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TIME OUT: ORGANIZATIONAL TRAINING FOR IMPROVISATION IN LIFESAVING CRITICAL TEAMS

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TIME OUT: ORGANIZATIONAL TRAINING FOR IMPROVISATION IN LIFESAVING CRITICAL TEAMS

by

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TIME OUT: ORGANIZATIONAL TRAINING FOR IMPROVISATION IN LIFESAVING CRITICAL TEAMS

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Abstract

Exemplified by fire crews, SWAT teams, and emergency surgical units, critical teams are a subset of action teams whose work is marked by finality, pressure, and potentially fatal outcomes (Ishak & Ballard, 2012). Using communicative and temporal lenses, this study investigates how organizations prime and prepare their embedded critical teams to deal with improvisation.

This study explicates how organizations both encourage and discourage improvisation for their embedded critical teams. Throughout the training process, organizations implement a structured yet flexible "roadmap"-type approach to critical team work, an approach that is encapsulated through three training goals. The first goal is to make events routine to members. The second goal is to help members deal with non-routine events. The third goal is to help members understand how to differentiate between what is routine and non-routine.

The grounded theory analysis in this study also surfaced three tools that are used within the parameters of the roadmap approach: experience, communicative decision making, and sensemaking. Using Dewey's (1939, 1958) theory of experience, I introduce a middle-range adapted theory of critical team experience. In this theory, experience and sensemaking are synthesized through communicative decision making to produce decisions, actions, and outcomes in time-limited, specialized, stressful environments.

Critical teams have unique temporal patterns that must be considered in any study of their work. Partially based on the nested phase model (Ishak & Ballard, 2012), I also identify three phases of critical team process as critical-interactive, meaning that they are specific to action/critical teams, and they are engaged in by critical teams for the expressed purpose of interaction. These phases are simulation, adaptation, and debriefing. These tools and phases are then placed in the Critical-Action-Response Training Outcomes Grid (CARTOG) to create nine interactions that are useful in implementing a structured yet flexible approach to improvisation in the work of critical teams.

Data collection consisted of field observations, semi-structured interviews, and impromptu interviews at work sites. In total, I engaged in 55 hours of field observations at 10 sites. I conducted 31 semi-structured interviews with members of wildland and urban fire crews; emergency medical teams; and tactical teams, including SWAT teams and a bomb squad. I also offer practical implications and future directions for research on the temporal and communicative aspects of critical teams, their parent organizations, and considerations of improvisation in their work.

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CHAPTER 1 - INTRODUCTION

There are particular teams for which dealing with unpredictability is a part of life. Made up of highly skilled members and tasked with time-sensitive performance events, *action teams* deal with novel circumstances on a daily basis (Sundstrom, 1999). The organizations that house them (e.g., fire departments, military branches) may provide structure and support to reduce the need to improvise in the face of non-routine events. For example, part of military training involves simulation of wartime activities so that personnel will have experienced as many common scenarios as possible before going to battle. Despite the criticality of these teams in our society, they have been vastly understudied.

Action Teams

Studies of action teams make up a very small percentage of the scholarly literature on groups. Sundstrom and colleagues (2000) examined 90 group studies from the 1980s and 1990s that met the following requirements: teams were 1) labeled as teams and 2) worked for pay; and researchers 3) treated groups as the unit of study and 4) measured group effectiveness (they did not include sports teams or student groups). Of the 90 studies, only 9 focused on action teams. Their research sites included military units (Eden, 1990; Tziner, 1988; Tziner & Eden, 1985; Tziner & Vardi, 1982), police teams (Brewer et al., 1994), hospital emergency units (Argote, 1982, 1989), firefighter teams (Wekselberg et al., 1997), string quartets (Murnighan & Conlon, 1991), and live

TV production crews (Carter & West, 1998). Given that action teams are often important components of society (e.g., firefighting, law enforcement, military), it would stand to reason that they should receive more attention from communication researchers going forward.

For the same reasons that certain teams *have* been studied in the field of group research, action teams have not received attention. Unlike those in the service industry, many action teams perform work that is highly guarded (e.g., military units), private (e.g., surgical teams), or dangerous (e.g., police squads and fire crews). Unlike management, action teams perform heavy physical work that sometimes occurs over large spaces (e.g., spill containment teams), which makes fieldwork difficult. And unlike production units, action teams do not have easily understood inputs, processes, and outcomes. In fact, action teams are defined by their inherent complexity. There are three components of action teams that add to their distinctiveness. First, they conduct time-limited engagements in front of audiences or against human and non-human adversaries (Sundstrom, 1999). Second, they are composed of highly skilled members who have specialized individual tasks and complementary roles (Mathieu & Day, 1997; Ziegert, Klein, & Xiao, 2001). Third, their life cycle is composed of two interrelated concepts: taskwork and team process (Marks, Mathieu, & Zaccaro, 2001). Taskwork is *what* teams do, including interaction with tasks, tools, and systems (Bowers, Braun, & Morgan, 1997); team process is *how* teams do things, involving interdependent events—such as communication and coordination—that convert inputs to outcome. Team process is used to direct taskwork, meaning that action teams cannot complete crucial tasks without

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effective communication. While the distinction between taskwork and team process can become blurry, the importance of interaction is not; for example, practices such as emergency medicine are mainly communicative activities (Eisenberg et al., 2005). Team process also includes interactions that span team boundaries (Cohen & Bailey, 1997), incorporating communication with other members of the larger organization.

Action teams are important to the larger field of organizational communication because most are highly integrated into organizations of societal consequence. For example, surgical units cannot exist without the larger system of a hospital. A hospital can technically exist without a surgical unit, but the goals of the hospital (e.g., saving lives, profit) would benefit from the inclusion of such teams. Most group research has not examined links between team performance and systems in which they are embedded (Joshi & Roh, 2009; Levine & Moreland, 1990). This is especially troubling when examining action teams because they are highly integrated into organizations. Because they conduct brief but complicated performances, the proficiency of action teams is dependent on prolonged training (Ellis et al., 2005; Sundstrom, 1999; Sundstrom & Altman, 1989), which is often structured and funded by the organization. And because they use scarce and highly developed expertise, they need a great deal of support from the rest of the organization for critical tasks. For example, hospital workers perform particular necessary tasks before surgery, such as cleaning and organization of tools, because a skilled surgical unit must focus their time and mental energy on specialized activities.

There are consequences of embeddedness for the team and organization (Ellis et al., 2005; Guzzo & Dickson, 1996; Joshi & Roh, 2009). First, the performance of the team is tied to that of the larger system. Second, changes that occur in one social entity will affect the other. Third, it becomes more difficult to understand cause and effect in either unit, as interventions made at one level have an effect at other levels. Guzzo and Dickson (1996) make a plea for research on teams and change in organizational systems even in the face of heightened complexity. Certainly any study of action teams will involve a level of difficulty, but such difficulties are outweighed by the benefits of being able to study concepts relevant to organizational communication at a different yet crucial unit of analysis. Below are three concepts that must be taken into account in any study of action teams.

Time. Action teams have a unique relationship with time in that they must perform activities in an externally paced temporal structure. For example, firefighters cannot choose when a fire needs extinguishing, nor can an emergency medical team put off dealing with an outbreak of a virus. Even in teams that control the start of an event, such as an orchestra, the tempo of the song then paces their work. More importantly, the work of action teams is characterized by finality. If a firefighting unit does not put out a fire appropriately and casualties occur, they cannot "redo" the activity later. Even in less consequential action settings, such as sports, performance events are still final. Because of external pacing, finality, and deadlines, action teams develop communicative practices that prioritize efficiency and specialization, discussed below.

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Communication. In the face of deadlines, action teams develop communicative practices anchored in efficiency and specialization. For example, pilots have their own language of short phrases and terms to signify elaborate concepts (Kanki & Smith, 2001). Pilots also have interaction patterns that are unique to their field. Time pressures have created a variety of "distinct, sophisticated and recognizable interaction" among action teams (McKinney et al., 2005, p.215). Because action teams use team process to direct taskwork, their interactions are just as crucial as their activities. Many teams that deal in life-or-death work (e.g., surgical units) must communicate seamlessly to be effective. Eisenberg and colleagues (2005) posit that emergency medicine is mainly a communicative activity; indeed, many mistakes in medicine are linked to communication procedures and are easily preventable (Aggarwal et al., 2004; Cicourel, 2004; Leape, Lawthers, Brennan, & Johnson, 1993; Lingard et al., 2004, 2005; Salas et al., 2008). NASA found that 70 percent of errors in aviation were due to human factors, including poor communication (Helmreich, Merritt, & Wilhelm, 1999). Even those practicing in the field agree on the importance of good communication practices in the face of time-constraints; 80 percent of medical professionals point to pre- and post-operative discussions as key components of teamwork and safety (Aggarwal et al., 2004). A study of flight crews found that pilots believe communication skills to be as important as flight skills to technical safety (Tajima, 2004). Certainly, action teams offer a critical setting in which to study the communicative processes of groups and organizations.

Complexity. Action teams are complex by nature. They have high levels of integration and differentiation, which creates intricate negotiations at the group-

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organization boundary. There is often a high level of turnover among action teams

(Klein, Ziegert, Knight, & Yan, 2006), requiring constant incorporation of new group

members. Their processes generally involve uncertain inputs and lead to unpredictable

outcomes. Demands such as time, decision-making, and stress lead to heightened

confusion among members (Marks et al., 2001). In addition, they often have to

improvise in the face of unpredictable environments.

In addition to studies of time, communication, and complexity, research on action

teams could reveal findings on team-organization relationships. The relationship

between the team and organization is critical because the team is enacting at least a

portion of organization's goal(s) and the organization provides a context in which to

achieve them. Organizational context is defined as the inputs provided (or not provided)

to the team—both intentionally and inadvertent—that affect their process and outcome.

More specifically, it is the rewards, information, education, and material resources at the

team's disposal (Hackman, 1987; Wageman, Gardner, & Mortensen, 2012).

Conceptually, context included only a few inputs in the 1970s but later broadened as

more factors were discovered in practice (Ketchum, 1984).

Many aspects of organizational context impact the effectiveness of work teams

(Doolen, 2006; Doolen, Hacker, & Van Aken 2003; Gladstein, 1984; Sundstrom et al.,

1990, based on a study by Cummings and Molloy, 1977). One aspect is organizational

culture, enacted by collective artifacts, values, norms, and assumptions (Keyton, 2011;

Rousseau & Cooke, 1988). High-performing teams are usually influenced by an

organizational culture that values principles such as superior quality and service, attention

to detail, and support of innovation (Dyer & Dyer, 2010; Peters & Waterman, 1982). Another aspect is task design and technology. While tasks differ from team to team, the importance of a task-focused process is widely supported by small group researchers (Arrow et al., 2000; Guzzo & Dickson, 1996; McGrath, 1984). Organizations must engage teams tasks such that expected processes fit the team type. For example, teams with unpredictable inputs and outcomes—a descriptor that fits many action teams—may perform best with decentralized communication (Tushman, 1979; Tushman, Lakhani, & Lifshitz-Assaf, 2012) and flexible coordination (Argote, 1982; Stachowski, Kaplan, & Waller, 2009; Susman, 1970).

Therefore, organizations must consider a team's integration and differentiation needs when determining the appropriate type of support and control given to the work group. Groups often negotiate interdependence with organizations because they function most effectively when inputs from the organization fit the team's demands (Anand, Clark, & Zellmer-Bruhn, 2003; Sundstrom & Altman, 1989). First, organizations must be aware of the level of group integration. Integration refers to the communication, coordination, and centralized control occurring among the organization and embedded group (Katz & Kahn, 1978; Kozlowski & Ilgen, 2006; Sundstrom & Altman, 1989). It involves temporal issues such as external pacing and synchronization. Variation on this measure has been described as tightly coupled versus loosely coupled (Kozlowski & Ilgen, 2006; Weick, 1982) or as autonomy versus centralization of control (McGrath and Kelly, 1992). Organizations must also consider differentiation between group members

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and nonmembers. Differentiation is defined as group specialization and independence (Humphrey, Morgeson, & Mannor, 2009; Sundstrom and Altman, 1989).

It is difficult for a group to be highly integrated with and differentiated from an organization at the same time, but this is the case for action teams. Sundstrom and Altman (1989) proposed a typology of teams based on levels of integration and differentiation in which most types of groups are either high on one measure or the other; the relationship between integration and differentiation is strongly inverse because of the complexities involved in achieving both concomitantly (Anand et al., 2003; Lawrence and Lorsch, 1969; Sundstrom & Altman, 1989). If a group is high in both measures, it would be constantly engaged in negotiations of control with the organization: organizations would want more control because of high integration needs, while the group would want autonomy due to specialization. For example, a military bomb squad has unique procedures they must enact to increase probability for success; at the same time, the larger military system would want to standardize procedures so their training, equipment, and strategy can be integrated with all squads under their control. Such teams must deal with complexity created by negotiations of control between the group and organization. The only team type that Sundstrom and Altman (1989) categorize as having high levels of both integration and differentiation are action teams. Thus, the interactions between action teams and their support organizations are both highly dynamic and ripe for research on the relationship between organizations and teams.

Team Improvisation

One interesting facet of the team-organization relationship is the approach to improvisation, which is heavily dependent on interactions that occur long before decisions are made. Because organizations are often responsible for training, personnel, and culture, decisions made in the heat of the moment by team members are influenced by input variables provided by the organization in preparation for actual performance events. In other words, the success of any team is dependent on the organization. *Manager-led work teams*, for example, require that the manager or organization monitor, design, and determine structure while teams perform tasks (Hackman, 1987; Stone, 2010). Organizations should also provide ongoing assistance, such as creating opportunities for the group to renegotiate design and context. The team relies on the organization for many of its inputs, and the organization should provide them because teams are crucial to their missions. This symbiotic relationship is no more apparent than in the study of improvisation for action teams.

The dilemma of improvisation is faced by many high-risk organizations. If they provide too much structure and experience for their teams, improvisation may occur less than it should. If they create culture and communication systems that are overly supportive of improvisation, teams may ad-lib too often. This is not to say that structure and support for improvisation are diametrically opposed; rather, they are orthogonal dimensions that organizations have to balance in training and support provided to teams. It is important to understand that teams may be forced to act independent from their

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parent organizations at times, so they must take particular issues into account well before teams engage in performance events. And while it may seem that action teams comprise only a small percentage of all group types, their specialization implies "non-normal organizational performance situations" which are important to mainstream organizational theory (Whetten & Cameron, 1994, p. 136). Improvisation is a variable that should be considered at the earliest stages of team training in organizations.

There are particular issues that should be addressed in future research of improvisation in organizational communication. First, our understanding of improvisation will be more robust if we know how members of teams and organizations talk about improvising. It is likely that some teams accept it as a part of their work and talk about it regularly, while other teams avoid it completely. Second, as we recognize that action teams have unique communication patterns, we should examine how particular interactions during performance events might initiate or preclude improvisation. For example, there may be interactions or schemas that organizations instill in their members to remind them of their structure. Third, we should strive to incorporate fieldwork into research on action teams. Even though access can be difficult, action teams are unique because of the real-life pressures they face on a day-to-day basis, something that cannot be captured in a laboratory.

Rationale

The study of action teams would answer a plea by group communication scholars to study teams with real consequences. Specifically, action teams also offer a rich setting

in which to study bona fide groups, or those that have stable yet permeable boundaries and interdependence with context (Frey, 2003; Putnam & Stohl, 1990). Action teams have stable yet permeable boundaries because membership is clearly defined but can be changed, and interdependence with context is a critical component of action teams because they almost exclusively exist within a larger support organization. This is of value to organizational and group communication scholars because studying groups in context eliminates the errors that occur from studying groups in a vacuum (Farris, 1981; Frey, 2003).

Any study of bona fide teams is a study of organizations. To attempt an understanding of teams without organizational context would be the same as trying to understand members without an organization ("then what are they members of?") or an organization without members ("then what is the organization made of?"). In this way, an organization's relationship to its teams is very similar to its relationship with the people that comprise it. Teams are like members but larger and more complex. In turn, the organization is often the implied variable in team communication research. This is especially true with action teams because they are highly integrated within the organization (Klein et al., 2006; Sundstrom and Altman, 1989).

Putnam and Stohl (1990) lay out three requirements for group research, all of which are met by the study of action teams. First, group research should involve the emotional intensity and stress associated with real groups. Because action teams always have something at stake (e.g. human lives, team victories), they cannot exist without emotions and stress. Second, groups should have temporal structures that resemble real

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life spans. Action teams always conduct time-limited engagements (work) that occur in an authentic group life span (time), a relationship that mediates communication of the team (Ballard & Seibold, 2000, 2003). Third, group research should cover a variety of team types. There are many different kinds of action teams. Ishak and Ballard (2012) detail three subsets of action teams with a multitude of differentiating factors. A study that focuses solely on action teams can still provide a robust variety of team types on which to focus.

The conceptualization of action teams at the group level is valuable because it falls into a Goldilocks-type window between organizations and individuals. Poole (1998) argues that the majority of studies that use the organization as the unit of analysis treat them as "giant individuals, much more as micro theories focus on individual human organisms" (p. 96). This perspective pushes the role of human interaction into the background. Thus, Poole says that small groups should be the fundamental unit of analysis for communication studies. It has also been argued that the organization is meaningless as a unit of analysis (Wiley, 1988); instead it may be more appropriate to focus on the intersubjective (dyads), generic subjective (roles), and extrasubjective conceptions (meaning that does not belong to an individual), such as organizational routines (Pentland & Feldman, 2005). Some prominent organizational researchers agree with the crux of Poole and Wiley's arguments. For example, Weick and colleagues (2008) allow that research on high-reliability organizations (HROs) does not have to occur at the organizational level of analysis. Instead, they feel that systems make up the appropriate analytical unit. Systems are defined any type of interrelated set of elements,

methods, structures, or arrangements, and they can be larger or smaller than organizations. Larger units are useful to study because errors that lead to bad consequences often involve multiple members embedded in larger systems (Woods, Johannesen, Cook, & Sorter, 1993). Smaller units, such as teams, can be the appropriate level of analysis because teams often contain the risk handlers of the organization, performing manual work and interpreting actions (Perrin, 1995). One example of a suitable approach is Vaughan's (1996) analysis of the *Challenger* disaster. Although Vaughan unitizes both dyads and larger NASA systems, her study works well because she maintains a focus on process. This is effective because processes that are fundamental for dyadic relationships are embedded in all communicative relationships that matter (Weick et al., 2008). A logical extension of this argument is that fundamental group processes are crucial to larger organizations. Consequently, a focus on teams can serve as a fresh perspective on vital concepts in organizational communication research.

Much like the broader categories of organizations, work groups, and action teams, a study on a crucial subset of action teams—critical teams—would offer unique settings for research on particular organizational communication principles. Critical teams are those that operate in life-and-death situations within complex systems that necessitate a high degree of coordination. Examples include fire crews, military units, and S.W.A.T. teams. Indeed, critical teams are embedded in *teams* and *action teams* but present opportunities to explore meaningful concepts that are not available in those wider categories. Management scholars might study work groups as a way to synthesize effectiveness, cohesion, organizational context, and the dual concepts of integration and

differentiation. More specifically, researchers on action teams will find a setting rich with data on time, complexity, and crucial communicative practices.

Organizations cannot be studied without accounting for the systems that comprise its structure, and teams exist to serve the function of the organization. Processes that are fundamental for dyadic relationships are embedded in all communicative relationships that matter (Weick et al., 2008). In other words, what we learn from interpersonal relationships can be applied to organizational communication. A logical extension of this argument is that the study of group communication has ramifications on the organization as well. Research on teams has multiple potential contributions to organizational research, including better comprehension of effectiveness, organizational context, and integration/differentiation.   In addition, research on action teams will help strengthen our understanding of improvisation and improvised communication, concepts that are vital for the advancement of organizational communication research. This manuscript spotlights action teams and their support organizations to contextualize research on improvisation and improvised communication.

CHAPTER 2 – LITERATURE REVIEW

The purpose of this chapter is to review multiple bodies of literature that form the background for the present study. In particular, the topics of improvisation, time, and communication are explored within the context of action teams. I begin with an overview of team-organizational context, focusing on the effects of inputs from the organization on team outputs. Next, I review critical teams—a subset of action teams—and compare them to the management perspective on high-reliability organizations (HROs). This leads to an examination of the phases of unique timing of action teams. Then. I review a component of the unique timing of action teams: the role of improvisation in their work. Finally, I identify several research questions that serve as the basis of my empirical investigation.

