lenient coding manual was employed. However, the preparation phase of FORSTÅTT does not specifically state that professional knowledge and experience include this type of general knowledge. In sum, a model of decision-making should include laws and regulations as well as how the emergency units are organized to better account for decision-making in ICP.

Third, technology which could aid the operational commanders in their decision-making process was also a prevailing theme. Decision-aid in the form of geographical maps have a great positive impact on decision-making during emergency response (Papadopoulou, Savvaidis, & Tziavos, 2011). But, as Vicente, Christoffersen and Pereklita (1995) noted, there is also a need to encourage and support mental models through decision aids. This way, novices may use knowledge which experts possess. Several technological decision-aids have been developed based on recognition-primed decisions (Fan, Sun, Sun, McNeese, & Yen, 2006; Fan, Sun, McNeese, & Yen, 2005; Ji et al., 2007; Warwick, McIlwaine, Hutton, & McDermott, 2001). Fan and colleagues (2006) tested one kind of system, called R-CAST, on a military and relief organizations working together and separately in the field. They concluded that decision makers who received technical support from their system made better assessments and decisions than experts without this support. Also, shared interactive tabletops have been developed to support collaborative decision-making (e.g. Rogers, Hazlewood, Blevis, & Lim, 2004). It is important to note, however, that not all technology automatically will better team performance such as decision-making. Team technology must be designed based on a thorough understanding of team needs and abilities (Salas, et al., 2008). All in all, technological resources should be included in a model where the aim is to describe decision-making in ICP.

In conclusion, the expertise-driven themes from the residuals, especially personal knowledge, organization, and technology give a clearer picture of what elements experts from the emergency units see as relevant to decision-making in ICP. They could thus be included in either the theoretical model or practical checklist, or a combined model, to better describe decision-making in ICP. Next, an alternative model comprised of the two frameworks and the residual themes will be discussed.

Alternative model. The new, alternative model seeks to better account for decision-making in ICP by including both a normative, practical checklist from the emergency response domain, and a theoretical model of decision making in teams. The results suggest that operational commanders are not only concerned with domain-specific tasks or intuitive team decision-making processes, but also other aspects of decision-making. Therefore, expertise-driven themes relevant to decision-making in ICP were also included in the alternative model. The findings from this study indicate that the checklist, theoretical model and expertise-driven themes complement each other to better describe decision-making in ICP. FORSTÅTT is a practical, normative checklist made for the emergency response domain, which is simple and quick to use. While the FORSTÅTT checklist is practical of use, it does not illustrate the complexity of decision-making in the field. Neither does it account for how the decision making process related to these elements occurs. ITD, on the other hand, is a research-based and descriptive model, which illustrates how expertise and contextual elements affect the team decision-making process. It accounts for how expert teams make intuitive decisions under uncertain and time-limited circumstances, and can therefore complement the simple FORSTÅTT checklist. In addition, the expertise-driven residuals account for aspects specific to the emergency response domain in Oslo and the surrounding districts. Combined, the research-based, "best practice" and expertise-driven new model give an improved insight into how operational commanders make decisions in ICP.

This section discussed prevailing categories in the two models and in the residuals with theoretical implications. Finally, it introduced a new combined model that may better account for elements and mechanisms which are relevant to decision-making in ICP. The next segment will draw a general picture of the situation today for the emergency units, and include practical implications of this study.

General Discussion

Modern society as a socio-technical system is becoming more complex and dynamic, with equally complex accidents as a consequence. The purpose of this study was not to prevent such accidents from happening, but to develop the emergency response which follows such accidents. The Norwegian Emergency Response Service requires the emergency units to collaborate in order to handle such incidents (Ministry of Justice and Police, 1999; Politidirektoratet, 2011; Vigerust, et al., 2009). This collaboration includes decision-making, which is challenging during emergency incidents characterized by time-pressure and uncertainty (Crichton, Flin, & McGeorge, 2005). Decisions during incident management are fast-paced and are based on a limited amount of information. This is especially the case when decisions have to be made by the operational commanders together in ICP, where they have different information they need to share in order to efficiently handle an incident. To have checklist to confer with can help teams to get an overview of what has to be done when managing an incident (Crichton, et al., 2005). In addition, when they have limited time to make a decision and the checklist does not suffice, experts are able to draw on shared knowledge and experience to make fast, intuitive decisions (Crichton, et al., 2005; Salas, et al., 2010). This study has illustrated the relevance of both a checklist and shared expertise. In the following, some practical implications will be introduced which are connected to the findings of this study.