Teams and Organizational Context

What do we call a set of individuals who work interdependently in a hierarchy to create goods or provide services: a *team* or an *organization*? It might be presumed that objects of study must be one or the other, but this is a false dichotomy. It has been argued that an organization is defined by the existence of five critical features: social collectivity, goals, coordination, structure, and embeddedness (Miller, 2011). This definition fits many teams and organizations interchangeably. In a study of the Mann Gulch disaster, Weick (1993) argues that a high-risk type of wildland firefighting team was also an organization because it had an interlocking set of routines—habitual patterns

that involve the same people and activities in the same times and places (Westley, 1990)—and it fit Mintzberg's (1983) five criteria for a simple organizational structure: coordination by direct supervision, top-down strategy, minimal formalized behavior, organic structure, and plans formed by leader institution. According to Weick, the same system can be considered a team or an organization. As a result of such conceptual flexibility, teams have a place in organizational communication even before an explication of the potential contributions of team research.

Here I will synthesize many scholarly conceptualizations into three characteristics that make up the basic definition of a *team*. First, they are *interdependent* because the tasks they perform demand such a setup (Guzzo & Dickson, 1996; Campion, Medsker, & Higgs, 1993; Offermann & Spiros, 2001). This interdepence should be structural, meaning the design of the work itself requires the interaction of a group of people (Wageman, et al., 2012). Teams also have *formal, shared responsibility* for one or more outcomes (Sundstrom & Altman, 1989). Lastly, they are *embedded within a larger social system* that is affected by said outcomes (Hackman, 1987; Hackman, 2012; Guzzo & Dickson, 1996, Sundstrom & Altman, 1989). Often, the larger social system is an organization with which the team has a symbiotic relationship.

Organizational Context and Effectiveness

It can be argued that most team studies have the implicit or explicit goal of understanding what makes teams more effective, since the goal of working in teams is to increase effectiveness at a given task. However, team effectiveness is a complex, multi-

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dimensional construct (Maynard et al., 2012; Wageman et al., 2012). The minimal

definition of effectiveness comes from Guzzo and Shea (1987): "the production of

designated products or services per specification" (p. 329). This denotes a binary

perspective on effectiveness: a team's output is either satisfactory or unsatisfactory.

However, issues like lasting conflict and dissatisfaction with process can lead to burnout,

leaving members unwilling to work on subsequent projects (Apker, Propp, & Zabava

Ford, 2009; Hackman & Oldham, 1980). Therefore, it has been posited that a team must

achieve both performance *and* viability (Maynard et al., 2012; Sundstrom et al., 1990;

Wageman et al., 2012). Groups must also strive for member satisfaction, participation

and a willingness to work together to consider their efforts effective. Building on the

classic definition from Hackman (1987), Wageman and colleagues (2012) define the

measurement of effectiveness as client satisfaction, team viability, and member growth

and fulfillment. From a temporal perspective, teams must balance effectiveness *now*

(e.g., how are we performing?) and effectiveness *later* (e.g., does our process have long-

term viability?). For example, a doctor will leave at the end of her shift, even if handing

off patient responsibility results in decreased effectiveness (Eisenberg et al., 2005). A

doctor will do so because she needs regular time off to be effective in the long term.

Team effectiveness is dependent on the *sustainability* of performance.

Many of the inputs for group effectiveness explicated by researchers are not under

total control of the team, a fact that calls attention to the importance of the organization.

For example, Sundstrom and colleagues (2000) argue that two types of processes have an

effect on group performance. One is intragroup process, defined as the communication,

coordination, conflict and collaboration within the team. The second type is external group process, which includes communication and collaboration with non-members and integration with the larger organization. Other factors that involve the organization include group composition, work design, and synergy (Hackman, 1987; Sundstrom et al., 2000). While these variables may be viewed as encapsulated by the group, it is important to remember that the organization has influence on member choice, task structure, and group norms (Hackman, 1987, Stone, 2010). Studies of effectiveness are more accurate if they account for organizational context, which affects and is affected by the team-organization relationship.

Researchers have previously argued that organizational context has an effect on group performance (Sundstrom et al., 2000). Hackman (1977, 1987) was one of the first social scientists to call for the inclusion of organizational context into studies of effectiveness. In doing so, he introduced new requirements for the study of effectiveness as well as requirements for group process. According to Hackman, studies of effectiveness must examine 1) intact social systems, not including social groups, advice groups, or coaching groups (because they have individual tasks). Groups of interest must have 2) boundaries and differentiated roles and 3) more than one task to perform. Lastly, they must 4) operate in an organizational context. This last requirement is also an important factor for determining the effectiveness of group process, as it has been argued that effectiveness should be defined by the system, not the researcher (Hackman, 1987. Freestanding groups (those not housed in an organization) are not of value in the study of performance because effects on the larger system cannot be measured. A model that

attempts to bridge the gap between understanding and improving effectiveness must only measure and predict the actions of intact social systems embedded in organizations—in other words, "real groups" (Hackman, 1987, p. 322). Otherwise, the researcher denies the consequences of organizational context on team effectiveness.

Critical Teams

Critical teams have received more focus from group scholars than other types of action teams, which is deserved given the high-risk nature of their work. Critical teams are so named because they generally deal in life-or-death outcomes (Ishak & Ballard, 2012) and they work in situations where "ineffective performance can have disastrous consequences" (Cannon-Bowers et al., 2001, p. 221). Multiple components of the definition of *critical* describe the category: teams of this type are 1) urgently needed, 2) societally necessary, and 3) marked by attention to errors and flaws. Their success is measured both competitively (i.e., they are trying to beat an adversary) and perfectively (i.e. success is on a spectrum). This is important to the process of critical teams because it adds complexity to already intricate situations. With such measures of performance, critical teams will be faced with the following question from time to time: do we try to win "harder", or do we satisfy ourselves with being barely victorious? The significance of this question may be clearer when considered in the framework of the military, where leaders often have to make decisions that place winning a battle (competition) and limiting casualties (perfection) on opposing ends of a decision-making scale.

Most of the research on critical teams has come from organizational behavior and management (although not labeled as such), with additional work done in communication and military psychology. There are a limited number of communication-based studies of critical teams, generally focusing on wildland firefighters (Larson, 2003) and emergency medical teams (Eisenberg et al., 2005; McKinney et al., 2005) Studies in military psychology have examined the links between team effectiveness and various inputs, all in a laboratory setting (Bowers, Baker, & Salas, 1994; Halfhill, Neilsen, Sundstrom, & Weilbaecher, 2005; Stout, Salas, & Carson, 1994; Urban, Bowers, Monday & Morgan, Jr., 1995; Halfhill, Neilsen, and Sundstrom, 2008). Additional studies, while not explicitly focused on the group level, are still relevant to studies of critical teams. For example, Thackaberry (2004) and Ziegler (2007) examine discourse, culture, and change in wildland firefighting training and accident investigation. These are examples of studies that are not necessarily focused on the team level but have relevance for critical team work.

Management scholars have conceptualized critical teams as *high-reliability organizations (HROs)*, systems that operate successfully in environments that could produce catastrophic errors (Perrow, 1984; Roberts, 1990; Weick, 1990; Weick & Sutcliffe, 2001). They argue that HROs have succeeded because of five factors: preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, and deference to expertise (Weick & Sutcliffe, 2001). Most research on HROs is comprised of case studies on organizations such as nuclear plants (Bierly, Paul, Gallagher, & Spender, 2008; Marcus, 1995; Bourrier, 1996), aircraft carriers (Rochlin,

LaPorte, & Roberts, 1987), and air traffic control systems (Kontogiannis, 2012; LaPorte, 1988; O'Neil & Krane 2012). The studies have focused on themes such as effective action and limited failure and have generally emphasized structure rather than process (Weick, Sutcliffe, & Obstfeld, 2008). While the most straightforward definition of HROs is that they are problem-solving organizations (van Stralen, 2008), such a simplification would neglect important details: all HROs operate in unforgiving social environments with a rich potential for error in which massive consequences rule out learning through experimentation (Weick, Sutcliffe, & Obstfeld, 2008). They must also use complex processes to manage intricate technologies in the face of dynamic vulnerability (Rochlin, 1993).

The conceptualization of critical teams is different in a few ways from that of HROs. First, HROs only include systems that have been successful, whereas critical teams include all teams regardless of outcome. Weick and Sutcliffe's (2001) label of *high-hazard organizations* is much closer to the conceptualization of critical teams, but that label has seen extremely limited use. Second, studies of HROs generally come from a behavioral perspective and focus on the concept of mindfulness (Weick & Roberts, 1993; Weick & Sutcliffe, 2001). Third, the literature on HROs is more focused on accidents than systems or coordination (Weick et al., 2008). This limits the types of organizations that can labeled as an HRO to those that have the potential for catastrophe. Fourth, critical teams are often conceptualized as smaller units while HROs generally encompass more than just the team. For example, a bomb squad would be viewed as a critical team while the larger military unit—including support crews—would be

considered an HRO. Methodologically, HROs have been exclusively studied using content analysis and interviews, as it would be difficult to predict a failure and then actively choose to embed one's self near a catastrophe for the purpose of fieldwork.

While most work on HROs has been descriptive (Weick et al., 2008), two main theories have branched from their study. Perrow's (1984) study of Three Mile Island led to the development of Normal Accidents Theory (NAT), which states that accidents are inevitable in systems that have tightly coupled elements and interactive complexity. Perrow argued that a change to loose coupling and/or a linear transformation system would reduce catastrophic error. In contrast, High Reliability Theory (HRT) is more complex and more popular among management scholars. Based on work of numerous researchers (LaPorte, 1994; LaPorte & Consolini, 1991; Roberts, 1990; Rochlin, 1993; Schulman, 1993; Weick, 1987; Weick et al., 2008), HRT involves the satisfaction of seven necessary conditions to avoid catastrophic errors: 1) prioritization of safety, 2) careful attention to design and procedures, 3) limited degree of trial-and-error learning, 4) redundancy, 5) decentralized decision-making, 6) continuous training, and 7) strong cultures that focus on preventing accidents. Proponents of NAT argue that HRT neglects complex environmental influences and politics (Sagan, 1994), and followers of HRT have declared that NAT is too quick to assume that a tightly coupled interactively complex system will not work. Both NAT and HRT have not been popularized in organizational research in part because they are more focused on accidents than organizations. Another reason is that reliability may seem like a simple, obvious concept to other scholars (Weick et al., 2008).

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High-hazard organizations that strive for reliability must enact cognitive processes that are both diverse and complex. An organization must give its members "license to think" because reliable systems are built on members that actively seek information before and after catastrophes (Westrum, 1992, p. 405). New ideas should be welcomed but should not challenge the singular focus on avoiding failure. Reliability also comes from collective mindfulness. In the case of HROs, mindfulness can be described as enriched awareness of events and surroundings coupled with a focus on catastrophe (Weick et al., 2008). Each time a routine occurs, it unfolds in a slightly different manner (March & Olsen, 1989), so members must combine fragments of old and new actions to create a distinct, appropriate response (Weick et al., 2008). HROs must also be careful not to oversimplify because it increases the likelihood of eventual surprise (Weick et al., 2008). In essence, members of HROs must be comfortable working in a complex, dynamic environment. This goes for critical teams as well, many of which are housed in HROs. What makes this difficult is that critical teams often do not have time for deliberate processes. In the next section I discuss the temporality of these teams.

Temporality of Action/Critical Teams

Action teams, particularly critical teams, have unique temporal traits that contribute to the value of their study. One such characteristic of action teams—which is different from many others—is the *finality* of their work. Teams such as surgical crews and military units cannot "redo" their work at a later time. In other words, deaths on an

operating table or battlefield are irreversible. Even action teams with lighter

consequences must deal with finality. A string quartet that makes a mistake during a

performance has made that mistake indelibly—they cannot remove it from their

performance history.   On the other hand, imagine a team of intellectual property lawyers

who need to correct an error on a patent. While there may be some time pressures (e.g., a

competing team trying to file a similar patent), they are still allowed to re-write the

patent. In addition, the lawyers can start the writing process earlier than anyone else,

providing time to revise first drafts. They are not bound by starting and ending time

constraints as strictly as are action teams.

It can be argued that finality is a dimension of the work of all groups, not just

action teams. This is certainly true in the long term. However, the work time of most

knowledge workers is generally fungible, meaning a minute of work now can be

substituted for a minute of work later with little consequence (Bluedorn, 2002; McGrath

& Rotchford, 1983).   In contrast, action teams deal frequently in epochal time, which is

composed of events (Bluedorn & Standifer, 2006; Whitehead, 1978). This is a

consequence of the dramatic starting and finishing points of performances. The

difference between fungible and epochal time can be roughly explained by comparing the

work of accountants and firefighters. A team of three accountants may estimate that their

work for the month of March will take around 900 hours total. They can choose to put in

hours at any time as long as they finish. This is because time (and the resulting task

accomplishment it affords)—not events—typically matter most for knowledge workers.

In contrast, if a fire crew is tasked with putting out a blaze, they cannot choose to do it at

a later time (even putting in the same number of person-hours) without major consequence. What matters is the *event*, not the *time* (in isolation from the event). Events like fires, oil spills, and heart attacks occur epochally because a clock does not determine their start and end points.

Therefore, action teams have to consider the finality and epochality of their process more than other teams do. Because of this, they have a unique schedule that is summarized in the nested phase model of action teams (Ishak & Ballard, 2012). Based on the recurring phase model (Marks, Mathieu, & Zaccaro, 2001), the nested phase model posits that action teams progress through four phases: preparation, simulation, production, and adaptation. Two of these phases, preparation and production, are common with other teams as well. Preparation includes most activities that are designed to better position team members for task success. Production is, in the simplest terms, is the time that counts. For example, a firefighter may read training documents (preparation) and then later fight a fire (production). The other two phases are special because they exist specifically to deal with the heighted finality and epochality of action teams.

Simulation

Simulation is a technique used to replicate aspects of the real world in an interactive manner (Gaba, 2004). It is not "real" action, as the outcome of simulation is only relevant to the extent that it affects later events (a true action phase is one in which the outcome directly affects goal accomplishment). However, the importance of this

phase should not be overlooked, as simulations are used to reduce uncertainty. First, members of the team become familiarized with likely scenarios, as well as with their teammates. Aggarwal, Undre, Moorthy, Vincent, and Darzi (2004) detail the benefits of a simulated operating theatre for surgical teams, with the main advantage being that simulation allows surgeons to familiarize themselves with external influences such as distractions and crisis situations. Second, previously unknown scenarios are brought to light by playing out events with different inputs. For example, a surgical unit may repeat a simulation that they have already completed, except this time they "accidentally" cut an artery. What follows may play out in a familiar fashion to the unit. However, members may experience unfamiliarity, or a sense of "I have never been here before," also known as *vu jàdé* (Weick, 1993). While *vu jàdé* is generally considered an unwelcome feeling, experiencing it during training could reduce the chance of unfamiliarity in a high-risk situation. The expectation is that simulations will uncover and weaken such feelings in a low-risk environment.

Simulation is crucial for action teams because there is no "redo" for what occurs during performance events, many of which have human lives at stake. The finality of their efforts is unforgiving, which results in a work culture that demands error-free performances. The amount a team allocates for simulation is often correlated with the rarity of their job. Teams such as surgical units or fire crews may occasionally use simulation, whereas more select teams (e.g., space shuttle crews, professional sports teams) may spend exponentially more time simulating than in "real" events. This

includes full simulations (e.g., five-on-five practice basketball games) and partial simulations (e.g., players lining up to make layup shots).

Adaptation

By definition, teams interact adaptively towards a common goal (Kozlowski et al., 2009; Salas, Dickinson, Converse, & Tannenbaum, 1992). In this phase, team members stop or slow their work in order to communicate with one another. Generally, teams use adaptation to realign members onto a previously determined trajectory or to discuss coordination onto a new path. The most practical example of adaptation comes from the field of sports. Teams call timeouts during which they players convene midgame to discuss strategy and evaluate their plan and options. Communication patterns and the ability to "stop the clock" during adaptation phases depend on the team and their surroundings. First, communication during a timeout depends on organizational structure. It is likely to be top-down for hierarchical groups such as fire crews, sports teams, and military units. On the other hand, there may be more two-way discussion among teams interested in gathering information from the field, such as search-and-rescue teams.

Second, the time constraints of the environment will determine whether work is stopped or slowed down. Calling a timeout in sports pauses the event, meaning the rules of the game cease to govern the proceedings (Coleman, 1969). Time can be "stopped" for most teams with a human adversary; some team sports allow for timeouts, many legal systems have recesses, and militaries can agree to ceasefires. Conversely, there are teams that do not have the luxury of stopping the clock. Time does not stop for teams that have

a natural adversary, such as a fire or a heart attack. For example, if a fire captain wants to discuss strategy with his crew, he has two options: 1) communicate and fight the fire concomitantly, or 2) stop fighting the fire to talk. The former option can be difficult for multiple reasons, including logistics and the drawbacks of multitasking on information retention. Therefore, the fire captain may choose to pause the physical fight against the fire, even though he knows the fire will not reciprocate. Okhuysen and Waller (2002) argue that the mere presence of temporal pacing can cause group members to interrupt their work and evaluate their progress. By doing so, the group can "consider alternative paths and determine the direction their group should follow in the subsequent work period" (Okhuysen & Waller, 2002, p. 1057). In other words, the group is afforded a chance to *adapt* to their situation when they take a voluntary timeout because they can exchange information more efficiently. Thus, whether it is "on the clock" (e.g., for fire crews) or if it acts as a pause (e.g., for legal teams), taking time to communicate can be beneficial even if it delays response.

Both the simulation and adaption phases exist specifically to counteract the negative effects of finality and epochality on team success. Action teams have a unique schedule involving progression through the four phases put forth in the nested phase model. Different types of action teams will progress in their own way, but each and every action team will spent time preparing, simulating, producing, and adapting. For action teams, the only phase that "counts" is production; consequently, the other three phases are in place to improve performance in the production phase. For example, teams run simulations in part to familiarize their members with various plans and they also have

to adapt when said plans are no longer applicable. Both simulation and adaptation phases are crucial for action teams in part because they often need to improvise during performance events in the face of unpredictable circumstances. The next section details the research on improvisation for action teams.

Improvisation

The majority of studies on improvisation in communication and management literatures describe it an organizational phenomenon that should only occur when something goes wrong—or in jazz music. It is often detailed as a method for the flummoxed, an ambiguous and risky path only to be employed as a last resort. Improvisation—whose very definition is problematic—is questionable as a reliable technique.

While it is true that the inputs, processes, and outcomes of improvisation are more visible—and thus more researchable—in groups, teams, and organizations, particularly during emergency events, improvisation is not limited to only these structures or situations. It occurs for a dentist when he loses electricity in the middle of an appointment. It befalls a guest speaker who cannot connect her computer to the projection system before a lecture. It happens to a mother who must make ends meet when she loses her job. Opportunities to improvise arise every day, multiple times a day, for both individuals and the structures to which they belong. Improvisation is not the provision of critical team organizations, but rather an approach that is deeply embedded into the fabric of human decision making. Still, studies on improvisation in a team or

organizational setting offer two critical values to the communication researcher. First, whereas individual improvisation is mainly a cognitive process that takes place internally, team improvisation will likely involve communicative acts in deliberating, decision making and diffusing options. Second, teams are often taught to communicate a certain way, such as the flight crew that is expected to use standardized nomenclature for their actions, or the police squad that utilizes 10-codes. Studies of team improvisation may allow for insights into *improvised communication*: when team members are forced or choose to interact in new ways (this is different from communication about improvisation).

Here I will review the existing literature on improvisation, pulling research mainly from communication and organizational management but also touching on emergency management as well. First, I will contextualize improvisation in the existing literature and speak to the heightened need among action teams. Next, I will focus on three seminal studies, all of which use improvisational jazz as the basis for their theoretical perspectives: studies by Nettl (1974), Berliner (1994), and Weick (1998). Then, I will examine the relationship between improvisation and planning. I will then compare improvisation and improvised communication. Finally, I will pose my research questions regarding the composition of improvisation and improvised communication for critical teams.

The Constitution of Improvisation

Improvisation involves using knowledge and intuition (Crossan & Sorrenti, 1997; Mendonça, 2001; Weick, 1998) to produce a novel action (Mendonça, 2001). The process involves using what is available at the moment, including cognitive, material, affective, and social resources (Cunha, Cunha & Kamoche, 1999). It is inherently creative; new actions and plans are created spontaneously, and action unfolds as it is conceived by an organization and/or its members (Cunha et al., 1999). It also has an intuitive basis. Improvising involves surfacing and restructuring "one's intuitive understanding of phenomena on the spot" (Weick, 1998, p. 147), and one must determine how to use what they know to extend their current thought patterns (Bruner, 1983). In other words, improvisation is a spontaneous, creative process with unspontaneous roots.

Improvisation not only involves knowledge and intuition, but the application of one's abilities under pressures of time. Moorman and Miner (1998) define improvisation as "the degree to which composition and execution converge in time" p. 702). Weick's (1998) definition of improvisation involves activity "at a time when action can still make a difference" (p. 147). And Mendonça's (2001) definition of improvisation in emergency management is producing novel actions "in time to meet the requirements of a given situation" (p. 1). Improvisation is not based solely on decision making; execution is a critical input of improvisation.

Previous studies of improvisation at the organizational level have focused on successful events and orderly arrangements; however, unpredictability is a major catalyst for improvisation. There are a host of studies that examine situations in which the correct

choice has been made (Hayes-Roth & Hayes-Roth, 1979); research on other outcomes, such as false positives—improvising when unnecessary—is under-investigated (Mendonça & Fiedrich, 2006). Studies of organizations generally place a strong emphasis on orderly arrangements of coordination and cooperation at the expense of focusing on the mechanisms that change them (Weick, 1998). However, the creation of novel actions at the individual, group, and organizational level is more common than people think (Mintzberg & McHugh, 1985; Pascale, 1993; Peters & Waterman, 1982; Rerup, 2001). People deal with situations that force them to rely on their intuition and knowledge to bring forth an action they have not taken before: a S.W.A.T. team out of flash bangs, a bomb squad working in the rain for the first time, a firefighter who has been in similar situations, but not this *exact* one. According to Barrett, improvisation is a distinguishing feature of some organizations:

> People in organizations are often jumping into action without clear plans, making up reasons as they proceed, discovering new routes once action is initiated, proposing multiple interpretations, navigating through discrepancies, combining disparate and incomplete materials and then discovering what their original purpose was. To pretend that improvisation is not happening in organizations is to not understand the nature of improvisation (1998, p. 617)

For many organizations, improvisation, or at least the expectation of it, is standard. Other organizations that more frequently follow protocol have to improvise improvising—in

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other words, when the time comes to improvise, members may be unclear what to do and unfamiliar with the process.

Improvisation is more necessary for action teams than other team types due to the finality of their work. All action teams require improvisation to deal with unpredictable circumstances (Eisenberg et al., 2005; Sundstrom et al., 1990), and some types need to improvise to a higher degree than others. For example, members of a string quartet (a type of performing team) only have to improvise in the rare situations that a musical performance descends into chaos; even then, it is probable that performing teams are taught to return to the script as soon as possible instead of improvising. In contrast, infantry members have to improvise more often because they face unpredictable adversaries in dynamic environments. Problems for groups develop when uncertainty contains risk and is time-dependent, but the "indeterminate problem" is so common that improvisation is considered part of routine process for many teams and organizations (van Stralen, 2008, p. 79).

Despite knowing that improvisation is critical, it can still be difficult to improvise in the face of impending danger. Eisenberg and colleagues (2005) found that emergency department personnel did a poor job of allowing for improvisation in the face of uncertainty. When listening to the stories of patients, emergency workers tended to force diagnoses into categories of previously-accumulated knowledge; in other words, the technical rationality of the doctors' training subjugated the narrative rationality of the patients (Eisenberg et al., 2005). Multiple studies of the Mann Gulch disaster echo the sentiment that action teams must rely on improvisation to perform at a high level. At

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Mann Gulch, a team of wildland firefighters (smokejumpers) that was running from a blaze disintegrated because they refused to drop their tools, an action that was wildly out of line with the standard procedure of firefighting (Weick, 1993). Weick (1993) posits that that action teams can be more resilient if they focus on improvisation, since the pressure of working in a high-risk situation fuels a desire to fall back on familiar routines (i.e., technical rationality). Dropping their tools would have given them a better chance to survive the blaze. Larson (2003) argues that the team did not improvise because the action of dropping their tools would have clashed with their roles as firefighters; their tools were a part of their smokejumper identities, and without them they were simply people running for their lives. This may have been connected to the way in which action teams structure their time. Through heavy, repetitive training, the concept of coordination is so impressed into firefighters, military members, athletes, and other action team members that they place a much higher value on teamwork than any other group. Action teams of all types have a hard time "dropping their tools" because doing so could lead to disintegration of the team. In spite of this, action teams can benefit from instilling a culture of comfort regarding improvisation, especially in novel situations in which members experience vu jadé: "I've never been here before, I have no idea where I am, I have no idea who can help me" (Weick, 1993).

Jazz Improvisation

Three studies that hold touchstone status in the field of team and organizational improvisation take a musicological approach to the subject. The first is Nettl's (1974)

comparative approach of musical improvisation in which the definition of improvisation is problematized. Next, Berliner's (1994) in-depth ethnography of improvisational jazz musicians builds on Nettl (1974) by pushing back against the perspective that improvisation is diametrically opposed to composition. Weick (1998) then argues that improvisation includes composition. While the nuances of each article cannot be fully summarized here, a brief summary of the three pieces can paint a picture of the relationship between improvisation, a supposedly spontaneous activity, and that which is pre-composed.

Nettl's (1974) comparative approach to musical improvisation in different cultures was the first major musicology work on the subject in decades. In a summary of previous publications, Nettl says we are led to believe that improvisation and composition are opposed concepts with opposed characteristics: spontaneous versus calculated, natural versus artificial, primitive versus sophisticated. The last dichotomy hints at a Western perspective of improvisation, as Nettl notes that many non-European cultures view improvisation as a necessary component of all music. One example is the music of the Plains Indians, whose songs are often borne out of periods of fasting and self-torture. A song may be created suddenly, but the creator "works it out" as he walks back to his tribe. Thus, it is hard to distinguish if the song has been improvised or composed; it seems that both procedures have played a hand in the song's creation. Other examples from Native American, Middle Eastern and South Asian cultures involve extemporaneous creation of songs along a repertory of standard formulas, again intermingling improvisation and composition. Nettle focuses on the effects of

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"improvisation" and "the model," two forces that help a performer create music. Again, one seems spontaneous and the other calculated, but it would be presumptuous to create a rigid dichotomy here. Realistically, improvisation is a type of composition and, by extension, it is not paradoxical for spontaneity to be bound by a model.

Berliner (1994) built on the work of Nettl (1974) with an in depth study of improvised jazz musicians around the Chicago area. Through interviews with over 50 jazz musicians, each of whom has developed their own improvisational style, Berliner refutes the popular claim that improvisation is more than "making something out of nothing" (p. 492). Building on Nettl's (1974) conceptualization that improvising is a *type* of composition, Berliner argues that improvisation is always based on previous work, or is, in his words, "flexible treatment of preplanned material" (p. 400). Berliner's detailed definition of jazz improvisation is useful not only for musicians but for anyone whose work requires adaptation:

> Improvisation involves reworking pre-composed material and designs in
> relation to unanticipated ideas conceived, shaped, and transformed under
> the special conditions of performance, thereby adding unique features to
> every creation (Berliner, 1994, p. 241).

Essentially, improvising applies past experience, knowledge, and plans (material and designs) to present conditions, which theoretically results in a different outcome each time. Berliner details the importance of the past in improvisation. The pre-composed material is the basis for decisions, tactics, and strategies taken by musicians. In addition, any material composed in the present—the improvised music—is then considered as

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composition and folded into the category of "pre-composed." What makes Berliner's findings so valuable to non-musician researchers is the idea that improvisation is more of a way of life than something to be activated at a particular time. The musicians interviewed by Berliner considered improvisation as critical to their performances as timing itself.

Citing both Berliner (1994) and Nettl (1974), Weick (1998) theorizes that the mindset of improvised jazz musicians is of benefit to organizational scholars and practitioners. Particularly, organizational theorists can find value in "the simultaneous presence of seeming opposites in organizations" rather than rushing to consider it a paradox (Weick, 1998, p. 551). Here, Weick is talking about improvisation as a mixture of seeming opposites: pre-composition and spontaneity. Weick argues that managers are like jazz musicians in a multitude of ways; citing Mangham and Pye (1991), Weick puts forth a list of similarities between managing and jazz improvisation, including: simultaneous reflection and action (p. 79 in Mangham and Pye), simultaneous rule creating and rule following (p. 78), action based on melodies, or codes (p. 40), and heavy reliance on both intuition and imagination (p. 18). All of these have a common thread that is best summarized with another notation from Weick's string of similarities: continuous mixing of the expected with the novel (p. 24). The existing melody is not only an early influence, but a continuing one (Weick, 1998).

Thematically, the work of Nettl, Berliner and Weick is more about complementarity than dichotomy, and like Weick, many studies of improvisation use music analogically to study the benefits of improvisation in organizational management

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and emergency management. The use of musical performance as a managerial analogy permeates the thought process of organizational practitioners as well. Tom Kneier (2003) of the Federal Bureau of Investigation compared the need for effective communication and coordination in disaster response to an orchestra: "They can be the best trumpeters and clarinet players in the world, but unless they're all on the same sheet of music, it's just noise." Much in the same way that different players must complement each other appropriately, so should pre-composition and spontaneity. Otherwise, organizational improvisation will end up not sounding quite right.

Categorizing Improvisation

Weick (1998) argues that to more fully understand improvisation, we must understand its place on a continuum. Citing Berliner's (1994) work on jazz improvisation, Weick places *improvisation* as the most imaginative and concentration-demanding endpoint of a creative spectrum. Improvisation requires major transformation of an action or process, whereas the next most imaginative point on the spectrum, *variation*, still has a clear connection to previous expectations. Next to variation is *embellishment* and then *interpretation*, which occur when people use some imagination or take minor liberties with predetermined plans. Weick (1998) implies that the actions researchers have labeled as improvisation are actually within of these four categories.

There are two salient takeaways from Weick and Berliner's continuum. First and most importantly, all four types of actions are based on something from the past, or as Berliner (1994) states about improvisation, they are "flexible treatment[s] of preplanned

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material" (p. 400). The unpremeditated nature of these actions is highlighted by Crossan & Sorrenti's (1996) defining improvisation as "intuition guiding action in a spontaneous way" (p. 1). Improvisation is not the creation of something out of nothing. New actions are based on old structures in ways that can vary from a small shift to a complete overhaul of previous plans. Berliner (1994) describes this as the perpetual cycle between improvised and precomposed elements, stating that the proportion of one to the other is in continual change throughout a performance. (p. 222).

The second takeaway from Weick and Berliner's continuum is that we cannot use a singular categorization to blanket the actions of a team or group. In other words, teams can improvise one part of a process at the same time that they embellish on another, all the while making a variation on another component of the same action. Improvisation is not dichotomous, as the issue is generally one of proportion and simultaneity rather than a choice between improvisation and premeditation (Weick, 1998, p. 551).

Still, some literature on disaster research supports a binary approach to improvisation. Webb (1998) describes Kreps and colleagues' (1994) four-part method of coding forms of organizing in which a structure must have four pieces to be considered an organization. *Domains* are collective representations of bounded units and the reason they exist. *Tasks* are collective representations of a division of labor for the enactment of human activities. *Resources* are individual capacities and the collective technologies of human populations. *Activities* are the conjoined actions of individual and social units. Kreps and colleagues argue that if one of these components is missing, the structure is not an organization, but rather, an organizing process. Webb's (1998) criticism of this

coding form is that it overemphasizes improvisation, as even the slightest presence of improvisation would classify a form as unconventional.

I believe there is value in the continual approach as well as Kreps and colleagues' (1994) coding system. From Weick and Berliner, I find it effective to look at improvisation on a continuum. However, I also feel that *improvisation, variation, embellishment,* and *interpretation* do not need to be categorically separated as different levels of flexible treatment. This set of terms can be confusing because *improvisation* is generally used as a blanket term by practitioners to describe any type of changes to pre-planned material, regardless of degree. I find it more valuable to use the term improvisation and modify it with a sense of degree, such as "slight" to "extreme" (other terms can be used). As for categorization, I believe Kreps and colleagues (1994) have presented a useful typology of sites of improvisation: domains, tasks, resources, and activities. While categorizing types of improvisation is not the aim of the study, I believe this typology can provide a useful framework in analyzing where improvisation is occurring for future studies because it is specific without being overly granular.

Improvisation and Planning

Improvisation is rooted in planning; it draws on what one already knows, and past experience is rapidly processes to extemporaneously guide action (Crossan & Sorrenti, 1997). This perspective is best espoused by Nettl (1974), who—as opposed to viewing them as mutually exclusive—sees improvisation as a type of composition. Berliner (1994) states that it is more than simply "making something out of nothing" (p. 492).

Weick agrees that "improvisation does not materialize out of thin air" (p. 546). In addition, the literature on disaster response, a field composed of critical teams, places emphasis on the need to plan for unexpected events (Dynes & Drabek, 1994) because organizations will perform non-routine tasks during a disaster (Dynes, 1970).

Arguing that improvisation is commonplace, particularly in the field of critical team, is not to imply that organizations are running around trying new things just because they can. Abandoning plans in favor of untested tactics can lead to consequences that are potentially much more damaging than using pre-established strategies (Wachtendorf, 2004). Still, an organization or team may choose to abandon plans for a variety of reasons. First, the stated plans may no longer apply (Turner, 1995). Second, resources may be unavailable, whether because they are wholly inaccessible or currently assigned to another sector or task (Turner, 1995). Third, a multifaceted event—e.g. an earthquake that causes a power outage and a tsunami—may necessitate consolidation with the plans of other organizations (Mendonça, 2001). Fourth, responsibility for dealing with the unexpected may not have been assigned to the particular organization (Scanlon, 1994)— for example, a construction company that helps to dig out debris after a building collapses. In these cases and others, the stimuli for improvisation are usually time pressures and/or uncertainty (Moorman & Miner, 1995, Vera & Crossan, 1999). However, not all stimuli are of the limiting type. Quarantelli (1996) lists four factors that can lead to emergent action. The first is perception of a need to act on urgent matters— essentially, perceiving time pressure—but the remaining three can be categorized as *opportunities* for improvisation: a supportive social climate for collective action, relevant

pre-crisis relationships, and access to resources. Time pressure and uncertainty are stimuli for improvisation in the sense that a person or system has to improvise as a response—improvisation *should* happen. Conversely, the opportunities listed are variables that allow for improvisation—it *can* happen given the presence of a supportive social climate, relevant pre-crisis relationships, and/or access to resources. Teams and organizations that satisfy the opportunities listed in time are less likely to be forced to respond to the stimuli of time pressure and uncertainty. This is why planning is a necessary process in the enhancement of decision making and action for teams facing dynamic adversaries. Improvisation is where planning meets opportunity (Crossan, Lane, White, & Klus, 1996), but opportunity—like improvisation—is also a function of planning. The work that an action team puts in before a performance will affect the options available to them during an event.

One way to look at the interplay between improvisation and planning is through the duality of structure and agency. This is most accurately embodied by Gidden's (1984) structuration theory and Browning's (1992) approach to technical and narrative rationality. Giddens argues that structure—the rules and resources present in a given social system—and agency—the ability of members of the social system to act as they choose—both constrain and enable each other. Much in the same way, Browning (1992) posits that technical rationality—like planning—is designed with controllable outcomes in mind, whereas narrative rationality—like improvisation—fills the space between "intentions and outcomes" (pp. 281, 292). Action teams have technical rationality in place as structure, such as fire orders, rules, and planning, but are ready to accept the

direction of narrative rationality when the intentions of the rules do not connect their desired outcomes. In her research on the genealogy of the 10 Standard Fire Orders of wildland firefighters, Ziegler (2007) details how firefighters are ordered to use lists to provide structure in their work. However, some members of the wildland fire community would rather depend on sensemaking by continually updating their situational awareness, treating the fire environment as dynamic (Weick and Putnam, 2006).

In the same sense, the structure of action teams is provided through rules, planning, training, etc. When a team or member makes an action, they do so based on the constraints and enablements of the structure itself. While it may be tempting to dichotomize such actions into "within" the structure and "outside" of the structure—essentially implying that the latter is improvisation—actions taken are *always* at least slightly based on the structure itself. A spectral approach to improvisation is in line with the previous perspectives on the subject. Berliner (1994) defines jazz improvisation as "reworking pre-composed material and designs in relation to unanticipated ideas conceived, shaped, and transformed under the special conditions of performance, thereby adding unique features to every creation" (p. 241). Weick (1998) builds on this definition by comparing improvisation to any other organizational action. He calls improvisation a mix of pre-composed and spontaneous elements, just as organizational action mixes "control with innovation, exploitation with exploration, non-routine with routine, and automatic with controlled" (p. 551). This reinforces the idea that improvisation is an issue of proportion, not of choice.

Indeed, both improvisation and planning are necessary in team-based sectors such as critical team. In his review of emergency management, Kreps (1991) declares that incorporation of both elements is a balance. Without improvisation, organizations and teams lose flexibility in the face of changing conditions; without planning, they lose clarity and efficiency in meeting essential demands. Kreps also writes that preparedness increases the ability to improvise, arguing against the competitive perspective of improvisation versus planning. The raises the question of what the organization's role is in terms of preparing their embedded teams and how they should approach improvisation in training efforts.

Improvisation and Training

The purpose of team training is to help prepare members for upcoming events. One outcome is to familiarize members with various scenarios, thereby reducing the chance of unfamiliarity during a real-life event. Training and preparation are required for critical teams more than any other type because of the life-and-death nature of their work (Sundstrom et al., 1990). Still, while training has been studied before, the context has generally been limited to service teams (Campion et al., 1993; Goldstein & Ford, 2002; Hyatt & Ruddy, 1997). This is in part because of the limited context in which training of critical teams can be studied (Sundstrom et al., 1990). For example, military teams must be protective of their training because of sensitive material.

Training for improvisation can occur in a variety of organizational settings. In their review of the role of information technology in emergency management training,

Mendonça and Fiedrich (2006, based on the work of Aase & Tjensvoll, 2003, and US FEMA, 2003) identify six types of training platforms. *Seminars and workshops* consist of group discussion and instruction, and are often classroom-based. In addition to serving as a primary interaction with new material, they help to identify needs and skills for the team and individuals. *Knowledge* databases have similar content to seminars and workshops; they summarize relevant information and serve as resources in times of training and action. *Drills* are cognitive and physical activities that enable personnel to develop skills through repetition and application of knowledge. Mendonça and Fiedrich point out an additional benefit of enacting drills: run-throughs of activities can be used to *develop* knowledge, an advantage in training for improvisation.

The next three training platforms are comprised of activities that require effective coordination by team members. *Tabletop exercises*, which use small-scale physical mock-ups to engage decision-makers in slow-paced problem solving, are "particularly useful for practicing roles and interaction" (p. 357). *Functional exercises* are activities that display a dynamic model of performance events with the purpose of practicing a specific function of complex activity. They are "based on a rich (and therefore more life-like) interaction" with functions, other people, and the environment (p. 357). Lastly, *full scale exercises* are replications in which all the functions and complex activities of an actual event are present; in emergency management this means using actual facilities and resources and behaving as if the event is real.

There are interesting insights to be gleaned from the descriptions of these six platforms. First, Mendonça and Fiedrich state that while full scale exercises are made to

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replicate actual events, they are done with "minimal simulation" (p. 357). This implies that Mendonça and Fiedrich see simulation as an imperfect learning scenario. However, simulation is still seen as a useful component of training, as functional exercises, tabletop exercises, and drills (partial simulation) use it to some degree. Second, Mendonça and Fiedrich note that all environmental variables may be manipulated within the last four training platforms (drills, tabletop exercises, functional exercises, and full scale exercises). For example, in functional exercises, consequences of decisions can be determined by a computer or a human controller, the latter setup referred to as a Wizard of Oz exercise. This implies that an external presence can be beneficial in the arrangement of training platforms.