There are four practical implications related to the results of this study which will be discussed next. First, the results indicate which key elements are relevant when making decisions in ICP, and may be used when evaluating the emergency response of an incident.

Checklists, with integrated behavioral dimensions, are often used to evaluate incidents (Hollnagel, et al., 2008). Decision-makers are thus evaluated on what was done or not done. However, there might be other elements which hinder the operational commanders in making sound decisions. An evaluation can draw a truer picture of the decision event by including how contextual issues (e.g. time constraints) and team characteristics (e.g. shared mental models) affect the decision-making process in teams (Rasmussen, 1997). The findings from evaluations may also form the basis for better training programs.

Second, it is widely acknowledged that in order to ensure an efficient incident management, training is needed (Crichton, et al., 2008). To make sure that procedures, such as FORSTÅTT, are well known and easily recalled, a greater emphasis should be placed on experiential training or knowledge testing (Crichton, 2003). The knowledge testing should include a better understanding of the assumptions and logic which underlie the procedures (Zsambok & Klein, 1997). This includes information on which response plans the procedure is based on, and goals and priorities inherent in the procedure. A lack of such training may hinder an efficient emergency response (Thévenaz & Resodihardjo, 2010). It is also important to train in order to improve the team's shared mental models (Cannon-Bowers & Salas, 2001). Training may include debriefs after practical field exercises, to allow team members to interpret what happened at critical moments, why the other team members behaved the way they did, and whether their expectations of other team members were correct. Also, the team members might be better equipped to anticipate and predict how the other team members will behave if they are provided with information about the others' roles and responsibilities in the team (Cannon-Bowers & Salas, 2001). Finally, Entin and Serfaty (1999) found that practical team training focused on adaption to shifting conditions improved the efficient use of mental models, which again improved performance. In sum, practical training and knowledge testing on both checklists and shared mental models may give operational commanders a better basis for making sound decisions in ICP.

Third, this study shows that experience with and knowledge of the other operational commanders is relevant to decision-making in ICP, which makes the organization of the operational commander position in the districts questionable. As of today, the operational commander position is different in Oslo and the districts. In Oslo, the emergency units have operational commanders as a permanent role, while in the districts this role is "ad hoc", meaning that they could be called upon to function as operational commanders if the incident escalated. The processes which affect decision-making teams are to a high degree characterized by past experience with the team and knowledge of their role as operational commander. It is easier to make decisions when team members know each other's abilities and do not have to spend time establishing common ground every time they meet (Pugh, 2002). Therefore, by organizing the operational commander position after the Oslo-model, the districts might be better equipped to collaborate and make decisions in ICP. However, economical and staffing constraints in the districts limit this opportunity. Additionally, Oslo has more complex and frequently occurring emergency incidents compared to the districts, which makes it questionable whether the districts need operational commanders as a permanent role. In sum, even though permanent operational commanders in Oslo have a broader experience with, and knowledge of, their positions and their colleagues from the other emergency units, economic restrictions as well as less complex incidents requiring the emergency units to cooperate makes it debatable whether introducing operational commander as permanent role is the best solution in the districts.

Finally, the present study has provided more knowledge of decision-making in the Norwegian emergency response domain. It has shown the relevance of a naturalistic decision making model in a Norwegian context, along with researchers such as Rake and Njå (2009) who also have done research in this field. Their study found that operational commanders from the three emergency units use distinct naturalistic decision-making strategies during the different phases of the emergency response.

In sum, this study has practical implications for evaluation, training, and organization, and contributes to research on the Norwegian emergency response domain. Next, limitations of this study which may have had an effect on the results will be listed.

Limitations

This study has certain limitations when it comes to the participants involved, the gathering of data through interviews, unitizing of transcribed interviews, the coding process and the analyzing of results. Next, how these limitations may have affected the results will be discussed.

Participants. Seventeen participants were interviewed for this study, which has statistical consequences as the results cannot be generalized to the whole population of operational commanders. However, the transfer value of the results to operational commanders in Oslo and the surrounding districts is relatively high, as ten of the 21 operational commanders from Oslo were represented in this study. Also, the degree of reflection varied between the participants. Some participants were more talkative than others, which lead to a relatively high standard deviation in the number of statements from each participant. The participants' varying years of experience as operational commander, in terms of years in service, types of incidents, and whether the role was permanent or ad hoc, might not give a unanimous view of decision-making in ICP.