Organizations may provide training for embedded teams, and when they do they should strive to meet two conditions. First, the relevant resources should exist somewhere in the organization (Hackman, 1987). If this is not the case, the organization should bring in expertise from outside. Second, there must be a delivery system for said training resources. While this may seem obvious, it is important to understand that the first step of resource delivery is often the explicit demand for it by group members, an action not so common in organizations that are hierarchical in nature (e.g., military organizations) (Hackman, 1987). The irony is that the teams that need the most training often belong to rank-and-file organizations; while these teams are usually differentiated from the rest of the system, their work necessitates a higher level of organizational integration.

Training schedules for action teams are different than most other team types. For example, one way in which action teams prepare is by engaging in simulations. Members of the team become familiarized with likely scenarios as well as with their teammates. Aggarwal, and colleagues (2004) detail the benefits of a simulated operating theatre for surgical teams, with the main advantage being that simulation allows surgeons to familiarize themselves with external influences such as distractions and crisis situations. Also, previously unknown scenarios are brought to light by playing out events with different inputs. For example, a surgical unit may repeat a simulation that they have already completed, except this time they "accidentally" cut an artery. What follows may play out in a familiar fashion to the unit. However, it may create a scenario that creates a feeling of unfamiliarity in team members. The expectation is that simulations will uncover those feelings in a low-risk environment, eventually making them familiar. Simulation is crucial for action teams because there is no "redo" for what occurs during performance events, many of which have human lives at stake.

We can highlight the value of simulation and preparation by examining the outcomes of training. The quality of decision making, coordination, and execution in real events are partially dependent on the quality and quantity of the available resources, of which I will identify five. One example is a physical resource: if a fire crew has more water when putting out a fire, they are more likely to be successful. Another example is a knowledge resource: if a fire crew, or a member, can find water faster, they are more likely to put out a fire. Another type is a skill resource: if a member knows how to best spray water, the crew is more likely to put out a fire. Yet another resource type is

familiarity: chances for success are increased if a member has been in a similar situation previously. Lastly, coordination is a resource; teams rarely achieve their potential (Steiner, 1972) because they frequently suffer from process losses due to lack of coordination (Stroebe and Frey, 1982). An organization can increase a team's chance for success by providing opportunities in which to increase the quality and quantity of these resources, such as simulation.

There are a number of simulation systems available in fields such as critical team. One such system is CATS (Swiatek, 1999) which is able to calculate outcomes such as damage and loss estimates with limited field data. Some systems are based on virtual reality technologies (Louka & Balducelli, 2001), but these are generally discussion- or experience-based. Few simulation systems are operational-based—meaning full-scale and carried out in real time (DHS, 2004)—and even when they are, their potential to support training in improvised decision-making is limited (Mendonça & Fiedrich, 2006). Simulations cannot possibly be 100 percent accurate in mimicking the pressures and experiences of a real event.

Simulation does not entirely remove the need for improvisational training. An organization such as a fire department may try to allow enough time for simulation so that most scenarios are commonplace to their teams, thereby attempting to provide the requisite resources for team success. However, even with all the standard elements of team effectiveness, there are still situations in which critical team must enact improvised coordination:

"A team in a fast-paced action context thus might have a clear goal

(putting out fires, saving patients' lives, landing an aircraft), the right mix

of experience and skills, adequate resources, and a task that calls for

teamwork – structures that support effectiveness (e.g., Hackman, 1987) –

yet still suffer a devastating breakdown in coordination due to

miscommunication, interpersonal conflict, or poor judgment in the heat of

the moment" (Edmonson, 2003, p. 1420).

Unfamiliar scenarios will occur even with the most robust training and simulation in

place, and training team members to deal with improvisation is an important facet of

organizational context.

The practice of improvisation in critical team has been the focus of increasing

research in recent years but the methods for training are understudied (Mendonça &

Fiedrich, 2006). An appropriate improvisational training regimen should provide

theoretically-grounded knowledge and tools to enable trainees to practice them (Salas and

Cannon-Bowers, 2001); for improvisational training, this refers to four specific training

needs (Medonça & Fiedrich, 2006). First, members must learn *when* it is appropriate to

depart from planned-for procedures, as overreliance on familiarity can be detrimental to

teams (Guzzo & Dickson, 1996; Larson, 2003; Weick, 1993). They must also learn to

make *inferences* about present and likely future states of complex systems (Rinaldi et al.,

2001). Members must also learn *how* to develop and deploy new procedures in a serial

fashion under time constraint. New procedures must satisfy constraints and sometimes

must be searched for or assembled. Lastly, members must learn to *communicate* and collaborate across multiple decision-makers.

The importance of communication as a training outcome is highlighted by types of musical training. Because musical training often takes place in a group setting, there is a high emphasis placed on learning to communicate and collaborate without compromising performance (Mendonça & Fiedrich, 2006). One method of training is called cognitive shadowing, in which one player is engages in active listening to determine the intention of a partner's improvisation (Mendonça, Beroggi, & Wallace, 2003). Critical teams can use this strategy by having members observe the communication and decision making practices of a teammate or by looking over communication logs (Mendonça & Fiedrich, 2006). Other simulation practices involve playing in groups of different sizes (Mendonça & Fiedrich, 2006), taking on other roles (Webb, 2004), and repetition of another player's performance (Della Pietra & Campbell, 1995). Lastly, Berliner (1994) found that jazz musicians desired to be well-practiced in *making a save*, or recovering from errors; therefore, they would make mistakes on purpose in order to recover from them. Mendonça and Fiedrich (2006) agree with the value of this strategy, stating that improvisers should introduce random choices or errors into simulations.

While there is analogical value in the application of musical improvisation, there are reasons why critical teams merit their own research on improvisation. First, the weight of the outcomes associated with critical teams and musical groups could not be more different. People can die if critical teams perform poorly, making stress levels and

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degrees of error avoidance different between such teams and musical groups. Second, improvised jazz musicians *desire* to improvise because it part of the performance, whereas critical teams only employ improvisation as a means to an end. Third, musical groups will have different communication patterns than critical teams. Additionally, the skills of emergency management are not easily borrowed from other professions (Dynes and Drabek, 1994). For these reasons, and others, those interested in communication and improvisation would benefit from the study of research on those subjects within the context of critical teams and their organizations

Summary and Research Question

In this chapter I have summarized the literature relevant to the proposed empirical study. First, I discussed teams and organizational context, which set up a review of the literature on critical teams. Next, I discussed the unique temporal elements of action and critical teams, namely finality and epochality. Then, I discussed various elements of improvisation, including its relationship to planning and training for critical teams and their organizations. Here, I highlight the question that guide this study:

RQ: Are critical team members primed and prepared to deal with improvisation by their parent organizations? If so, in what ways does this happen?

I am very interested in the organization's attitude towards team improvisation. The dilemma of organizational support for improvisation is that a team should be encouraged to improvise where necessary but discouraged at all other points. I posit that action teams

that are provided a high level of structure and experience by their organization will theoretically activate feel a need to improvise less. If members of a team are familiar with a scenario, they are more likely to enact an appropriate response. A prominent example of this phenomenon is the series of management studies on the Mann Gulch disaster (Alder, 1997; Larson, 2003; Thackaberry, 2004; Weick, 1993). A team of smokejumpers failed in part because they were presented with an unfamiliar situation that forced them to move past what they already knew, which created a spiral of unpredictability. Organizations can potentially limit this by providing two types of resources. First, training and simulations will increase familiarity with a wider variety of scenarios. Increased clarity about the parameters of a performance situation includes information about constrains that might limit strategic options as well as the analytic tools necessary to evaluate probable consequences (Hackman, 1987). Second, educational materials and directives (e.g., the 10 Standard Fire Orders, Ziegler, 2007) should be available to team members. Directives such as lists and flowcharts give structure to member action (Browning, 1992).

While it is important for organizations to provide structure and experience, it is impractical to expect that a team can gain familiarity with every possible scenario (Kendra & Wachtendorf, 2003). Successful teams are able to transition seamlessly from highly structured organization to loosely structured teams in the face of emergencies and other unpredictable situations (Bea, 2008). Returning to the Mann Gulch disaster, it is the members that did not "drop their tools"—in other words, those who did not improvise—who met disastrous consequences (Weick, 1993; Larson, 2003). Critical

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teams work in dynamic environments, and members would benefit by depending on sensemaking to continuously update their situational awareness (Weick & Sutcliffe, 2006). Part of the structure and experience provided by the organization should include the learning of cognitive processes designed to determine when to transition to improvisation, as well as the communication patterns necessary to interact flexibly.

I argue that improvisation is more effective if the organization has configured interactive systems that enable teams to communicate efficiently in moments of improvisation. Teams with more structure are less likely to improvise, and the implementation of improvisation implies that structure has been bypassed. In other words, there is an inverse relationship between the application of structure and improvisation for teams. However, improvisation is ineffective unless teams can interact to coordinate efforts. Teams must have open lines of communication to enable "real-time, reciprocal coordination of action" in novel situations (Edmondson 2003, p. 1421). In this way, organizations should structure communicative arrangements so that teams have a way to communicate efficiently if they improvise.

In the next chapter I will detail the methodology for data collection and analysis for this study.

CHAPTER 3 - METHODS

This chapter includes the research methods used to answer the question posed in Chapter 2. This study utilizes a qualitative method of participant observation and semi-structured interviews in order to understand the roles of structure, improvisation, and training in critical teams and organizations.

One of the challenges of studying critical teams is that it is difficult to get continued access to the same critical team over a long period of time. For example, one local fire department only allows citizens to go on a ride-along once every 90 days; this is the norm for most departments. Access to medical teams is limited because of privacy issues associated with patients. While there are a plethora of studies that take place in hospitals, they are generally confined to patient visits in which the patient has the cognition to grant access. Patients of emergency surgical teams may not have the time or ability to grant permission for observation. In addition, many fruitful opportunities for research on critical teams are complicated by the very characteristics that make them intriguing: 1) their work is often dangerous for participants and observers (e.g., a S.W.A.T. standoff), and 2) emergency events are not scheduled and can happen at any time during the day in any location. Therefore, I took any opportunities to observe teams and interview members as I did want to rely on the slim prospect of getting access to one team over an extended period of time. Though there are advantages to an in-depth study with one organization, I believe there are also advantages to a study with multiple research settings, primarily the chance to compare data between teams.

Previous research on action teams is methodologically varied. Studies interested

in communicative *practices* have generally taken a qualitative approach. Eisenberg and

colleagues' (2005) study of communication in emergency medicine primarily used

participant observation in conjunction with unstructured interviews and retrospective

event histories. Methodologically, their study is an exemplar of the qualitative work on

action teams and also serves as a loose model for my research study. Other studies of

action teams that use a similar approach include Murphy's (2001) study of sensemaking

during in-flight emergencies; McKinney, Barker, Davis and Smith's (2005) work on

swift-starting flight crews; Klein, Ziegert, Knight and Yan's (2006) research on hierarchy

in emergency medicine; and Murnighan & Conlon's (1991) study of string quartets. On

the other hand, research geared at understanding communicative *meaning* has used

quantitative methodology, such as surveys (Erickson, Cheatham, and Haggard, 1976;

Halfhill, Neilsen & Sundstrom, 2008). This includes many experiments published in

Military Psychology (Bowers, Baker & Salas, 1994; Halfhill, Neilsen, Sundstrom &

Weilbaecher, 2005; Stout, Salas, & Carson, 1994; Urban, Bowers, Monday & Morgan,

1995)*,* presumably because it is difficult to get access to military teams in situ. Many of

the studies of firefighters in the field of communication use some form of content

analysis, such as Ziegler's (2007) genealogy of the Wildland firefighters 10 standard fire

orders and the various studies of the Mann Gulch disaster (Alder, 1997; Larson, 2003;

Thackaberry, 2004; Weick, 1993). While this demonstrates the methodological diversity

of the field, most of the studies on action teams that are interested in *observed*

communicative practices have taken a qualitative approach combining observation and interviews, which is why I am also using qualitative methods.

Previous research on temporality and communication is also methodologically diverse. For example, much of the research on the experience of time has used quantitative methods (for examples, see Ballard & Seibold, 2000, 2004, 2006; Okhuysen & Waller, 2002). Like with the research on action teams, temporal studies that use quantitative methods generally focus on meaning—here, the focus is on the meaning of time at work for individuals or groups. On the other hand, temporal field research on communicative practices has used qualitative methods (for examples, see Gersick, 1988, Perlow 1999). The qualitative temporal studies are more in line with my research, as I am less concerned with how meaning is constructed and more with communicative practices.

Besides precedent, there are two main reasons I am employing qualitative methods in this study. First, observing a team in situ will allow the data to come naturally, rather than forcing answers to particular questions. Second, qualitative is appropriate for topics that are somewhat vague (Patton, 2002). Indeed, while communication, timing, improvisation, simulation, and pauses can be clear as topics on their own, their interaction will create complexity that demands a qualitative approach. This is not to say that there are no drawbacks to qualitative methodology. For instance, I am interested in issues of causality with respect to how simulation practices affect the success of action teams, and a quantitative approach is much better for studying causality. In addition, quantitative research can be less time and cost intensive, and can enable

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rigorous statistical assessment. However, qualitative research is generally superior in vividness, density of information, and clarity of meaning (Jick, 1979; Weiss, 1968). Also, overuse of surveys in organizational research can lead to the suggestion that the field is more interested in verbally expressed sentiments and beliefs rather than actual conduct (Van Maanen, 1983, p. 11-12). Given the research questions at hand, it is imperative to be involved in the organizational experiences, as there is relevance to being close to organizational practice when developing theory (Berger, 1991; Redding, 1992). Therefore, a qualitative approach best fits this research study.

Grounded Theory

In this study I use an inductive approach known as grounded theory. There are three main motives for using an inductive method. First, it is essential that I study actual communication practices. Second, the research questions in this study are exploratory. Third, I am interested in making theoretical advancements, not only collecting data. Therefore, I am taking a grounded theory approach because of its usefulness in building middle-range theoretical frameworks (Charmaz, 2000, p. 509). Middle range theories fall in between working hypotheses and all-inclusive "grand theories" (Glaser & Strauss, 1967, p. 32-33). The purpose of a middle range theory is to explain one particular set of communication practices, as they are only applicable to limited ranges of data (Weick, 1974). Because I am only interested in action teams, my study will be well served by this approach.

The first step in taking a grounded theory approach is to become familiarized with the field at study. Many ethnographers approach their work as blank slates; while I respect such an approach, I believe that theoretically grounding the research questions in the existing literature will help me to have more direction in my study (Glaser & Strauss, 1967; Strauss, 1987; Strauss & Corbin, 1990). By using grounded theory, I have the flexibility to internalize unexpected data and allow theories to emerge from the data collected, not a predetermined set of information (Strauss & Corbin, 1994). While Charmaz (2000) writes that grounded theory strategies do not need to be rigid, I am choosing to base my research plan on few of her prescriptions. I collected and analyzed data simultaneously and I engaged in a two-step coding process (see Data Analysis) and used the constant comparative method. I also employ methods to ensure that my data is valid (see Data Authentication).

Data Collection

This study uses a qualitative methodology consisting of participant observations and semi-structured interviews. Observations took place from June 2010 to February 2012. Interviews began in June 2010 and finished in April 2012. Because grounded theory involves analyzing data concomitantly with data collection, I started analyzing data shortly after what turned out to be the halfway point (in terms of data quantity), around September 2011. My review of qualitative research has given me a rough framework for a collection process that is helping to develop, refine, and connect

theoretical concepts, even though Charmaz (2000) notes that grounded theory methods generally do not divulge data collection techniques in detail.

Interviews and Observations

The majority of the data collected in this project has come from semi-structured interviews with participants. I conducted 31 interviews in all with members of teams from varied team types all over the country. I interviewed 10 members of fire crews, including both urban and wildland firefighters; in addition some urban firefighters had previously worked as wildland firefighters or in the military. I interviewed 11 members of what I would classify as medical teams: ER physicians, EMTs, critical care nurses, and a physician's assistant who works on surgeries. This also included a ski patroller whose main duties are medical but also performs many other tasks. I also interviewed 10 members of tactical teams, including military units, SWAT teams, and bomb squads. Interviewees were located across the country, including the Southwest (12), Pacific (11), Mountain (4), Northeast (2), and Southeast (1) regions of the United States. In addition, one interviewee was deployed in Afghanistan at the time of her interview.

As a whole, I believe my interview sample has given my study variation and a thorough representation of team participants. I used snowball and quota sampling in order to ensure a broad range of representation and to stratify my sample. Participants were recruited mainly using online posts on social networks and through casual conversations about my work. I know 12 participants personally, and 19 were friends of friends that I met through this project (please see the Appendix for the recruitment email

as well as a table of all participants). Semi-structured interviews took place in the participant's free time; the locations were varied and included their workplaces, public spaces, their homes, and the homes of mutual friends. Some participants were interviewed over the phone when distance made collocated interviewing difficult. All interview procedures, including the obtainment of informed consent, were in compliance with the Human Subjects IRB for this study.

As a requirement, interview participants should have been part of a critical team, as defined by Ishak and Ballard (2012), at the time of the interview. However, exceptions were made when an interview seemed likely to prove valuable to the study. Four interviewees fit this criterion. Larry is currently retired but was a smokejumper in the 1970s. Because of the time that has elapsed since his tenure as a smokejumper, I took extra care to compare his statements with another interviewee who also served as a smokejumper more recently, and any noticeable differences have been mentioned in the results. The three other non-critical-team members are all in the medical field and have worked in emergency rooms. Greg is an obstetrician who has spent time in the ER and has led more emergency caesarian sections than he could recall. Hans has worked in an ER for decades and is currently a medical instructor at a technical college, as is his wife Nevine, who has also worked in the ER. Greg, Hans, and Nevine were my first three interview participants in June 2010, and they helped give me an excellent background on how teams work together in the ER before interviewing other participants.

These 31 interviews were semi-structured in nature. An advantage of the semi-structured schedule is that it gives the researcher a modicum of flexibility to explore

unexpected topics; choosing the right structure is vital because it can influence the way that data is collected. (Frey, Botan, Friedman, & Kreps, 1992). In addition to the semi-structured interviews, I had many opportunities to conduct short (1 to 10-minute) informal interviews with observed participants.

In the semi-structured interviews, I followed a general guideline of questions but asked unscripted probing questions when necessary to 1) deepen responses, 2) increase richness and depth, and 3) give cues to the participant about the desired level of response (Patton, 2002, p. 372). The interviews were of the ethnographic and informant types (Lindlof & Taylor, 2002); both ethnographic and informant interviews invite the participant to speak for the whole of the group. The goal of such interviews was to secure details from the participant's point of view regarding norms, process and culture of the their team and organization. I used Wood and Kroger's (2000) orthographic method for transcribing interviews. Whether an interview was transcribed by myself (27) or an assistant (4), the transcriptions were standardized to include commas and periods to represent pauses. I reviewed transcriptions completed by my assistant to check for accuracy and detail.

There are three primary reasons I used interviews in this study. First, they lend depth to the research study, and they also offer potential for openness and detail (Patton, 2002). Such depth can assist in creating vivid descriptions to help understand a given phenomenon (Miles & Huberman, 1984). Another reason for interviewing is that I can learn about phenomena that are difficult to observe directly (Lindlof & Taylor, 2002). Third, interviews allow researchers to ask about "communication events too time-

consuming or too private to observe" (Frey et al., 1992, p. 285). By definition, time is of the essence for action teams, so they cannot slow down or pause their tasks and explain what they are doing to an outside source. Therefore, any time spent with participants outside of their activities should prove to be worthwhile. As for privacy, many action teams (such as military units) have strict hierarchical structures that require members to keep objections and emotions hidden during company time. Members may be more willing to share their feelings outside of the hierarchical structure.

The questions I asked were chosen to reveal how members felt about their teams and organizations. I started with questions designed to relax the participant and encourage them to share details (Spradley, 1979). These primary questions were broad and usually fact-based, not requiring a strong opinion of the participant; this is done in order to give the participant a sense of confidence and to build trust with the interviewer (Rabiger, 2009). Such queries includes: 1) "Tell me about a typical work shift." and 2) "Tell me about the workings of your team." Once I gained a sense of comfort from the participant, I asked more specific questions about the workings of their team with regards to decision-making, stress, improvisation, simulation, pauses, and failure. I brought a letter-sized notepad with me to each interview, which included questions that could be asked of any participant as well as questions that were specific to that individual. I did not ask the same questions in every interview since I used a semi-structured schedule.

Interview answers were broad and varied in nature, with some common themes as the exceptions. Some participants gave me answers that fit the "company line," and my challenge with them was to make them feel comfortable expressing their own opinions.

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Regardless, these participants were valuable because they offer a window into the perspective of the organization. Other participants were much more specific and open. These participants were also valuable because they added depth and detail to the study. A third type spoke for the team or organization but from their own perspective. These participants were most valuable to the study because it is likely that they are naturally inquisitive people who have knowingly and unknowingly given much thought to the research topic. In some sense, they are my researchers on the inside—or informants— and the transcriptions of their interviews provided exceptional worth to the project. In addition some interviewees continued the process by writing me emails after the interview with additional thoughts. In all, I received insightful details, thoughtful personal mantras, and interesting stories, the last of which were helpful in setting the scene in the Results section (Maxwell, Poeppelmeyer, & Polich, 1999).

I have also had the opportunity to interview participants during downtimes of observations. While there may be concerns about intrusion or distraction of those being observed, I only asked questions after being approached and/or prompted by participants. These informal interviews have been valuable to the research project as a type of contextual recall: I am asking questions of participants while they are situated in their workplace, which supports them to answer questions in the mindset of a police officer, firefighter, et cetera. These short sessions were also valuable to the participants in two ways. First, by asking me to make inquiries related to my research project, they have gained comfort with my presence in their workspace. Second, on more than one occasion, a participant lingered on a particular question in a way that led me to believe

they were engaging in productive analysis about their work process. Of course, the

disadvantage to these informal interviews is clear: I am studying how action teams use

their time and my presence is changing their schedule. However, I noticed that most of

the participants do not pay any attention to my presence or questions. In addition, the

value of inquiries regarding their work is—in my estimation—higher than if I refrained

from interaction. While these interviews are part of my field notes, I am using many of

the techniques associated with semi-structured interviewing when I conduct this form of

data collection.

Interviewees were technically oriented in their responses, as the following

chapters will show. I attribute this to two factors. First, the nature of their work is more

technique-based then members of teams that are generally studied in the field of

organizational communication. Second, critical team workers are trained to speak clearly

and objectively so that nothing is misunderstood during events. There was very little

philosophizing or theoretical analysis done by interviewees. Many of my probing

questions received answers along the lines of "I've never really thought about that"

followed by a re-statement of a previously given technical response. Again, I think this is

closely related to the nature of communication in their professions.

The interview data was supplemented with observational data. My observations

came over a period of 20 months in a variety of settings[1]. In June 2010, I toured an ER

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[1]In addition to my scheduled and escorted observations, some supporting data comes from observing
unscheduled, spontaneous firefighter action. Over the summer of 2011, by happenstance, I found myself on
the scene of three different fires in an area west of downtown. Also, by sheer coincidence, the same shift
was on the scene at all three fires. The first fire in April was actually two feet from my home in the
neighboring unit. I was working in my office and I saw faint wisps of smoke outside the window. They

and spent time observing the interactions of physicians and nurses at the nurses' station. In December 2010, I took part in a 12-hour ride-along in the downtown branch of a police department, getting the opportunity to attend morning and evening meetings and experience 10 hours in a patrol car. That was followed the next week by another 6-hour police ride along in an area east of downtown ("where the drugs are," according to one officer; I did not observe any drug busts during my ride along). Also in December 2010, I spent 12 hours in a downtown station of a fire department. The next month, I spent time touring and observing at the headquarters of a SWAT unit that included two teams, and in February 2011, I spent a "Simulation Day" with a bomb squad, observing scenario-based training on site. In June 2011, I toured another ER and was able to spend some time observing interactions, and lastly, in February 2012, I spent a day with a SWAT team observing simulation activities.

My scheduled observations with teams and my escorted visits to ERs became more focused yet expansive with time. At the beginning, my observations and field notes focused primarily on documenting the team's norms, processes, and culture. As I

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were coming from my neighbor's balcony, and after determining that he was not home, I called in the fire. When the engine came out, I observed their actions and conversations, and then I spoke with some of the firefighters as they waited on scene for their chief to take care of some administrative details. The second fire occurred in August during the hottest summer on record in Austin. I was driving to the grocery store and saw black smoke coming from the backyard of a home, I looped back around and the fire was large enough for me to call in again. This fire had already been called in. Along with the neighbors, we helped the homeowner get her child and pets out of the home safely, and again I stayed to observe as the same engine came to put out this fire. Again, I talked with some members of the engine once they fell into a holding pattern. The third time was on a rainy Friday night. We heard a clap of lightning that felt like… (continued) it was less than 200 yards away. Soon after, fire trucks wailed by our home and I followed them to what turned out to be a lightning-ignited home fire. Again, I was able to observe interactions, although unlike the first two fires, I arrived after the firefighters. When I noticed that it was the same shift (the chance of seeing them all three times is 1-in-9, as there are A, B, and C shifts in this area), I decided it would be better to refrain from re-introducing myself and asking about their experiences again. I do not directly reference these data in the following chapters, but I did use them to mentally elucidate my analysis.

continued with my observations, I also included references to the research goals. I made sure to note my initial impressions, key events, and concepts that those in the field react to as "significant" (Emerson et al., 1995, p. 28). The field notes were written loosely and flowingly, as prescribed by Emerson and colleagues (1995). I also made direct quotations and theoretical memos where appropriate. I followed Geertz's (1973) model of thick description in order to most accurately capture the intricacies of the events occurring in the field. Thick description is necessary because fieldwork often observes "a multiplicity of complex conceptual structures, many of them superimposed upon or knotted into one another, which are at once strange, irregular, and inexplicit" (Geertz, 1973, p. 9). This is especially true in trying to understand the practices of action teams that deal in life-or-death terms because of complications from emotion and time constraints.

I collected data until I felt that I had achieved theoretical saturation, which can be assumed when all new units of data can be categorized and explained by the research, offering no new conceptual returns (Glaser & Strauss, 1967; Lindlof & Taylor, 2002; Snow, 1980). I used Snow's (1980) three-part test for information sufficiency. First, data collection is sufficient when the world of research becomes *taken for granted*. Second, when no new data are being found to illuminate the categories, a project achieves *theoretical saturation*. Third, when a researcher feels that their conceptual framework forms a systematic theory, he has achieved *heightened confidence* (Glaser & Strauss, 1967).

Data Authentication

I used multiple methods to authenticate the data in this study. Primarily, I used triangulation. The value of triangulation is that the credibility of findings is strengthened if multiple methods, sources, researchers or theories provide similar results (Baxter & Eyles, 1997). I engaged in methodological triangulation by observing communicative processes, interviewing members about them, and reviewing training documents. I also engaged in source triangulation by using examples and quotes from multiple participants and multiple team types to support themes from the data. Second, I engaged in member checking, a process by which findings are shared with the participants for further validation (Baxter & Eyles, 1997; Lindlof & Taylor, 2002; Lincoln & Guba, 1985). I did so by sending brief summaries of my findings to some participants asking for their reactions. While it is important to remember that participants do not have "privileged access to the truth" (Hammersley, 1992, p. 65), it can be valuable to see if the product of research study resonates with those who are being researched. This process is also referred to as member tests of validity (Douglas, 1976) and host verification (Schatzman & Strauss, 1973). In general, participants supported my thoughts about their work, although there were a few minor disputes of terminology.

Lastly, I used peer debriefing to help authenticate my data. Peer debriefing is the process of showing data and claims to another researcher in order to account for personal misinterpretation and suppression of themes and voices (Baxter & Eyles, 1997). The process can also help uncover inconsistencies in analytical claims. Peer debriefing is

based on the assumption that a researcher cannot take an omniscient perspective on their data, thereby missing certain components and overvaluing others. Under this assumption, it is important that the peer who will assist in authentication is not too similar to the researcher than they have the same blind spots, but also not so different that they desire to take the research in a completely different direction. Overall, while it may seem like four types of authentication are too many, I believe that data authentication is a process that deserves as much time and effort as possible.

Data Analysis

From my perspective, one of the advantages of qualitative research is that the researcher uses his own interpretations to shape categories, unlike quantitative research in which data is fit into preconceived codes (Charmaz, 2000). While the perceptions of participants and past researchers are useful and valid, a qualitative researcher must have faith that the schema created by their personal lens are the most valid for a particular study.

I took a thematic approach to coding both the observation and interview data, reducing the data and employing sensemaking as an attempt to "identify core consistencies" (Patton, 2002, p. 453). I began by using an open coding scheme, using emergent categories to understand the roles of structure and improvisation in the process of critical teams (Emerson, Fretz, & Shaw, 1995; Browning, 1978). During this first step, I assigned a code to each thought. Codes were titled according to how they answered a research question or how they bonded to a major theme—from my subjective

perspective—of the research project. "Thoughts" varied in length; some were as short as four words (e.g., "There's no perfect scene") and others comprised an entire paragraph's worth of words. By doing this, I followed the "unrestricted" strategy of Lindlof and Taylor (2002, p.219) by not yet defining the categories or their ranges, or specifically unitizing the data. The focus in this round of coding was on strength and repetition of comments (Owen, 1984). The second stage consisted of focused coding, sometimes called selective coding (Lofland & Lofland, 1995). Focused coding is more directed and conceptual than line-by-line coding (Charmaz, 1995; Glaser, 1978). In this stage, initial categories were examined for affinity to others with the purpose of collapsing the initial categories into broader meta-themes. The second round collapsed 197 codes (over 1,000 "thoughts") into 27 meta-themes.

I used the constant comparative method (Glaser & Strauss, 1967; Strauss & Corbin, 1994) to ensure that data fits both the initial categories of open coding and the meta-themes of focused coding. This method involves consistently reevaluating data and themes, taking care to confirm that each unit of data is placed in the appropriate category. Charmaz (2000) prescribes comparing data from: 1) different people and their perspectives and actions, 2) the same person at different times, 3) different incidents, 4) data with a category, and 5) one category with another (see Figure 3 for a visual representation of comparison types). One of the advantages of the constant comparative method is that new data can be used to test the boundaries of conceptual categories and tentative hypotheses (Browning, Beyer, & Shetler, 1995). On a macro level, all grounded theory researchers makes comparisons between data from the start of the collection

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process by comparing what they find to things they already know from lived experience. Accordingly, the constant comparison method is a formalization of naturally-occurring human inductive analysis.

Summary

In this section, I have detailed the research methodology I used to collect and analyze data for my dissertation. My methodological approach consists of semi-structured interviews, informal interviews, and participant and even observation. I used grounded theory because it allows theory to emerge from the data, and an inductive approach is appropriate because of the exploratory nature of this project. I used two rounds of coding—open and focused—and I observed and analyzed data until achieving theoretical saturation.

I am confident this research study meets Taylor and Trujillo's (2001) criteria for rigorous qualitative research. In terms of analysis, I believe I have: 1) demonstrated reflexivity between explanations and data, 2) used data that is representative of the larger set, 3) engaged in triangulation, and 4) saturated theoretical claims. I provided evidence of a committed study and demonstrated verisimilitude.

There is one additional measure from Taylor and Trujillo (2001) that I would like to discuss here. Taylor and Trujillo (2001) call for researchers to use emic and inductive analyses in an effort to not succumb to totalization and reductionism. However, my perspective on communication research is that the best studies are well generalized outside of the "naturally occurring features and discourse" of a particular organizational

scene (Taylor & Trujillo, 2001, p. 183); I believe that a good theory can act as a "hammer" to shatter the emic character of qualitative research (p. 183-184). Ideally, the theory that has come out of the research will prove applicable to a larger set than just the observed group. This is a desire, but not a necessity, of this research project.

However, the more realistic goal of this dissertation is development of a useful middle-range theoretical framework. Glaser (1978, 1992) established four criteria for evaluating a grounded theory (as referenced in Charmaz, 2000). First, a theory must be developed from and *fit* the data and subsequent analysis. Second, a theory must *work* by providing a useful conceptual rendering. Third, it must display *relevance* by offering analytical explanations of actual problems or processes. Fourth, a theory should contain enough *modifiability* that it can change to adapt to new, intriguing data. With these four criteria in mind, I completed this research project.

Preface to the Results

The following chapters present data collected about critical team training for improvisation. The data set and analysis is a response to this overarching question: *How are critical team members primed, prepared, and equipped to deal with improvisation by their parent organizations?*

The data is presented in four chapters. Chapters Five, Six, and Seven each explore one of the three major "tools," or training outcomes, that are used by critical teams to deal with improvisation: experience, communicative decision making, and sensemaking, respectively. These tools are promoted in organizational training and continue to develop throughout the lifespan of teams.

In each of these three chapters, I also explore how organizations that house critical teams have them progress through a particular phase to help nurture the corresponding improvisational tool:

- In Chapter Five, I will explore how critical teams use simulations to develop experience. To set this up, I will position experience as both the primary basis for decisions as well as the primary process for learning.

- In Chapter Six, I will explore how critical teams use the adaptation phase (i.e., timeouts) to allow space for communicative decision making. This follows a discussion of two main concepts of communicative decision making: discursive decision structures and team deliberation.

- In Chapter Seven, I will explore how critical teams use the debriefing process to enhance sensemaking. I will also explore situational awareness and organizational narratives, two forms of sensemaking that bookend the form that occurs in debriefing.

These three phases—simulation, adaptation, and debriefing (which is technically a subphase of preparation, as I will explain in Chapter Eight) are what I term *critical-interactive* phases. I use this term because they are specific to action and critical teams, and they are phases that are designed specifically for team interaction. Please see Figure 1 for a visual presentation of how the tools correspond to chapters and phases. These phases are taken in part from the nested phase model (Ishak & Ballard, 2012).

	Chapter 5	Chapter 6	Chapter 7
Critical-specific phase➜ Training Outcomes (Tools) ⬇	**Simulation**	**Adaptation**	**Debriefing**
Experience	Becoming experienced		
Communicative Decision Making		Making decisions communicatively	
Sensemaking			Sensemaking retrospectively

Figure 1. Chapter analysis of critical-specific phases and training outcomes

Before delving into specific tools and phases, in the next chapter I introduce the general framework of organizational training for critical team improvisation. The first

part of the results section, Chapter Four, is a study of dualities and dichotomies in the critical team process. First, I will discuss the duality of routine and non-routine events. Next, I will explore two complementary concepts: experiential structuring and improvising through critical thinking. Then, I will examine how critical organizations promote a structured yet flexible approach in the response process. Lastly, in Chapter Eight, I will explore the connection between this approach and the three tools and three phases explored in Chapters Five through Seven.

CHAPTER 4 – STRUCTURED YET FLEXIBLE

When Maggie joined the Marine Corps, they put her in a helicopter, strapped her into a flight seat, put blackout goggles on her eyes, and flipped her underwater. Then they told her to unstrap herself and swim on her own out of a window that she couldn't see, shimmying out and rotating her body to make it safely to the surface before she ran out of air. This may seem like an extreme activity, but it is in fact standard for anyone who wants to be a helicopter pilot in any branch of the armed forces (if someone wants to be a jet pilot, they will have to do the same activity in the flight seat of a jet cockpit). Aspiring pilots have to escape the "helo dunker" multiple times in groups of six to eight. First, they will do it upright with eyes open. They will do that one more time. Next, they will turn them upside down, but give them oxygen bottles, and ask them to do it all over again. Then again, with no oxygen. Then, eyes closed. Again. By the time you are done with the helo dunker, the experience of being trapped upside down underwater with no vision does not seem all that unfamiliar anymore.

In addition, Maggie said that the end of every stage of training in the Marine Corps involves dealing with something called a compound emergency. This is when "more than one thing is going wrong at once and you have to figure out what order is best to address something that is going wrong. Some things will kill you faster than others so you put those fires out first." Sometimes it is a literal fire, like if you are a helicopter pilot and "your number two engine is on fire and your radio goes out." Sometimes, it is a metaphorical fire: what if your helicopter crashes in the middle of the ocean at night—

which is difficult enough to deal with—and your own restraining harness will not come unbuckled? What if you cut through the restraining harness but the person in the flight seat closest to the window gets stuck trying to pass through the escape route? What do you do when you cannot do what you are supposed to do?

These instances illustrate what I believe to be the main process-related goals of organizational training for critical teams and their members. Organizations want their members to increase familiarity and experience with critical team processes and the variables that affect them, such as environment, teammates, and resources. They also want members to develop senses of critical thinking, decision making, and situational awareness to help them deal with unique situations. These outcomes are used complementarily and concomitantly in the work of critical teams.

More complex types of training may be aimed explicitly at advancing both goals. Success in full-scale simulations, which are designed to replicate an actual emergency, is contingent on accurate decision making as well as correctly enacted procedures. However, certain types of training can focus on or highlight one goal at a time. Familiarity training (goal 1) includes developing procedural memory (Moorman and Miner, 1998), which is learning how to perform skills and routines. Sometimes referred to as "motor memory" (Pressing, 1988), procedural memory is made up of "things you can do" (Berliner, 1994, p. 102), like a vocabulary of words and phrases, and can only be learned through repetition. For critical teams, this may include procedures like connecting a hose to a fire hydrant or landing a helicopter. These types of procedures are practiced over and over again until they become part of the "vocabulary" or "motor

memory" of members. From the organization's standpoint, the goal of training that focuses on developing procedures, routines, and skills is to turn what is considered non-routine into routine.

Some types of training only highlight or focus on critical thinking and decision making (Goal 2). For example, tabletop exercises use scaled-down mockups of emergencies to help decision makers develop their understanding of the physical world (Mendonça & Fiedrich, 2006). These are sometimes referred to as sandbox or sand table simulations because symbolic or small-scale objects are often pushed around in a sandbox to mimic what would happen in an emergency. They are especially useful for practicing roles, interactions, and problem solving (Mendonça & Fiedrich, 2006), and variables can easily be manipulated to help decision makers become more comfortable with unexpected changes in the environment. Tabletop exercises are not particularly useful in developing or practicing procedures, with the possible exception of interactional procedures (e.g., a role call). From the organization's perspective, the goal of this type of training is to help members understand how to make decisions in routine and non-routine events, including when to improvise.

The difference between what is considered routine and non-routine is a salient one for critical teams. Interviewees repeatedly pointed out that routine events do not require improvisation whereas non-routine events do. Based on analysis of the data collected in this research project, I argue that the primary goals of critical team training are 1) to increase familiarity with processes and variables, 2) to develop a sense of critical thinking to know when to enact particular processes, and 3) to develop a sense of situational

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awareness. In other words, the goals are to turn previously non-routine into routine events (in which improvisation is unnecessary), to better understand how to deal with non-routine events, and to understand the difference between the two. The distinction is important, as organizations prefer that teams work in routine events as much as possible. Why do organizations prefer that their embedded teams interpret events as routine, as opposed to non-routine? And why does the difference matter in a study about critical team training? In the next section, I detail the difference between the two types of events.

Routine and Non-routine Events

The literature on organizational improvisation distinguishes between routine and non-routine factors for critical teams, such as tasks (Quarantelli, 1996), environments (Weick, 1993), and events (Dynes & Drabek, 1994). Distinguishing between the last of these—routine and non-routine events—is especially critical in this project. Many interviewees highlighted this duality by using the exact terms *routine* and *non-routine*, while some used their own terms or a set of terms provided by their organization. Most common in the medical field was the classifying term *cut and dry* (i.e., routine), spoken by three members of emergency medical terms. The term was used to explain that non-routine situations require teamwork and critical thinking: "we use our critical thinking skills together to decide, because not everything's cut and dry" (Tamara, ER Nurse). Other members differentiated events by commonality ("So like draining a wound—there are certain procedures that are very common. Cracking a chest open, that is a very uncommon procedure," Nancy, ER Physician) and by referencing standard operating

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procedure, or SOP ("You basically make decisions based on what you've seen. Some are SOP, some aren't," Tom, Firefighter). Heath, a nuclear electronics technician in the U.S. Navy, said that choosing the type of procedure or type of guidance to follow depends on the severity of the abnormal condition. He said there is a big difference between events that cause him to say: "oh, a light went off, do this"—meaning something small like a light-emitting diode needs to be replaced on a control panel—and "whoa, that's the pump," referring to a water pump that keeps the entire aircraft carrier from flooding.