Interviews. The interviewer changes the phenomenon when gathering data (Kvale, 1996) . The exploratory questions which were asked during this study inherently generate knowledge throughout the interview. This weakens the reliability of the results, as the questions probe differing answers. However, the validity is strengthened with this approach. Also, how the interviewer conducts him- or herself will affect the resulting answers (Kvale, 1996). To minimize these effects, the interviewers were trained in interview technique which both focused on how to properly ask exploratory questions and how to approach the interview setting. Additionally, two sets of questions were asked in each interview, which might have affected the results. Therefore, one set of questions was asked before the other in half of the interviews, and vice versa, to avoid a priming effect. However, the priming effect would have been avoided all together if only one set of questions were asked. Nevertheless, asking the questions in different orders was the best way to solve the priming effect problem due to time restrictions.

Unitizing. The unitizing process is a subjective process. The concept of a meaningful statement varies from researcher to researcher, which makes studies difficult to replicate. The most reliable unitizing is based on objective measures such as sentences and paragraphs, not segments of meaning (Krippendorff, 2004). However, unitizing text according to physical distinctions leads to the loss of meaning, thus rendering the units less valid for an exploratory study. Therefore, a detailed unitizing procedure was followed to ensure reliable units, without making the validity suffer. An inter-judge reliability was calculated, and could be better. But it was considered as sufficiently good within the time- and resource-limits of this thesis.

Coding. The operationalization of variables as well as coding of units of text is a challenge. When operationalizing the ITD model, it was divided into three parts based on literature (Agor, 1989; Kline, 2005). If they were included into one model, the results may have differed, and some categories would capture fewer statements. However, even though both the context variables and the team's background variables are part of the ITD model, they are mechanisms which affect the actual decision-making process. Therefore the categories in the different parts are not mutually exclusive. Thus, if all categories were placed in one model, the statements would be difficult to categorize, and the results would not properly reflect the relevance of the categories.

The operationalization of the categories in the two frameworks was based on the original definitions from the given paper. Limited or overlapping descriptions of categories made the statements difficult to categorize. For example, communication with the other operational commanders in Incident Command Post was mentioned both in *risk Assessment, reconnaissance and resources (R)* as well as in *securing and situation report (S)* in the FORSTÅTT model. The consequences of overlapping categories might be that some statements were wrongly coded into a category. In order to minimize this effect, Measures were taken to ensure that statements with these themes were evenly distributed between the relevant categories.

All the categories were considered value free, except for some categories in the context part of the ITD model. This was done because the context describes elements, for example and *lack of "facts*", which promotes intuitive decision-making. If the categories were operationalized as value-free, more statements might have been captured by the ITD model. However, including positive values, such as technology which ensures sufficient information, would not be representative of a context which promotes intuitive decisions.

Also, the phases in FORSTÅTT were not coded. This might have led to less statements being captured by the FORSTÅTT model. However, the phases were largely incorporated in the FORSTÅTT phases, as discussed in the introduction. Therefore, it was considered that coding the phases in addition to the FORSTÅTT model would not be of significant value to this study. In addition, statements that are ironic of nature cannot be categorized using this method, as only semantic meaning of statement was considered. If the implied meaning of statements had been considered, the results might have been different. However, only a few statements were ironic in nature, which makes the implications of adding the implied meaning of irony minimal.

In addition, inter-coder reliability was not assessed. This might have affected the results as another coder might categorize the statements differently and ended with more or less statements captured by the frameworks. However, to heighten the coder reliability, one interview was coded together with the other researchers in the FORSTÅTT model. Also, the interviews were coded in the ITD model once, and then recoded when a better understanding of the categories in the three parts of the model was achieved. This was seen as sufficient within the time limits of this study.

Analyzis. The data was analyzed both qualitatively and quantitatively. The meaning of the statements may have been interpreted incorrectly. Also, analyzing of results was mainly done by looking at the prevalence of statements. But the frequency of statements does not reflect how important the participant found this theme to be for decision making. The lack of statements in a category also does not mean that the given category is not important to decision-making. Therefore, the relative importance of the categories cannot be assessed with this method. However, the fact that the participants reflected upon certain aspects of decision-making which could be placed within certain categories means that the participant found this to be *relevant* of decision-making in ICP. Therefore, the results from this study show how relevant the categories in the FORSTÅTT checklist and the ITD model are to decision-making in ICP. In addition, the statistical t-tests showed significant results, with a large effect size. However, because there was a high correlation, the effect size may be artificially large. This means that a lower correlation might have given other results.

In conclusion, even if this study had certain limitations, measures have been taken in order to minimize the negative consequences.