Three important facets of critical team work came out of the data regarding routine and non-routine events. First, some events (routine) are what would be considered *cut and dry* (originally *cut and dried*), meaning the correct action has been prepared in advance and lacks spontaneity, while other events do not have such an arrangement (non-routine). Second, events that are non-routine require a different decision making process than those that are routine. Third, decision making in non-routine events usually becomes a communicative team endeavor. For example, Kristen, an EMT, said "communication depends on the situation" and went on to differentiate between communication in routine and non-routine calls. These three points substantiate the differences between routine and non-routine events and their importance in a study about team communication.

One of the main differences between organizational approaches to routine and non-routine events is that routine events are considered procedural whereas non-routine events are seen to be deserving of a more nuanced approach. Larry, a retired smokejumper, said: "most of the time, fighting fires was exactly like the training." However, training seemed—at least from Larry's perspective—more useful for non-

routine events: "the time when training was most important was when it was a fire that was out of control." At first glance it may seem contradictory for someone to say that routine events were just like training, all the while arguing that training was most important during non-routine events. However, this gives us some insight into the mindset of critical team members by showing us that training means something different for routine versus non-routine events. Spencer, a firefighter in the Southeast region of the United States, explained how training is made up of everyday, specific activities as well as more general concepts:

> I think we're trained in two ways. One is things you just deal with every day. You're gonna have, people are gonna have heart attacks, people are gonna get in car accidents. Those are the types of things you can drill. Car fire: step A) lead the hose lines, step B) you know, put it through a straight stream, extinguish underneath the car, approach it as—go through: this is what's exactly going to happen. And then at the same time, you need to teach people more general concepts. One of the big things they teach is to use situational awareness, which is very broad idea. The idea of situational awareness is that you kind of like don't want your head to get lost in the fog, or you don't totally focus on exactly on what you're doing, but you want a general idea of like: okay I know the car is right there, the person is right here, there's um, a propane tank over there. If you know what's going on around you so that, that's a very general thing, you need to apply that anywhere you go, and they'll hammer you on that, too.

Spencer's comment elucidates how critical team training is made up of two components. One part of training is "the types of things you can drill," meaning the common procedures, routines, and skills that will comprise the bulk of their work. This is what Moorman and Miner (1998) call *procedural memory*, which is based on familiarity with one's routines. The second component of training is the general idea of not getting "lost in the fog" out in the field—in other words, keeping your wits about you. Many interviewees, including Spencer, use the term *situational awareness*, a concept very similar to sensemaking (Weick, 1993; 1995), and something that I will discuss in more detail in Chapter 7. However, here I will note one thing about it: situational awareness is important enough for critical teams that training leaders will "hammer" trainees on it, constantly reminding them to refresh their understanding of the situation and their environment. It is a tool that teams use to help make the right decisions in critical team work and the absence of it can result in feelings of *vu jadé—I have never been here before*--feelings that can lead to poor decisions and even death (Weick, 1993). Situational awareness must be present for decision making to be effective in both routine and non-routine events, since decision making is based on situational elements.

Most of the time, but not always, a person's situational awareness is correlated with their comfort and experience in a given scenario. Kelly, a leader of an elite group of firefighters in the Mountain region of the U.S. known as a "hotshot crew," explains what happens to new members during their first callouts: "Initially, there is a totally lost feeling: 'what am I doing?' It's never scary, but you don't understand." As new members turn into experienced members, that feeling tends to go away (again, most of the time, but

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not always). In this way, *vu jade* ("I've never been here before, I don't know what to do") is often a symptom of unfamiliarity. The potential breakdowns that could arise from feelings of *vu jadé*—combined with the mental, physical, and temporal pressures of critical team work—have pushed many organizations to believe that members will only perform as well as you train them to, and no better. This notion was expressed in a variety of ways, including idioms used by the organization to encourage robust levels of training. Damon, a downtown patrol officer in the Southwest, relayed a mantra from his police academy sessions: "We have this saying, which is: 'you don't rise to the occasion—you fall to your level of training.'" This shows why training is so valued for critical teams.

This is not to say that team members perform poorer than expected during events; rather, it is an affirmation that people will do what they are trained to do. For example, when asked about the value of procedures, Spencer noted: "Those are the type of skills that I think people rely on when they're in an emergency situation and they don't have time to think everything out. They kinda have to fall back on what they've been doing." Considering the epochality and finality—as well as the specialization and coordination needed to perform well—in critical team work, training is seen as a necessity, not a luxury (one SWAT team member mentioned the lack of training in his previous position with drug enforcement; this was the only mention of a dearth of training throughout the entire project). And when it comes to dealing with unpredictable scenes as critical team members do, training is necessary for drilling procedures, routines, and skills into members, and for "hammering" them on the general principles that make them able to

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piece things together (things including procedures, routines and skills). The findings in this chapter revolve around these training outcomes.

It is the non-routine events for which both of these outcomes are needed, as routine events are familiar to team members and rely most heavily on procedural memory, not critical thinking. Based on the thoughts expressed by interviewees, I argue that a member must satisfy three conditions for him or her to consider an event to be routine: 1) *we know what to do*, 2) *we know how to do it*, and 3) the *what* and *how* are fully applicable in the current situation. If any of these three conditions are not met, the event is likely to be considered non-routine by members. Another way to look at this three-condition set is that it is a method of determining if there are unknowns in decision making (team process), performance (taskwork), or in the situation. These three concepts relate to the three conditions listed, respectively. As for who "we" is, the term is used to refer to the relevant actors and decision makers involved in the event. In some fields (e.g. fire crews), this refers to the entirety of the team, potentially including as many as 20 people. In others (e.g. ski patrol), this may refer to the single person who is present at an event before other members arrive.

The concern in categorizing events like this as routine and non-routine is similar to the issue that Webb (1998) takes with Kreps and colleagues' (1994) four-part method of coding structural forms: it can overemphasize the non-routine. In the case of Kreps and colleagues' method, all four forms (domains, tasks, resources, and activities) have to be present for a structure to be considered an organization; otherwise, it is an organizing process. Webb believes this method overemphasizes improvisation. Here, in the case of

routine and non-routine events, I am arguing that all three conditions must be satisfied for an event to be considered routine; therefore, it could be argued that I am overemphasizing the non-routine. However, as I stated in Chapter 2 with regards to improvisation, taking a continuum approach is more accurate and effective than creating a bipartition. I have not once used the word *dichotomy* to describe routine and non-routine events because, although many interviewees phrased it that way for emphasis, I do not believe that "routine" and "non-routine" are perfectly exhaustive and mutually exclusive. There is some overlap. Much like the difference between day and night, the two categories could be viewed as complete opposites, yet there are times when either (or neither) term could be used without being wrong (e.g., dusk; periods of midnight sun in the arctic circle). However, the difference between routine and non-routine events is still critical to understanding critical team training because it works as a way to understand events, as the categorization is salient to members of critical teams. In the next section, I will discuss how critical organizations train their members to gain experience and familiarity so that the set of events considered non-routine becomes smaller and smaller.

Experiential Structuring

For a member to consider an event routine (and for his assessment to be accurate), it must mean that the level of training provided to him and his team has been sufficient for that event. The routine events are routine simply because members have been trained repeatedly to deal with those events. The challenge, then, is the set of non-routine events

that may present themselves in critical team work. How do teams and their parent organizations respond to non-routine events if the teams have not been trained for them?

Some of the main goals of organizational training for critical teams are to increase familiarity with critical team processes and to develop a sense of critical thinking. The first goal, increasing familiarity with processes, is a way of building structural components into the response patterns of critical teams. In his discussion of improvisation in jazz and organizations, Barrett (1998) claims that building structure is a way for the organization to improve processes: "In an effort to guarantee consistency and efficiency, organizations often attempt to systematically avoid changes and ambiguity through creating standard operating procedures, clear and rationalized goals, and forms of centralized control" (p. 611). This is the core concept of the first goal of critical team training, which I will discuss below.

Structure and Training

From the start, basic training acts as a structural foundation for new members: "I think the structure is definitely there as a baseline we all start from. Then experience and personal relationships build on that foundation. I think the structure provides a common background to make working with new people more effective" (Kim, Wildland Firefighter). The importance of consistency in basic training was echoed throughout the interviews. Larry, a retired smokejumper, said that consistency in personnel was a key element in teamwork: "it's really important that you—the other guys that are around you have had the exactly the same training that you did and are going to respond to situations

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exactly the same way you did." Sometimes, the basic structure comes in the form of a degree or certification, such as attending medical school or a police academy. In other fields, such as ski patrol, some of the structure may present itself in team training days: "Every year, we do preseason; we do three days of training, two of which are exclusively medical focused, and one of which is kind of procedures and what's going on on the mountain" (Trent, Ski Patroller). Trent said that one person missing the preseason would put the whole team at a disadvantage because it could cause a lack of consistency.

In the case of degree programs, major certifications, or academies, structure builds as training moves from somewhat theoretical to mostly applied. For example, most medical programs will require numerous hours of classroom learning followed by some form of observational learning. EMT certifications in most states require 120 hours in the classroom (half lecture-based, half skills training) followed by 20 hours of ride-alongs (10 hours in an ambulance and 10 hours in the ER). Spencer said that his firefighter training followed a similar pattern, going from mostly PowerPoint lectures to scenario-based training: "as the course progresses, it gets more and more hands on, until at the end, we are, two times a week, sometimes three times a week, we are going to the firefighter training grounds and doing simulations." Spencer's experience serves as an exemplar for training in the medical and firefighting fields. All nurses, physicians, EMTs, ski patrollers, and firefighters recalled similar training experiences, as did some of the tactical team members (e.g., SWAT team and bomb squad members). The only critical team members who felt their training went slightly differently were those in the military, who felt that the physical component of their work played a larger role early on in

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training than in other fields. However, all interviewees supported the idea that structure slowly builds as training moves from the classroom into the field.

Lt. Denton, leader of a SWAT team in the Southwest, used the phrase "Crawl, walk, run" to explain how training escalates in complexity in his unit. He said that new members cannot learn everything right away, "and they may not be ready to learn something if they don't have the earlier structure in place." Lt. Denton and two of his team leaders, Darren and John, were adamant that asking a team member to "run" before they have the right building blocks in place would probably be detrimental to their learning process, especially in an actual event. There is a similar notion in medical school expressed as "See one, do one, teach one." The idea behind this process is that a person would have to observe something before they could attempt it; then, they would become good enough to start the process with someone else. Nancy said that this is how she has learned to do a number of procedures on the job as an ER physician. She explained how she became familiar with a complicated procedure using this approach—including what she should do if she made a mistake:

> I've seen one done before. So you've heard in medicine – you can see one, do one, teach one? So I saw *one* (laughs). So, then yesterday I did one, but I told Jeff, I'm like: 'Look, I've never done one. Can you do it with me but let me do it?' So he showed me exactly what to do. He handed me the needles to numb up the eye, he handed me—he was holding the instruments—so he handed me the scissors to cut the ligaments, so I mean, he was good about walking me through it. So, I

mean, I knew the steps, I just wanted someone there by my side in case I did it wrong, or maybe had some type of difficulty in the procedure.

The only interviewee who was able to recall a moment in training in which they were asked to do something that was well above their familiarity level was Spencer, who told a story about a being placed in a mass casualty simulation during the first week of training. Spencer said it was chaotic and went horribly wrong as he and his classmates found out that they were woefully underprepared. However, Spencer believes that was the purpose of the simulation: to learn how far they had to go. This "trial-by-fire" approach, while certainly dramatic, does not seem to be too common among critical team training programs.

A more common approach to increasing difficulty in training is to do so gradually, so that structure can build as simulations become more difficult. Larry, a retired smokejumper, recalls his last practice jump as the culmination of a series of escalating steps:

> The practice jumps were pretty thorough. And then the final one was in an area where there was no good place to land. And almost everybody landed with their parachutes draped over tall trees and you had to then lower yourself to the ground and figure out how to get your parachute out of the tree.

The final practice jump built on the structure of earlier, easier jumps by adding a new component to the situation. Maggie's story about the helo-dunker at the beginning of this chapter also had a gradual increase in difficulty: "So they run you through kind of what I would call a 'crawl, walk, run' phase to run through this stuff." Maggie explained how

they first simulated a water landing by going in upright with oxygen tanks and eyes open. Next they did the exercise upside down, then they did it without oxygen tanks, and finally they simulated a night water landing by wearing black-out goggles. Maggie also said there was an explanation of what to do before every iteration, and they were encouraged to sit in the flight seats before the dunks and to become comfortable with the equipment and layout. In this way, organizations try to expand the comfort zones of the participants with each new component of training.

In many ways, the process of building structure though training is much like the workup cycle of an aircraft carrier. One iteration of the workup cycle starts when the vessel comes out of the shipyard, where it had been receiving maintenance. As Heath, a nuclear electronics technician with the U.S. Navy, explained, the ship "hasn't really been doing anything. And so you go on the water a few times, no aircraft, and you test it out." Then, in the next few months, Heath said the ship will go out again a few times with aircraft, and team members will check on a few extra capabilities of the ship. After building up more and more use, the aircraft carrier would be able to go out on deployment for a 12 to 18 months. In fact, the training cycle of the people on the aircraft carrier is often entrained with the workup cycle of the ship. In this way, the workup cycle is a mechanical manifestation of the process by which critical teams build structure.

Summary

One of the main goals of critical team training is increasing experience and familiarity with events and situations for team members. This is a form of structure

building. This includes basic training, which acts as a structural foundation for new members. Organizations generally bring members along gradually by following a "crawl, walk, run" setup, allowing members to increase their familiarity and comfort with each new component of training. In this way, training is a continual process of building structure that will help the actions of critical teams.

Improvising through Critical Thinking

The second goal of training is to develop a sense of critical thinking that would allow for enactment of routines or new processes. This is an important outcome of training because it is not practically feasible to run through every scenario or even for training coordinators to know every scenario beforehand (Kendra & Wachtendorf, 2003). In addition, team members themselves believe critical thinking to be an important component of their work; for example, Thackaberry (2004), found that wildland firefighters wanted a culture that promoted thinking; specifically, the firefighters viewed development of a safety culture "that encourages people to think rather than just obey the rules" as a highly favored solution to the safety problems they faced in their work (Tri-Data, 1997, p. 10).

Consequently, training exists in part to help members learn how to adapt in unfamiliar situations, or as one firefighter said: "You can train for everything, but the reason you train so much is to train for the thing you haven't been trained for" (Mac). Adaptation is a precursor to improvising, which involves critically thinking about the

situation and composing previously known elements in a new way (Berliner, 1994; Crossan & Sorrenti, 1997). This is necessary in non-routine events.

So training helps teams deal with non-routine events in two ways. First, training helps them turn the non-routine into routine, which comes through a process of building structure. This was covered in the previous section. Second, training helps teams understand how to use previously known (routine) aspects of their work to deal with non-routine events through critical thinking. These two goals complement each other in a structurational pattern (Giddens, 1984). As stated earlier, routine events occur when teams 1) know what do to do, 2) know how to do it, and 3) *what* and *how* are fully applicable in the current situation. If one of these conditions is not met, a team must enact some form of improvisation in response to a non-routine event. According to Shibutani (1986), "if the normative framework does not provide an adequate guide to concerted action, the people involved in the situation must work together to improvise some way of coping with it" (p. 269). That is the essence of the findings in this section.

One example of the interaction between structure and improvisation in critical team work comes from a story from Nancy, an ER physician, about an aortic dissection. Nancy was working in the emergency department of a community hospital on the overnight shift. Most times, she was not the only physician in the department, but on this night she was working by herself. A patient came in complaining of chest pain, and Nancy's department was under-resourced for what that symptom could lead to, as it did not have a catheterization laboratory to perform emergency angioplasties or place a stent in case of a heart attack. Nonetheless, Nancy saw the patient and asked if he was still

having chest pains. He said no. However, 30 minutes later, the patient's wife ran out of his room banged on the glass of the "fish bowl," where the nurses and doctors sat: "Come see! Come see! Something is wrong with my husband!" Nancy and the nurses went to the room and the patient had turned blue. He started vomiting and he flat lined. Nancy tried to intubate him, but before she could do that, he woke up and said he was having pain in his side. Nancy grabbed the ultrasound machine and looked at his gall bladder; it was fine. He said: "No, it's lower than that." He started shaking his legs, so Nancy pulled up the sheet to see that his right leg was as white as the linens themselves. He had no pulse in his leg. Nancy decided that it might have been an aortic dissection, something she recognized from medical school and from previous experiences. She confirmed it with a cat scan. An aortic dissection is serious enough that a doctor will ask for family to come in that night, as the patient might die. In this case, the patient's medical condition's severity was compounded by the fact that this hospital was ill-equipped for the necessary surgery. Nancy spent all night trying to get the patient transferred to another hospital: "I'll go through this the regular route which is calling each hospital to try to find someone who could accept the patient." Eventually, a sister hospital agreed to accept him. However, the ambulance that was supposed to transfer him never showed:

> We called them and said: 'Where are you guys?' and they were like, 'oh, we are coming—we'll be there in a little bit.' And I said, 'no this is not in a little bit.' Someone had told me you could call 911 and get an ambulance to come to the ER, so we ended up calling 911 which in hindsight, now that I know what I know after going through this experience, next time I am calling 911. You can actually

call 911 from the Emergency department if that ER is not equipped to handle a

patient.

The 911 ambulance came and refused to take the patient unless a doctor chaperoned him

there. Nancy went with him to the other hospital where he had a successful surgery, and

he walked out of the hospital two weeks later. This shows how Nancy had to think

critically and improvise.

Nancy's story about calling 911 from the emergency department is an excellent

example of the interplay between structure and improvisation during non-routine events.

First, structure was present in the procedures Nancy used when the patient first showed

life-threatening symptoms, and when she made calls to other hospitals. Second, Nancy

remembered that someone said she could call 911 from the ER, which was a form of

learning that occurred before the event, making it a type of structure. As for

improvisation, Nancy demonstrated her ability to take structured information ("this

patient needs surgery" and "I can call 911 from the ER") and compose it in a way that

was new to her. She had never done that before, and as she said: "now that I know what I

know after going through this experience, next time I am calling 911." In this way,

Nancy's improvisation ultimately became part of her structure.

Improvisation is seen as a natural response to the unpredictability and time-

sensitive nature of critical team work. Interviewees were very matter-of-fact when asked

about improvisation. Sarah, an ER nurse on the west coast, said, simply: "I mean, you

improvise. [Our work] usually goes pretty smoothly and everyone just assumes their role

but there's always situations where it's kinda chaotic or something unexpected happens."

Other interviewees acknowledged the routineness of non-routineness. As an EMT,

Kristen said there are times when she has no idea what is going on, and her job is to cover

the basic life threats and get the patient safely to the hospital (she said that sometimes it is

"a wild goose chase" trying to find the problem). As a, ER physician, Nancy said that

patients can always throw her "a curve ball," even when she does everything correctly

according to the textbook. This does not mean that Kristen and Nancy are unprepared in

any way. Rather, it confirms two ideas: 1) as Mac said: "You can train for everything, but

the reason you train so much is to train for the thing you haven't been trained for," and 2)

due to that, the expectation in critical team work is that you will have to improvise from

time to time to the best of your abilities. Multiple interviewees said that there are

unlimited variables in critical team work and they see improvising as a natural response

to them.

Sometimes, improvisation is seen as simply responding in a way that makes the

most sense in a given situation. For tactical teams, this can mean improvising as a

response to the unpredictability of a suspect. Lt. Denton said SWAT callouts are

systematic and actions are driven by 1) intelligence (i.e., what they know about the

situation) and 2) actions of "the bad guy." A team may go outside of general orders to do

what makes sense given the unpredictability of the suspect's actions. Sgt. Carey, the

leader of a bomb squad in the Southwest, pointed out that the majority of the so-called

"bombs" that they deal with are technically termed "*improvised* explosive devices" in

which the components are purchased from a place like Radio Shack and assembled in a

garage: "It's made out of whatever the maker can beg, borrow, steal, or buy." As a

response to the improvised nature of the explosives, Sgt. Carey ensures that his team is familiar with as many components as possible and that his team is intelligently flexible in their own responses.

In addition, environmental variables may lead to the need for improvisation. Trent, a ski patroller in the Mountain region of the U.S., said that extreme weather factors often lead to decisions that are sensible but go against standard operating procedure.

> I think for us there's a lot of like: okay, is it better for me to sit here and do a real thorough full assessment and make sure I'm not missing anything on this person who blew their knee out, or is it better to get them the hell out of the 30 mile-an-hour winds and negative 10-degree weather. I mean protocol says we sit there and do a head to toe, and a patient history, and all that stuff, but more often than not for us, it's package and go, at a much more quick rate and with less assessment than other agencies due to the environment.