Future Studies

There is little research on decision-making in the emergency response domain in Norway. This study contributes in improving the understanding of what factors are relevant to decision-making in ICP. Even though this study lists some interesting finding, there some elements in the study which would be interesting to research further.

First, this study mainly focused on the positive effects of shared mental models on team decision-making. However, even though shared mental models facilitate quick decisions, it has its by-affects. The team might develop “groupthink” if their shared mental models are too much in synch, and refuse to discard incorrect mental models because they are shared by the group (Cannon-Bowers & Salas, 2001). Therefore, future studies should study the negative effects of shared mental models on team decision-making.

Second, the effect of differing experience on decision-making was not explored in this study. Operational commanders from the emergency units vary in number of years of experience in their role, which has been found to affect decision-making (Crichton, 2003). Therefore, further studies should explore whether amount of experience has an effect on the operational commanders’ ability to make decisions in ICP.

Third, a new model has been suggested in this study, which combines the FORSTÅTT checklist, the ITD model and the expert-driven residual themes. This model should be tested empirically in future studies, through for example survey-driven research. Whether the new model can be applied to the emergency response domain in the rest of Norway should also be studied. The appropriateness of the new model could also be studied in other countries.

Fourth, the study included operational commanders from the three emergency units.

Further research should investigate whether they reflected differently on decision-making, and thus see how well the frameworks were able to describe the three different units. Also, the operational commanders in this study were both from Oslo and the surrounding districts. Working in the city and in the districts might pose different challenges. In addition, the fact that the operational commanders in the city have a permanent role as operational commander, and the ones from the districts have an “ad hoc” role, might present them with different challenges. Thus, future studies should compare these two groups, and investigate whether they reflect upon different topics related to decision-making.

Conclusion

This study showed that neither a theoretical decision-making model (ITD) nor a practical, domain-specific checklist (FORSTÅTT) could account for the majority of statements shared by operational commanders on decision-making in the emergency response domain. Combined, these two models could account for more reflections relevant to decision-making in ICP than they could separately, but still they did not account for everything shared by the operational commanders. Several themes relevant to decision-making in ICP were found in the residual statements, and are a valuable source for further research. The study showed which elements are more and less relevant to decision-making in ICP, and gives a better understanding of which elements affect the decision-making process. With the challenging emergency incidents the emergency units have to handle in society today, it is important to focus on what mechanisms affect operational commanders when they make decisions in ICP.

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Appendix A: Information Sheet

Informasjonsskriv til deltakere desember 2011

Takk for at du har vist interesse for å delta i dette forskningsprosjektet.

Vi er tre masterstudenter innen Arbeids- og Organisasjonspsykologi ved Universitetet i Oslo som skriver oppgave for SINTEF, som leder BRIDGE prosjektet. I forbindelse med våre masteroppgaver ønsker vi å intervjue operative ledere fra helse, innsatsledere fra politi og fagledere fra brann, som har erfaringer fra en eller flere større krisehendelser.

BRIDGE-prosjektet
BRIDGE er et EU-finansiert prosjekt som har som mål å øke sikkerhet gjennom å utvikle tekniske og organisatoriske løsninger, for å forbedre håndtering av kriser og katastrofer. Fokuset ligger blant annet på samarbeid på tvers av etater og landegrenser ved store krisehendelser som terroranslag, naturkatastrofer og industriulykker. Prosjektet skal medføre økt sikkerhet og trygghet for befolkningen i Europa gjennom fler-faglig nødetatskoordinering og ledelse ved storskala akutthendelser. For mer informasjon om BRIDGE-prosjektet, se http://www.bridgeproject.eu/.

Mål med forskningen: Vi vil fokusere på ILKO bestående av operative ledere fra de tre blålysetatene, og se på koordinering, kommunikasjon, informasjonsbehov og beslutningsprosesser. Formålet er å teste vitenskapelige modeller, prosedyrer og «best practice» i krisesituasjoner.

Hvordan du kan forberede deg
Vi er interessert i *dine* personlige meninger og erfaringer når vi intervjuer deg, ikke andres tanker. I tiden frem til intervjuet ber vi deg tenke over følgende:

Hvilke styrker ser du ved måten du tar beslutninger i ILKO i dag?
Hvilke svakheter ser du ved måten du tar beslutninger i ILKO i dag?
Hvilke muligheter ser du for at du kan ta bedre beslutninger i ILKO i fremtiden?
Hvilke trusler ser du mot at du kan ta bedre beslutninger i ILKO i fremtiden?

Hvilke styrker ser du ved måten du samhandler i ILKO?
Hvilke svakheter du ser ved måten du samhandler i ILKO?
Hva kan på sikt kan være utfordringer ved samhandlingen i ILKO?
Hvilke muligheter ser du for at samhandlingen i ILKO kan bli mer effektiv i fremtiden?

Deltakelse: Intervjuet vil foregå på norsk. Vi vil være to stykker tilstede ved intervjuet, der en har rollen som intervjuer, og den andre som observatør. Vi regner med at intervjuet vil ta ca. 1,5 til 2 timer.

Håndtering av datamaterialet og konfidensialitet
I henhold til etiske retningslinjer for forskning er din deltakelse i studiet frivillig. Du kan når som helst trekke deg fra intervjuet og studiet uten å oppgi noen grunn.

Intervjuet vil bli tatt opp på bånd, deretter transkribert. Deler vil også oversettes til engelsk. Dette vil gjøre det lettere for oss å analysere data i ettertid og sikre korrekt gjengivelse av det du sier. Informasjonen du oppgir kan også være av interesse for Bridge forskere fra andre land, kun forskere i Bridge vil få tilgang til datamaterialet. Transkripsjonene vil beholdes i anonymisert form for bruk videre i BRIDGE-prosjektet. Lyd filene vil bli sletter senest ved prosjektslutt 2014

Med mange takk,

Karen Ranestad, Ida Maria Haugstveit og Maria Borén, på vegne av Bridge forskningsteam.

Karen Ranestad
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Appendix B: Consent Form

European Commission
Seventh Framework Programme (FP7-SEC-2010-1)
SEC-2010.4.2-1: Interoperability of data, systems, tools and equipment

www.sec-bridge.eu
www.bridgeproject.eu

Bridging Resources and Agencies in Large-Scale Emergency Management

Samtykkeskjema for å delta i EU prosjektet Bridge

Ved å signere dette skjema bekrefter du at du har mottatt informasjon om prosedyrene og detaljer rundt prosjektet, at du har fått tilstrekkelig mulighet til å vurdere denne informasjonen, og at du frivillig vil delta i prosjektet. Du vil motta en kopi av dette samtykkeskjema.

Jeg bekrefter at jeg har lest og forstått "Informasjonsskriv november 2011" for Bridge prosjektet. ☐

Jeg har hatt muligheten til å vurdere denne informasjonen, og fått tilfredsstillende svar på spørsmål vedrørende forskningen. ☐

Jeg sier meg villig til å delta i intervjuet og forstår at min deltakelse er frivillig. ☐

Jeg forstår at jeg når som helst kan trekke meg som deltaker, uten å matte oppgi noen grunn. ☐

Jeg er innforstått med at informasjonen jeg gir vil bli behandlet konfidensielt av alle forskerne. ☐

Jeg tillater at mine svar blir tatt opp på lydbånd. ☐

Jeg forstår at all data som samles inn vil bli behandlet anonymt, med pseudonym. ☐

Jeg tillater at dere referer til meg som «Operativ leder» ☐

Jeg forstår at jeg kan få tilsendt kopier av resultatene av studiet. ☐

NAVN (vennligst bruk blokkbokstaver):

____

ADDRESSE:

____

____

SIGNATUR til deltaker: ______________________

DATO OG STED: ______________________________

Appendix C: Interview Guide

1. Før intervjuet:

- Kort informasjon om:
  - Masteroppgaven: tre masteroppgaver om samhandling, kommunikasjon og beslutninger. Skriver for SINTEF som leder BRIDGE-prosjektet.
  - BRIDGE: prosjekt som har som mål å utvikle metoder og teknologi for å bedre samarbeidet på tvers av etater og land under større krisesituasjoner.
- Samtykkeskjema
- SWOT
  - Nåtid/fremtid
  - Kan bli noe likt, mulig vi må be deg repetere.

2. Intervjuet: SWOT spørsmål om beslutninger:

NÅTID

Jeg vil først høre litt som beslutninger du tar i ILKO slik det er pr. i dag:
Hvilke styrker ser du ved måten du tar beslutninger i ILKO i dag?

Jeg er fortsatt interessert i beslutninger du tar i ILKO pr. i dag, men ønsker nå å høre litt om:
Hvilke svakheter ser du ved måten du tar beslutninger i ILKO i dag?

FREMTID

Med tanke på dagens praksis så ønsker jeg nå å se litt fremover i tid:
Hva kan på sikt være utfordringer knyttet til beslutninger du tar i ILKO?