Trent's comments, along with those of the tactical team leaders, demonstrate that critical teams must often step outside of standard procedures in order to most effectively respond to the unlimited variables in their work environments. In addition, stepping outside of standard procedures is not considered taboo, or even uncommon, among team members, their leaders, or their parent organizations. In fact, it seems that most organizations give their members flexibility to act as they see fit, as long as their actions are considered sensible in the end. Such flexibility complements the structural components that members learn throughout training, and both flexibility and structure come into play for routine and non-routine event alike. Therefore, given that it is not as simple as saying: "routine events

demand structural responses" and "non-routine events call for improvisation," how do critical team organizations train their members to have structure and flexibility complement each other in their work?

Summary

One of the main goals of critical team training for organizations is developing a sense of critical thinking in its members. Critical thinking is a form of adaptation, and adaptation is a precursor to improvisation. Training for critical thinking involves helping members understand how to use previously known aspects of their work to deal with non-routine events. According to Shibutani (1986), "if the normative framework does not provide an adequate guide to concerted action, the people involved in the situation must work together to improvise some way of coping with it" (p. 269). In this way, training creates spaces for flexibility that will help the actions of critical teams.

A Structured Yet Flexible Approach

The following passage is from a book on cooking techniques by Alton Brown (2006), host of the cooking show *Good Eats*:

> Let's say I invite you to lunch. You've never been to my house so you ask for directions. I fax you a very precise list of instructions designed to get you where you're going. Distances are calculated to the tenth of the mile and landmarks are described in Proustian detail. You arrive without a hitch. But do you know where you are? If a tree had fallen in the road or a road suddenly closed, would you

know what to do? Unless you have a global positioning system in your pocket,

I'm eating lunch alone. If only I had sent you a map instead (p. 6).

Brown uses this analogy to set the reader up for the dearth of recipes in his book. He

explains that recipes are like explicit driving directions, in that one misstep or missing

ingredient could get somebody completely lost. Instead, his book is filled with general

concepts of cooking, lists of substitutions, and many alterative strategies that help the

user "know where we are when we get there" (p. 6). However, Brown says: "I not only

use recipes, I try to memorize them from time to time so that I can ponder their finer

points" (p.10). Brown's philosophy of cooking is that one should know procedures but

still think critically ("the most underused tool in the kitchen is the brain") to do things

differently if necessary or desired.

In the same way, organizations try to give their members a holistic understanding

of critical team work by providing small forms of structure combined with methods to

encourage flexibility. Instead of giving specific directions on how to handle entire scenes,

organizations give their members *roadmaps* of events: detailed yet general and flexible

understandings of what could happen. The roadmap approach relies on resources,

experience, smaller procedure directions, and other forms of decision support. It also

takes critical thinking skills and situational awareness to be able to read a map correctly.

The roadmap approach allows teams to make small adjustments and not feel lost or off-

track.

While simpler tasks may have one applicable method that can be considered

"best," the complexity present in critical team work makes it difficult to identify one

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perfect approach to an entire scene, which usually includes numerous interrelated decisions and actions. Put another way, "there is not one perfect way to do everything" (Sgt. Carey, Bomb Squad). This understanding allows teams the flexibility to change course or adapt when they feel it is appropriate; the roadmap approach is a team's license to improvise.

Of course, the roadmap approach only works under the assumption that members are using, in their words, "common sense." Common sense, of course, is in the eye of the person doing the sensing. As someone who is not familiar with the human body, or the intricacies of fire control, there are many aspects of critical team work that they might consider common sense about which I would be clueless. Consider this quote from Mac, a firefighter:

> But the focus has been on: stop worrying about following every rule to the T, just use your common sense. You know, don't waste time or energies trying to make sure you're following every protocol. If you see an obvious fix to it, don't let common sense go out the door.

For a firefighter who has only been taught procedures using very specific, step-by-step directions, it would be "common sense" to follow every protocol, because he would not know how to approach the situation any differently; he would respond exactly as his training had taught him. This highlights the main caveat of the roadmap approach: it gives members a lot of flexibility, and consequently a lot of responsibility, to choose the right path.

In the following chapters, I will talk about three process values that are desired by critical team members and valued by the organizations training them. These three process values are experience, communicative decision making, and situational awareness. I believe that "common sense," as it relates to critical teams, is a combination of these three values. As a critical team member, do you have the experience to make a scenario "common"? Do you have the situational awareness to make sense of the scenario? And can you use these values to make a decision as a team? These are the questions that must be answered affirmatively for the roadmap approach to be an effective one.

Communication Flexibility

The flexibility of the roadmap approach is also applied to communicating within critical teams. Many firefighting and police crews previously used the "10 codes," which are a series of numerical codes said verbally to represent common phrases. For example, saying the code 10-31 verbally over the police radio means that there is a crime in progress: "We have a 10-31 at Westover and Norwalk." In his time as a smokejumper more than four decades ago, Larry said that they had to learn radio codes as part of the firefighting vocabulary: "We all knew, for instance, about the radio codes. So if somebody had a radio they would use it the same way, there 10 codes and 6 codes and 10-4, 10-6, 10-20, what's your 20, all that kind of stuff, but the vocabulary was the same for everybody that was there." However, in recent years many departments and states have phased out 10 codes in favor of plain English. Tom, a firefighter in the downtown area of a major city in the Southwest, said that they stopped using the codes because they

were too confusing among different jurisdictions, and that it was much easier and clearer to simply ask "Where are you?" instead of "What's your 10-20?" His department stopped using them 11 years ago. The SWAT team in the same city switched away from the 10 codes as well and uses what they call "plain talk." Even within departments that still use the codes, there is an understanding that plain talk can be less inhibiting during events. Trent said that while ski patrollers still use them, there is a shift away from the codes. The National Incident Management System (NIMS)—an attempt by FEMA to coordinate critical team work across all public and private sectors—does not use them because:

> Not all agencies know the 10 codes, and you have to memorize all this different numbers, and if you say the wrong one, you're not communicating. So I know for NIMS, for which I have a cert, they get rid of that, and they say: screw that stuff, we just want to make sure you're clear and concise. And that is coached for sure.

Mac said that the leaders of his firefighter training were very clear that communication should not get in the way of getting the job done: "One of the big deals is saying: if you forget a particular code, or, you know, you don't quite know how to sound quite as professional on the radio as you're supposed to…bottom line, if you just tell people what you need, no mater how sophisticated the language is, that's kind of been the new mantra in the department, because we have so many new people, kind of interchanging in and out of the department."

However, critical teams still structure components of their communication patterns. For example, Sarah said that medical professionals practice what is called *closed loop communication*, in which the receiver repeats and responds to the command audibly:

So in a code situation, the MD supervisor would say: "let's give 100 mg of

epinephrine" then the one who's actually administering the medication needs to

say out loud: "giving 100 mg of epinephrine" or whatever. I find this very helpful.

When you do it, it eliminates a lot of errors. Usually there's too many people

yelling and screaming.

Sarah said that closed loop communication is emphasized by the organization in training

and in simulations. It mirrors the communication pattern used in some branches of the

military, including the Navy ("closing the pump, aye"). In this way, minimal structures

(Brown & Eisenhardt, 1997; Kamoche & Cunha, 2001) exist in the communication

environment around which other patterns can be flexible, clear, and concise.

Role Flexibility

It is also expected that members should be flexible in the roles they assume within

the team, because "you don't know who's going to be put into different situations" (Kim,

Wildland Firefighter). Role improvisation has been well-documented in the emergency

management (Mendonça & Fiedrich, 2006; Webb, 2004) and can be practiced by cross-

training members during simulations (Mendonça & Fiedrich, 2006). This is consistent

with the patterns of the teams observed for this study. For example, a senior member of a

bomb squad said that each member of the squad is cross-trained to perform every role on

the team; he described his crew as "a team of individuals" in that they have to be ready to

move from role to role without skipping a beat. Kim said that cross-training is critical in

wildland firefighting because "you never know when you're going to be the person on the

radio, or a situation pops up where you kind of, all of a sudden, are the only man around."

This idea was supported by other wildland firefighter and some urban firefighters as well.

The nature of critical team work is that scenes are unpredictable and structures can

change in an instant. Each member needs to be ready for a multitude of roles within the

team.

As with actions and communication patterns, roles are seen as flexible yet

structured. Many medical team members have specializations based on their training and

experience. Tactical team members mentioned that most of them have "unofficial"

specializations; in addition, SWAT teams have official specialists, such as snipers. In

other instances, roles are assigned on a daily basis. Sarah said that members in critical

care centers are often assigned "code blue" roles—such as medication nurse or equipment

nurse—at the beginning of each shift so that they know exactly who should do what in

the case of a heart attack. She said that this type of role-specific response is practiced in

training as well, and she supports the strategy: "I think that just helps to cut down the

stress and eliminate communication problems because you have that one role that you

know you're doing and nobody jumps into another person's role." Sarah said that there

are often too many members during a code blue and it can lead to decision making and

environmental stresses that lower overall efficacy. By assigning temporary roles at the

beginning of each shift, the hospital works to lower the average number of extraneous

people in a room. This demonstrates how roles can be minimally structured in critical

teams.

Summary

Organizations that support critical teams give their members a holistic understanding of—and an allowance of freedom—in events by providing small forms of structure combined with processes that encourage flexibility. I term this the *roadmap* approach to critical team work because members are given a general view with details as opposed to specific step-by-step direction for entire events. The roadmap approach provides structure through experience and flexibility through encouragement of critical thinking processes. This approach also applies to communication patterns and roles. The roadmap approach's quality is dependent on the sense of team members, which will be discussed further in Chapter 7.

Chapter 4 Summary

In this chapter, I explored how organizations conceptually prime and prepare their members for improvisation and flexibility in their work. First, I examined the duality of routine and non-routine events. Next, I discussed how members structure their actions through experience. Then, I examined how critical thinking encourages improvisation. Finally, I detailed a structured yet flexible perspective on events that I termed the *roadmap* approach.

I have also identified three highly desired outcomes of critical team training. I discuss each of these outcomes as well as how they fit into the nested phase model (Ishak & Ballard, 2012) in the next three chapters:

- In Chapter 5, I discuss experience. Experienced members have a large repository of procedural memory—or routines to access—that help that feel familiar with their work. Organizations provide a low- to no-risk environment for gaining experience by running simulations.

- In Chapter 6, I discuss communicative decision making, which is an avenue for accessing and compiling the right routines. Communicative decision making is a form of critical thinking that often occurs during the adaptation phase.

- The third desired outcome is a way to make sense of it all, which happens through situational awareness and sensemaking (discussed in Chapter 7). Situational awareness is a form of sensemaking that is applicable to action teams; it is a way to understand surrounds so that decisions have the correct inputs. Retrospective sensemaking occurs in the debriefing process.

These three outcomes are critical to effective use of the roadmap approach. In other words, balancing structure and flexibility in critical team work is a delicate process that requires experience, teamwork, and common sense.

CHAPTER 5 – TIME FOR EXPERIENCE

What are decisions in critical team work based on? In Chapter 4, I discussed how emergency organizations provide structural elements (e.g., procedures, routines, and skills) for their members while still allowing space for flexibility in decision making. In this chapter, I will explore how experience serves the primary basis for decisions in critical team work. I will also discuss how experience also serves as the primary means of learning how to do work.

These two values of experience create a paradox of sorts. Let us say a fire department wants to train members on skills and decision making processes in high-rise fires; the best way for them to do so would be to have them experience the scenario. However, putting them in a position to get experience in a real-life high-rise situation could be unwise because they have not yet developed their situation-specific decision making capabilities. How, then, do organizations get experience for their members?

Organizations create safe spaces for experience in two ways. The first way is by using the "see one, do one, teach one" style of training, in which inexperienced members can be supervised by those with longer tenures. In this way, safety is ensured while new members (or experienced members learning a new procedure) get valuable experience that will serve them well in the future. This was discussed in Chapter 4.

The second way that organizations create a safe space for gaining experience is by making *time* for it in training. Specifically, I am talking about scenario-based training (SBT), or simulations. In simulations, decision making and skill capabilities are exercised

in a low- to no-risk environment. Simulations are described in the nested phase model as a way of coping with the finality of the work of action teams (Ishak & Ballard, 2012). In this chapter, I discuss simulations as a way of "cheating" the paradox of the two values of experience described above. First, however, I will explore the two values of experience: it is the foundation of decisions as well as the primary method of learning.

Experience as the Foundation of Decisions

Viewing experience through the works of Dewey (1939, 1958) lends support to the idea that the two goals of critical team training are 1) to turn the routine into the non-routine, and 2) to help teams enact new processes when necessary. Specifically, I will examine two dualities of experience in Dewey's work. First, I will examine the distinction between primary and secondary experience. Primary experience is a gross, crude experience of subject matters, meaning it is based on interaction with physical senses, and not a process of reflection (Dewey, 1958). By contrast, secondary experience is the reflection on primary experience; it is a rational process that involves making mental sense of the interactions with one's environment or situation (Dewey, 1958). I will discuss this distinction, and the connection between the data in this project and Dewey's view of experience, in depth in Chapter 8.

However, there is another distinction that Dewey makes that is important to discuss at this point. Dewey (1938) posits that experience comes out of the collaboration between two principles: continuity and interaction. Continuity means that past experiences will influence present experiences, and interaction means that experiences

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are based on situational elements in the present. Present experiences are created by the collaboration of these continuities and interactions. Like Dewey, Giddens (1979) argues that we reflexively monitor our past when deciding to engage in actions. In other words, decisions are founded on experience.

Supporting the arguments of Dewey (1938) and Giddens (1979), interviewees in this project said that past experiences are a form of structure for current decisions. When asked what her decisions were based on, Kristen, an EMT and instructor, said: "I would say for me, it's probably 95 percent experience." She added: "It's only by experience that you can learn how to identify, I mean as soon as you walk in a room, that person's sick, or that person's not sick. Are there exceptions to the rule? Absolutely, as with anything. But with experience comes the ability to make that differentiation." This was a common refrain in medical, tactical, and firefighting interviews, and it recalls the triage process of Eisenberg and colleagues' (2005) study of communication in emergency departments. In the triage process, nurses had to be especially skilled at determining if patients were sick, faking, or a hypochondriac. They also said that said that the ED staff makes quick decisions based on incomplete information by relying on information from past experiences (p. 398). The idea that decisions are based on past experiences is the foundation of this section.

An aspiring critical team member's first exposure to real-life events comes during training. Strong training programs are ones that get their students experience early and often. Sarah said that exposure to real-life scenarios makes some programs better than others, and that exposure generally comes through clinical hours in rotation. She said a

good program "exposes you more," which is beneficial because it offers opportunities for critical thinking and evaluation. As an instructor for EMTs, Kristen said that a good program is one that speeds up the experience curve ("As instructors, we try to teach them how to get experienced"), which can come from something like scenario-based education. However, Kelly argued that you cannot "speed up the process; it just takes time." She said that firefighters have to fight actual fires—not practice burns—to understand what's going on. But how can a person get real-life experience if it takes experience to make the decisions necessary in those real-life experiences? This is a tautological issue for all action teams. Essentially, one needs experience to be experienced enough to get experience.

Team leaders also value experience when staffing their teams. This means two things: they will 1) look for people with experience, and 2) try to get them experience as quickly as possible. Sgt. Carey said that he wants people with a proven track record and work ethic for his bomb squad, in part because it demonstrates "they have seen most of it" in their time as a patrol officer, meaning that he wants officers with a long tenure that will serve as a strong experience-based foundation. He also wants people who will join the squad for the long haul so they can get substantial experience with improvised explosive devices. Currently, most members of his squad have tenures of 5 to 10 years, and while an aspiring squad member can get certified in two years, Sgt. Carey will not allow them to make decisions until one to two years after that: "they still need that experience to be ready." Other bomb squad members hinted that Sgt. Carey believes this because he places an especially high premium on experience within his squad; he

believes that previous experiences are not entirely transferrable. This raises the question of what is considered relevant experience, a question that I will address in Chapter 8.

Sgt. Carey's team is not the only one that gives credibility to those with the most experience. Senior members generally make teamwide decisions for critical teams. Part of this is that they may have the official title to make decisions, and part of the reason is that they have the most experience on the team. Larry explained that he deferred to experience in multiple aspects of smokejumping because he believed experience to be an indicator of quality decision making: "The team leader was always somebody who had more experience and had been in this situation more often than I had, and therefore what he said was what I was gonna do." Kristen said that when EMTs are paired for shifts, they are designated as the senior and junior partner based on experience; she said juniors with less than a few years of experience are generally hesitant to make big decisions without the consultation of a senior member. This shows how experience is valued in team decision making.

Summary

Past experience acts as structure for current decisions for critical team members. Experience helps members make decisions during stressful situations in which decision making must occur swiftly and accurately. This is why critical team training programs are considered better when they get their students exposure to real-life events early and often. Team leaders value experience when staffing their teams, and generally allow the most experienced members to have the final say in major decisions. I have discussed

experience as the basis for decisions, and in the next section, I will explore how experience is seen as the only way to learn how make decisions.

Experience as the Only Way to Learn

In the previous section, "experience" was the answer to the question: "how do you make decisions?" In this section, "experience is the answer to a slightly different question: "How do you *learn* to make decisions?" The distinction is subtle but important. In the previous section, I discussed past experience as a repository of knowledge, or the *basis* for current action and decisions. In this section, I will discuss how experience is the *process* by which critical team members learn how to do their work.

In any critical team training program, there are two major components: classroom instruction and hands-on instruction. Members said these two types of learning have completely different roles in their decision making processes and physical actions. Namely, classroom instruction is seen as a good basis for hands-on instruction. Kristen, an EMT, described the dichotomy in this way: "there's what the book teaches you, and there's what the street teaches you, and they're two totally different things. And you need to know what the book says, but there is no way possible that any textbook is going to cover every situation that you come across." When asked how she made decisions, Kristen responded by saying that her decisions are based mostly on what the "street" had taught her:

> I mean, certainly, you learn a lot in the classroom, and theoretically, everybody
>
> has the same foundation, but you can only learn so much about human being or

about the disease process by reading a book. You have to actually get your hands

on patients, and see patients, and examine them and assess them, to see who's

sick and who's not sick.

Kristen's response was echoed by numerous interviewees across all types of work:

medical, firefighting, and tactical. Classroom instruction cannot teach things that hands-

on instruction can, things that are absolutely essential to the jobs of critical team

members. Experiential learning is the key to good critical team work.

Interviewees overwhelmingly pointed to hands-on experience as the most critical

opportunity for building procedural memory. Spencer said that "you have to kind of just

go out there and get it yourself," at the same time arguing that it is difficult to absorb

most material during "3-hour PowerPoint lectures." Kelly, a hotshot crew leader, explains

that all the teaching does not "make sense" until you have the hands-on experience:

You know your basics in the classroom, but to be honest, you have nothing in

which to base those basics upon until you get into the field and start doing your

work. When you start doing the work then you start to see you can apply the stuff

you learned in the classroom and it makes more sense…you have your 40-80

hours of training that you have to have before you go out with the hot shot crew,

but it really doesn't make sense till you are doing it.

One way to phrase this phenomenon is that there is an epiphany or "a-ha" moment that

comes from hands-on experience in critical team training. This is why "you have to

actually get your hands on patients (Kristen, EMT)" and "until you actually do it, it's

kind of hard to understand what they are talking about" (Kelly, Wildland Firefighter). In

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some sense, knowledge cannot be part of one's structure until it is supplemented by enough experience.

As for learning how when to improvise in critical events, the interviewees again pointed to experience. Nancy, an ER physician, was asked how she knew what the best course of action was during a non-routine event. She said: "We don't have classes on this. I mean maybe we did in medical school, I can't remember. But this kind of stuff comes with experience."