Fortsatt med tanke på fremtiden:
Hvilke muligheter ser du for at du kan ta bedre beslutninger i ILKO i fremtiden?

- Under svakheter nevnte du…… Hvordan kan dette løses i fremtiden?

3. Avslutningsvis:

Hvordan synes du det gikk?
Informere om når vi skal levere oppgavene våre, og spørre om de vil ha en kopi.

Appendix D: Unitizing Procedure

Mål med unitizing:

Målet med unitizing er å isolere meninger fra hverandre. Meningsfulle ytringer må forstås i seg selv. Vi må forme kortest mulige enheter med deler av eksempel/spørsmål for å klargjøre poenget.

Definisjon meningsfylt ytring: Så korte utsagn som mulig, men fortsatt meningsfulle. *"The best content analyses define their context units as large as is meaningful (adding to their validity) and as small as is feasible (adding to their reliability)"* (Krippendorff, 2004).

Typer utsagn:

Vi har møtt på følgende type utsagn. Eksemplifisering av disse kommer lenger nede.

1. Et avgrenset og meningsfylt utsagn (statement).
2. En nyansert beskrivelse av et overordnet tema.
3. Eksemplifiseringer som bærer mening i og for seg.
4. Eksemplifiseringer som forbereder eller følger opp et statement
5. Premisser for et kommende eller allerede uttalt poeng/ytring
6. Eksempler beskriver i fortid i kontrast eller likhet til nåværende tilstand
7. Utsagn ikke knyttet til tematikk eller tema ("Northug er kongen!!!") – irrelevante utsagn,

1. **Et avgrenset og meningsfylt utsagn (statement)**

   Hvordan vi vurderer avgrensning av meningsfylte utsagn

   - Vi ser det som et nytt utsagn ved tematisk brudd.
     - Et poeng/mening = et nytt tema, nye aktører, nye sider ved saken.
     - Eksempel: «frisk luft, frisk luft, mosjon, frisk luft» - statement «frisk luft», «mosjon», «frik luft».'
   - Vi deler i to statements der hvor det er mulig å dele uten å miste mening.
   - Vi må vurdere statements ift bottom up og top down (SWOT og andre modeller) hvis i tvil. Så lite som mulig føringer fra top-down.

2. **En nyansert beskrivelse av et overordnet tema**

   Ved store, generelle temaer lager vi også mindre statements av undertemaer.

   - En mening som gjentas og nyanseres må unitizes som en egen enhet.

- eksempel:
  - Store/generelle temaer: kommunikasjon
  - Mindre statements: ikke verbal kommunikasjon, ansikt til ansikt kommunikasjon, dialog, radio etc.
  - KUN når han nevner flere underkategorier, da skilles det til flere enheter. Også hvis det skilles med «og» i en setning. Hvis ikke er det del av eksempelet («i forhold til» uten «og», «fordi», «det vil si», «som gjør at».)

Bruk av klammer:

- Legge til informasjon fra spørsmål/eksempler i setninger rundt i klammer for å klargjøre meningsfulle ytringer.
- Hvis det refereres til «det/den/dette» o.l., må det eksemplifisere med klamme. For eksempel ved svar på spørsmål må det refereres til deler avl spørsmålet stilt.

3. Eksemplifiseringer som bærer mening i og for seg.

Hvordan vi vurderer eksempler som meningsfylte utsagn.

- Et eksempel som har et poeng men som ikke uttales/konkretiseres markeres i blått for å senere vurdere/konkretisere i SPSS.
- Hvis i tvil om man skal kode eksempel som en statement, ta med til hverandre og diskuter.

4. **Eksemplifiseringer som forbereder eller følger opp et statement:**

- Alle eksemplifiseringer som understøtter/forløper en statement.
  - Følger opp/understøtter: Poeng tatt opp i neste setning, derfor kategorisert som eksempel.
  - Forbereder/forløper: Poeng tatt opp i setninger før, men konkretisert i senere statement.
  - Eventuelt legge til deler av eksempelet i klammer for å tydeliggjøre statement.
- Disse utsagnene blir skrevet i egne setninger i SPSS, og refererer tilbake til statements.
  - De skal puttes inn i SPSS som statements, men kodes som eksempel i SPSS i stede for på modeller. De kodes i egen kolonne «eksempel» som 1, der statements blir kodet som 2.

5. Premisser for et kommende eller allerede uttalt poeng/ytring
Bakgrunnsinformasjon/kontekst, premisser som understøtter et poeng.

- Eksempel: «Vi har nødnett.»

- Hvordan det påvirker samhandling/beslutning blir gjerne utdypet, og DET blir en statement.
- Inkludere premissen i utsagnet for å gjøre det mer forståelig. Men er premissen veldig lang blir det unitizet i grått.

6. **Eksempler beskriver i fortid i kontrast eller likhet til nåværende tilstand**

7. **Utsagn ikke knyttet til tematikk eller tema**
   - Skal ikke inn i SPSS.
   - Men de skal telles slik at vi vet hvor mye irrelevant som er tatt ut.
   - Fjerne fyllord og lydord
     - «dette er en svakhet»/»Det er en liten utfordring da»?
     - «Eeeh»
   - Fjerne ufulsstendige setninger som ikke gir mening i seg selv.
8. **Utsagn som ikke blir fullført**
   - Setninger som ikke blir fullført eller fulgt opp, og ikke gir mening i seg selv.

Når det er lange eksempler kan det være lurt å se om det har blitt tatt opp før i samme eksempel og om det tilfører nye elementer eller bare gjentar de.

<u>Fargekoding i transkripsjonene</u>:

Hele teksten skal fargekodes i enheter, men unntak av det intervjuer sier.

<u>Meningsfulle ytringer</u>: gul/grønn/turkis

<u>Eksempler og utbroderinger:</u> grå (to nyanser hvis ulike eksempler rett etter hverandre)

<u>Eksempel-units:</u> mørkeblå

<u>Statements vi er usikre på:</u> rød skrift, legges inn i SPSS , med ref. til plassering i teksten og begrunnelse. Begrunnelse og videre kommentarer legges inn i kommentarfeltet i SPSS bak hver statement.

<u>Ytringer som ikke er relevante for tematikken: </u>i rosa. Skal ikke inn i SPSS.

Gjennomføring av unitizing

- Lese gjennom en gang og skille enheter fra hverandre, deretter lese gjennom en gang til for å få helheten og sile ut eventuelle «ekstra-statements»
  - f.eks: «statement» eksempel «statement», der begge statements er like og dermed den ene blir støttende setning.

- Der det er skrivefeil eller ord ikke hører hjemme (ulogisk setning), hør gjennom lydfilen. Gjør deretter endringer i den unitizede filen, og marker denne endringen i **bold**. Etter at vi er ferdig med å unitize alle intervju, gå tilbake til den originale transkripsjonen og gjør nødvendige endringer.
- Når ytringer kuttes ut av teksten (7 og 8), kun kutte på begynnelsen og slutten av en statement.

SPSS

- To SPSS filer – en for beslutninger og en for samhandling
- En deltaker har samme tall i begge SPSS filene
- Vi har to SPSS filer hver som vi slår sammen til slutt til to (beslutninger og samhandling)
- Der eksempler som hører til statements, skriver man nummeret på statement foran eksempelteksten i parantes
    - «(3) For eksempel, nå…»
- Stjerne (*) før statement hvis man har skrevet en kommentar.
- Deler av statement som er i fokus (hvis setningen gjentas) i CAPS LOCK.
- Legge til informasjon (eks. for «det») i klammer for å klargjøre meningsfulle ytringer.

Appendix E: FORSTÅTT Coding Scheme

The following operationalizations were based on Vigerust and colleagues (2009). All the categories are considered value-free, ie. statements are coded in the categories even though they reflect the *lack of* the given elements. One statement is only coded in one of the categories of the model. If it does not fit into a category, it is placed in *Residuals.*

F = Preparation (Forberedelse)

- Be prepared for all types of events
- Use existing professional knowledge and experience, including education and training.
- Consider necessary equipment and resources
- Take weather conditions and environment into account
- Consider safety issues
- Make plans and strategies for further performance through established standard operational procedures
- Establish contact with other leaders in CP.

O = Information, deployment, organization/management (Opplysninger, oppmarsj og organisering/ledelse)

- Gather and provide information and details on the way to the incident
- Think big and request sufficient resources
- Communicate with the dispatch center
- Follow a deployment plan, including appropriate placement of vehicles and resources, and ensure an escape route.
- Establish CP and other management functions
- Communicate clearly in the initial phase of the operation

R = Risk assessment, reconnaissance and resources

(Risikovurdering, rekognosering og ressurser)

- Risk and safety assessment for oneself, others (personnel and patients), environment, and assets.
- Obtain an overview of the situation
- Reconnaissance together with the operational commanders and other possible leaders in CP to understand each other’s needs and not lose contact.
- Proactive resource assessment (acquire enough resources for the present and for the future)
- Alert other emergency units and stakeholders (e.g. Red Cross, Coast Guard, land owners) and consider their response time

S = Securing and situation report (Sikring og situasjonsforståelse)

- Ensure the safety of oneself and personnel
- Secure against present and future threats
- Consider future aspects and be pro-active, not reactive and incident driven
- Provide and obtain situation report to the dispatch centers

- Give and receive good, accurate and time-critical information
- Adjustment of resources if needed

T = Triage (prioritizing)
(Triage (prioritering))

- Prioritizing of patients so everybody gets the right treatment to the right time
- Prioritizing of life first, then environment and assets.
- Provide appropriate treatment, in the right order, at the right time.

Å = Incident management
(Åstedshåndtering)

- Continue with the operative work at the incident
- Good overview over the situation
- Clear roles and responsibilities
- Communication, coordination and control
- Handle the media

T = Measures on patient
(Tiltak på pasient)

- Life-saving measures is the main priority for all agencies
- After the triage, give physical and psychological first aid to all who are involved

T = Transportation to hospital
(Transport til sykehus)

- Start the transportation of critical patients to the hospital as soon as possible
- Contact with medical dispatch center regarding transportation of patients
- Establish collaboration between the patient assembly area and the evacuation control point

Appendix F: ITD Coding Scheme

The Intuitive Team Decision Making model was divided into three parts: the decision-making process, the team's background variables and context variables. One statement is coded in one of the categories in each part of the model. If it does not fit into a category, it is placed in *Residuals* category in the given part of the model. The categories within each part of the model were operationalized as the following:

Part 1: The decision-making process

The operationalization of the following categories were based on Kline (2005). All the categories are considered value-free, ie. statements are coded in the categories even though they reflect the *lack of* the given elements.

Event occurs which requires a decision, including limited time to make a decision.

Intuitive understanding of the event: The team has a collective intuitive understanding of the event by comparing it to shared mental models, including recognizing characteristics or patterns in the situation.

Situation shared mental model: The team builds a shared situation mental model of elements in the situation which they cannot understand, by suggesting alternative courses of action, sharing relevant information and agreeing when the appropriate course of action is suggested.

Intuitive consensus: The team immidiately reach a consensus on a decision, and implicit or explicit support the mutual agreement.

Validate/implement the intuitive consensus: The team members validate the decision after it is taken, to one another and others, while concurrently planning how the decision will be implemented.

Part 2: The Team's background variables.

The operationalization of the following categories were based on Kline (2005). All the categories are considered value-free, ie. statements are coded in the categories even though they reflect the *lack of* the given elements.

Informal routines: Routines developed through informal communication, including discussing scenarios, asking for advice, and discussing work problems.

Expert team: An expert team consists of individual experts. Internal and external expectations, roles, and common goals are recognized. The team is able to reach consensus on most decisions. The team members have broad knowledge and/or experience of specific parts of the team work, such as available resources, staff, relevant experience etc., and share this information with the rest of the team.

Shared mental models of team norms: Team members have common expectations of how the team members will act toward one another, including honesty, trust, respect for each other, accountability, empathy, belonging and open communication.

Shared mental model of team goals: Team members share a common understanding of their goals as well as the tasks and experiences necessary to accomplish them.

Shared mental models of team identity: The team members perception of themselves as a team, including their understanding of the collective behavior in a given situation.

Part 3: The context variables

The operationalization of the following categories were based on Kline (2005) and Agor (1989). The categories are *not* considered value-free.

Variables in a situation that promote intuitive decisions:

Uncertainty and risk: Situations characterized by high levels of uncertainty, including perceptions of risk, unclear roles, uncertainty of what decision to make.

Little previous precedent: Situations which are unfamiliar to the team members, including cooperation with other team members and staff and new situations.

Unpredictable variables: Situations characterized by scientifically unpredictable elements, such as new developments in a situation, weather conditions and appointments contingent on developing situations

Limited «facts»: Situations characterized by limited information, including lack of situation overview, information about the situation and about available resources.

«Facts» are ambiguous: Situations characterized by ambiguous information, including information that leads to misunderstanding.

Time pressure: Situations where there is limited time and pressure to make a right decision, including fast decision-making.

Alternative solutions: Situations where there are several valid alternative solutions with good arguments for each.

New trends: New trends are emerging in societies which affect the situation, including societal challenges, different infrastructure, actors involved in the situation and economic conditions.