Particularly in the medical field, interviewees explained that learning from experience is how critical team workers expand their comfort zones. Some interviewees expressed a strong willingness to learn on the job: "He was my patient and I actually wanted to do it because I have never done one before. So I wanted the experience" (Nancy, ER Physician). This shows how critical team members who are hungry to learn may actually look forward to somewhat unfamiliar situations. Others spoke matter-of-factly about the way that their jobs require them to try new things. As a physician's assistant, Miguel said that "pushing the envelope" helps him learn in his job. He said he is regularly put in positions in which doctors trust him more than Miguel feels they should, but that is what helps him learn "[The physicians] think that you've seen it enough to help, and you're in that gray area: I don't know if I've seen it enough yet. And then the doc's like: 'Well you need to help, and now you're gonna have to learn.' So that's on the job." One of Sitkin's (1996) characteristics of what he calls "intelligent failure" is that the potential failure takes place in a space that is familiar enough to permit effective learning. This may be what Miguel describes as "that gray area:" a domain that

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has enough familiarity to permit learning but not so much that one's comfort zone is not expanded. A question that arises from this is if and how the senior physician knows if the procedure falls in the gray area of the physician's assistant.

In some cases, the prospect of failure is not particularly daunting. Nancy explained that physicians are often willing to take more risks with patients who are less likely to survive. In fact, more recently she had another patient with a similar hematoma, and this time the patient was much closer to death than the previous one. Because of this, Nancy felt more comfortable trying a new procedure:

> I am sure there are some physicians that would say, "I haven't done one before" and just defer and say well she is going to die anyways and not do it.   For me, I want to learn. If there is anything I haven't done I want to do it. And I don't want to sound morbid or anything, but this particular patient might die anyway – she was bleeding in her brain, bleeding in her legs – so this would be a case – I don't want to say practice on, but learn on because if any bad outcome with the procedure – this particular patient is probably going to die anyways.

Nancy shared another story about a time she learned on a patient who was near death. The quoted section is long but worth printing here as another example of what practicing during production sometimes means to critical teams. Working on a patient who had a multiple gunshot wounds and was basically brain dead became an opportunity to learn how to crack a chest open:

> I would actually pronounce him dead but my partner Tamer who—he is the gutsiest ER physician I have ever met in my life. I mean he does procedures I

have never even heard of—he turns to me—it was my trauma but he walks into the room and asks if I am okay. I said yeah, I am fine. Did you get a GSW [gun shot wound] and I said yeah I am going to call it—pronounce him dead. Well Samir said: 'Do you want to crack his chest open?' I said: 'Well, I've never done one. Will you walk me through it?" He said yes, and before I even had a chance to put a gown on, he cut the chest open. Take grip cutters, pulled back the ribs, and opened his chest. He said: 'Here's the heart. Grab the heart. Here's the hole from the gunshot wound,' and we fished around to see – because usually you have to put a clamp on the aorta to prevent blood from going out so that you can repair what is going on in the heart if there is a wound so they don't bleed out. But the guy—whoever had shot him—did a good job. He obviously died, but for me it was a good learning experience because I had never done one. But I'd seen one – kind of from afar – I'd read up on it so I was familiar with it. So for me it was great.

Practicing on what could be called a "lost cause" is seen as a way to gain experience in a low-risk environment, much like a simulation or another training exercise. In fact, Nancy pointed to those situations as much more useful because they are real: the patient is real, the symptoms are real, and the outcomes are real. The only variable that is slightly different from a non-"lost cause" would be that the stress involved in the situation is lower because the expected outcome is death. Other than that, working on patients for which there is very little hope is a useful way to be experienced for the next patient who comes in with similar symptoms.

Not all practice during the production phase is as morbid as that in the medical field. Sometimes, teams like fire crews use routine events to help bring along new members—usually with strict supervision—or to practice new techniques: "In the middle of a fire, there may be a good opportunity for, say, a newer person on the fire to get to do a new role. To work as a lookout or whatever—and they are never alone, so they always take advantage of those times. So yeah, we will stop in the middle of fighting a fire and using a training opportunity" (Kelly, Wildland Firefighter). Again, this type of experience is seen as superior to simulation-based experience, mainly because it is the more realistic: "And I think it is easier for people to understand - because this is what is happening right now - and now you can see and understand why we are doing this" (Kelly). Learning during the production phase can also come through responsibility. Sgt. Shaw, the head of a SWAT team, lets his two team leads make decisions during events, with Shaw's silence implying consent with the decision. By using this strategy, the team leads have to think through the decision making process on their own with about the same level of stress as they would if Sgt. Shaw was not present. Again, this is more realistic. In summary, practice during production is beneficial to because it is the most realistic type of experience that teams and members can have.

Sometimes learning from experience comes in planned opportunities for failure, usually during simulations and scenario-based training. Failure often creates spaces for critical thinking and discussion. Leaders of SWAT teams, bomb squads, and wildland fire crews concurred that they let their members make mistakes in training because failing will push a person to think about their process and what they can do differently. This is

especially true with people who are competitive by nature, a trait that is very common in critical team workers (this notion came up regularly in training observations and was confirmed multiple times in interviews). Mac said that failure was a critical part of the training process for him as a firefighter. He told a story about a training scenario in which he and his fellow trainees had to find their way into a "burning" building. The training facilitators gave the trainees space to make common mistakes, such running out of air because they took too long during some procedures. Mac said that allowing the trainees to make mistakes—and explaining why afterwards—was helpful in understanding the challenges of a real scene:

> They want things to go wrong. Or, complications to occur, because that's what's going to happen in reality if this presents itself at a real scene…Say you're running out of air, which is a big no no. And maybe they'll let you run out of air on a sim because this is a controlled environment. And so, if something goes awry, they'll shut down this particular scenario. They'll say: 'okay this scenario's over. Everybody come out. Alright, everybody failed, and this is what happened. You ran out of air, you didn't report, you spent too long trying to get through here, you know, you didn't handle the stress well, you freaked out, and you kinda forgot all your training. Why did this happen? Okay, let's do it again.'

Mac said that he and the other trainees were given space to recover on their own; they were interrupted at the moment of error unless their safety was in danger. They only received new instruction after each round of the scenario was over. This is related to Berliner's (1994) idea of practicing the *save*, in which a jazz player will be asked to

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recover from an error in decision making. Berliner found that jazz musicians often made mistakes on purpose when practicing to help them understand how to recover. This helps them in developing a set of routines and skills that be called upon in a variety of situations. This illustrates how failure often serves as a catalyst for learning (like in Mac's example, this is especially true when it is coupled tightly with communication, such as a team debriefing after a simulation. I will discuss the iterative process in of simulation debriefing with more detail in Chapter 7).

Lastly, working with people who have more experience is seen as an efficient way to "learn the ropes," so to speak. In working with team members with a long tenure, critical team members have the opportunity to learn lessons from both the experiences of others and by common experiences. Trent, a ski patroller with less than 10 years of experience, explains how simply being around those with more experience is one of the best ways to learn how to do his job effectively and save lives:

> So our longest-term ski patroller it's his 34th year this year, ski patrolling. So I would say that one of the things I get most out of training is, we might be working with a certain splinting system or talking about a certain issue if you come across somebody with a broken hip and they're laying on the broken side, what's the best way to move that person? Typically it's an excruciatingly painful injury, that if you get within 2 feet of them they're screaming at you, typically. So what I love is that when we're talking about that, there's at least 30 years of experience next to you, and so many chances for people who have been doing it long enough to say: 'Yeah yeah yeah, the book says that, but listen, in my experience the best

thing to do is to get a blanket. You get a blanket and you tie it around their hips

and do it pretty snug and that's really holds and stabilizes that joint and then you

can move them much easier.' People, things like that that aren't in the book, that

only exist in the spoken word and the wisdom of people who have been doing it

for 35 years.

The relationship between two team members with varied tenures gets at the idea

presented at the beginning of this section: there's what the book teaches you, and there's

what the street teaches you. Sometimes the book explains the best way to do something

because an experienced person wrote it, and other times it does not. The latter may

happen because the book is outdated, and a new, better method has been introduced since

publication. It may also happen because the book has a method that is mandated to be

taught, but is not actually followed by practitioners in the field. Working with people who

have a longer tenure is an efficient way to learn from experiences.

Summary

Critical team members cited experience as the more prominent way in which they

learn how to make decisions. Experience, or hands-on learning, teaches things that book

learning cannot, or as one EMT said: "there's what the book teaches you, and there's

what the street teaches you, and they're two totally different things" (Kristen, EMT).

Experiential learning is the most critical opportunity to build procedural memory, as well

as the best way to learn when to improvise. Experience helps members expand their

comfort zones by taking on incrementally more responsibility, both in real events and

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simulations. Simulations are of special importance here because critical teams take time out of their schedule to run them. The goal, of course, is to get experience in a low- to no-risk environment. The emphasis on simulations in the work of critical teams is much higher than for non-action teams (e.g., management or service teams). In the next section, I discuss how simulations are a time for experiential learning as well as a source of experience for decision making.

Time for Experience: Simulations

Experience is highly necessary as a precursor to decision making for critical teams; at the same time, experience is also the only process by which new critical team members (and seasoned members learning new things) can learn to do their jobs. Organizations that support critical teams bypass this conundrum by using simulations. Simulations are experience-based activities that replicate the processes of real-life events; they are used to replicate aspects in an interactive manner (Gaba, 2004). While they have been used in a variety of contexts, they are especially important for critical teams because of two temporal features of their work. Critical team work is final, meaning that surgical crews and military units cannot "redo" their work later. And because the outcomes of critical team work are often that a person lives or dies, it means that mistakes on the operating table or battlefield can result in irreversible casualties. Critical team work is also characterized by epochality, which is to say that it is composed of events (Whitehead, 1978). There are usually dramatic starting and finishing points for critical teams: a fire alarm goes off to start an event, or a suspect is killed to end it. Therefore,

critical teams cannot choose to delay their work to a later time. In addition, the timing of events in critical team work is unpredictable. Finality, epochality, and unpredictability combine to make the temporal structure of critical teams (and action teams) different than other team types.

Simulations are a response to the finality and epochality of the work of critical teams (Ishak & Ballard, 2012). Once an event starts, there is generally no time to practice procedures, skills, routines, and decision making; once an event ends, there is no time to do it over. So simulations are a method of gaining experience and becoming familiar with situational elements in a low risk-environment. Here, I will identify five main purposes of simulations that surfaced during interviews and observations.

First, simulations are used to introduce to and familiarize members with situational environments and other variables. Without referring to one type of scenario in particular, Mac, a firefighter, said that the main purpose of simulations is familiarizing the team with the pressures of critical team work by suppressing feelings of *vu jadé* (Weick, 1993) or being "lost in the fog" (Spencer, Firefighter) that can result from a lack of situational awareness. He said that many situations are "highly, highly stressful, very complicated, very intense, and they want to make sure that we're as trained as we can be, and that we handle (the situation) as best as we can" (Mac, Firefighter). Therefore, simulation facilitators will often create realistic intensity levels to get members used to the stress. Simulations are also valuable for familiarizing teammates with each other. Mac also mentioned that his department will pair up volunteer and paid firefighters to mimic "what's it's actually like on a larger scene." In this way, one of the main outcomes of

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simulations is familiarity with event variables. This is consistent with the research of Aggarwal and colleagues (2004) who argued that the main advantage of simulation is familiarization with external influences such as distractions and crisis situations.

Second, simulations are used to instill new procedural memory into members. Kelly said that her wildland crew runs two types of simulations: sandbox, which I will discuss below, and drills. Drills are chances to become familiar with the procedures and routines necessary in firefighting, or as Kelly put it, "more of a time to practice things like, running our pumps and things, and putting hose lines out, and knowing how to connect all the pieces, and learning what pieces you're gonna need, and lengths of things like that." Drills are useful for developing skills needed to execute procedures as well as for developing knowledge about how multiple "things you can do" (Berliner, 1994) can be combined based on a given scenario (Mendonça & Fiedrich, 2006).

Drills must be repetitive to become part of procedural memory. Larry, a smokejumper, said that his training involved practicing how to jump out of an airplane safely, which was especially unfamiliar to him:

> And so the end of the training involved seven airplane jumps—you know, practice airplane jumps. And on my first of those, I had never been in an airplane before. So the first seven times I went up in an airplane, I didn't come back down on it. Which was pretty exciting for an 18 year-old kid in Montana.

Repetition is necessary for becoming motor memory, but also for comfort. Larry said that by the seventh jump, he felt extremely comfortable jumping out of a plane. However, landing was a little more complicated. Before the jump simulations, they practiced how

to safely land by using a zip line much more than seven times in order to instill procedural memory:

> They had a big tall tower that was probably sixty feet tall and you would climb up to the top of that and latch into a cable and kind of do a zing line down until you smashed into the ground. And that simulated the speed and angle of attack of a parachute coming down. So we jumped out of that a lot of times. And we practiced a lot in, uh, what does it feel like to come down out of a big tall tree, you know lowering your self out of a tree without killing yourself. We did that over and over and over again, probably 100 times.

Larry said he landed more off the zip line than he landed an actual parachute jump during real fires; this ratio is not surprising considering the disastrous outcomes of a poor parachute landing. The key is that the first *real* jump should not feel like the first.

The third value of simulations is that they can be used to engage in decision making practices. Van der Heijden and colleagues (2002) suggest that one of the main benefits of scenario-based training is that it provides a space for mental experimentation and formulation of strategic options, which leads to increased confidence in decision making. This is consistent with the findings of this project.

Simulated decision making plays out in two distinct forms. One way is through sandbox or tabletop exercises in which problems and solutions are discussed in depth around a small-scale mockup of the environment (Mendonça and Fiedrich, 2006). While sandbox exercises do not involve practicing physical skills or routines, they are still considered useful by scholars; for example, Spencer (1978) argued that a skillful surgery

is 75 percent decision making and 25 percent dexterity; therefore, simply practicing decision making is a useful outcome of a training session. Tabletop exercises have an advantage over other types of training in that members can focus on communication in their decision making processes:

> The sandbox simulations give you more of a chance to discuss things, and really talk about things, because when you're out maybe in the fields, you're physically apart from people more. So you're more face-to-face talking about it and running through a scenario (Kim, Wildland Firefighter).

By being able to talk about decisions face-to-face, teammates who might have mountains between them during a real event are able to better predict how everyone else will react. Kim also said that sandbox simulations are beneficial because they allow members to see events from a unique perspective: "You're looking down from the sky. If the fire's over here, and this is the access road, what do you do? Or where would you put a lookout?" By seeing events from different perspectives in simulations, members can have a better understanding (and hopefully awareness) of situational elements during a real event.

Besides sandbox simulations, the other way that teams can simulate decision making is through functional or full-scale exercises. Functional exercises are real-time, facilitated exercises that are used to practice a specific experience. They are very common among teams that do not spend a lot of time in the production phase. For example, ER physicians are constantly with patients; therefore, they will rarely be asked to participate in functional exercises. Most tactical teams, on the other hand, may have only one or two callouts a week (a SWAT team I spent time with had exactly 52 callouts

last year). This means they have more time for functional exercises that require a facilitator, physical space, and an entire team.

Functional exercises are used to engage critical thinking in a specific scenario. For example, I observed a bomb squad simulation in which the facilitator (an assigned member of the team) created constraints in a way that pushed members to do two things, according to Sgt. Carey, the team leader: 1) "to practice the new X-ray," and 2) to "think outside the box." In other words, functional exercises on the bomb squad are for practicing a specific aspect of their work and critical thinking while practicing said aspect. In this case, the bomb squad had just gotten a new X-ray machine[2], so the facilitator put the simulated improvised explosive device (IED) in a sealed cardboard package so that the team had to use the X-ray. In addition, the facilitator designed the simulated IED in such a way that there would be conflicting ideas about how to proceed, forcing the team to deliberate about the best possible course of action. This is how functional simulations are usually for the bomb squad, as each weekly session involves a novel scenario that promotes critical thinking among team members (Sgt. Carey: "We might put a bomb 10 feet in the air so you can't use the robots. What do you do then?"). An observation of a SWAT team corroborated this model. Lt. Denton said they try to incorporate quick decision making processes into their scenario-based training (e.g., "Is he holding a gun or a cell phone?") because that helps them practice split-second decision

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[2] The team had also gotten a new robot two weeks prior. They broke an arm off a previous robot "sword fighting," according to one member.

making. All types of simulations, from drills to full-scale exercise, can be used to practice decision making abilities.

The fourth value of simulations is that they help teams *maintain* procedural memory and decision making practices, or what many tactical team members referred to as "perishable skills," which can only be maintained through repetition (Sgt. Carey, Bomb Squad). For example, Lt. Denton (SWAT) has his team members practice their shooting at least three times a week—his snipers are there every day—because weapons training is considered a perishable skill. Another perishable skill is readiness. Heath said that the leaders of his aircraft carrier would frequently call for General Quarters (also known as "Battle Stations" in some organizations), in which every member on board should "go where you are supposed to go." His captain would also test the crew by creating an "abnormal condition," which sometimes involved flipping a switch to shut down the nuclear reactor on the ship:

> It's not unheard of to be on a submarine or whatever, and the commanding officer will go down to the reactor space and be like: "Oh, let's see how my crews doing today." BUNK and he'll punk out the reactor, and just trip it out, flipping a switch, and 'ooooh, there you are.' BEEP BEEP BEEP all the lights go off. 'Somebody just scrammed the plant!' And sure, do what you gotta do to get it back online.

Heath said this was done to check response times when getting things "back and corrected," as well as to keep crew members on their toes. Those kinds of simulations are

"planned and random," and will happen throughout a workup cycle. In this way, readiness is treated as perishable skill to be constantly maintained.

Lastly, simulations are used to assess member competencies (Aggarwal et al., 2004; Shapiro et al., 2004). When asked about their experiences with simulations multiple health care interviewees mentioned that they were familiar with them as a testing tool. Sarah said that simulations were part of CPR certification and what was called a "skills update day" in her intensive care unit, in which skills were tested more than updated. Trent said that preseason training for ski patrollers involves a setup of five different scenario-based stations—all run by paramedics or physicians—in which members must prove their competency. The facilitator will explain the situation as well as resources at hand, and say: "Here's your stuff—what are you going to do?" This kind of simulation is a chance to experience critical thinking as well as demonstrate competency.

Organizations are likely to place an emphasis on communication in simulations. Essentially, practicing communication processes is a combination of the first two simulation outcomes: familiarity and skills training. By communicating with teammates, members familiarize themselves with their teammates. Mac said that part of the purpose of simulations is "joint" training simulations, which involves multiple agencies, are "really beneficial because not only do you get to work with one another, you're communicating with one another." He said that it is important to practice communicating with people from other teams because that mimics what it would be like in a real emergency. In addition, members enhance their communication skills by simulating

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them: "part of the purpose of the sims is to build better teamwork, and improve the communication, because we are reliant upon one another" (Mac, Firefighter). Sarah said that a segment of her training as a critical care nurse involved learning and simulating basic communication skills. So practicing communication processes is valuable because it familiarizes teammates with one another, and it is a skill in and of itself. However, it is also challenging to simulate communication because it is more variable than other skills:

> You can't simulate communication personalities. People might talk one way at the sandbox, then they get in there and all of a sudden they're somebody else. You can't simulate pulling rank, but it happens. People are people, they're gonna act the way they're gonna act. But fighting the fire won't change. They'll do what has to get done. (Tom, Lieutenant Firefighter).

In context, Tom's quote was a response to the validity of simulations. His quote highlights how communication patterns are not as easy to replicate in a simulation than the skills that are directly related to "fighting the fire." This remains one of the bigger challenges of scenario-based training.

Summary

Simulation is a temporal "cheat" of sorts for organizations that support critical teams, meaning that they act as a workaround for the temporal stresses of critical team work. Once an event ends, there is no time to redo it—the finality means that decisions and actions must be right the first time. However, there is generally no time to practice procedures, skills, routines, and decision making once an event *starts*—the epochality of

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critical team work means that teams must be familiar with the decisions, actions, and situation variables before the situation occurs. In other words, they must be experienced before the experience itself; they must overcome a tautology. Simulations are a method of gaining experience and becoming familiar with situational elements in a low risk-environment. They have five main purposes for critical teams: 1) they introduce to and familiarize members with situational environments and other variables, 2) they are used to instill new procedural memory into members, 3) they can be used to practice decision making, 4) they help maintain procedural memory, and 5) they are used to assess member competencies. Simulations are a safe space for experiential learning and make up an essential phase of critical team work.

Chapter 5 Summary

In this chapter, I have discussed experience, the first major outcome of critical team training, and simulations, a process through which critical teams gain valuable experience in a low- to no-risk environment. The reason that critical teams run simulations is because of a paradox regarding experience; it is both the primary basis for decisions in critical team work as well as the primary means of learning how to do work. This paradox presents a challenge to organizations that want their teams to be well prepared to make decisions and take actions (because there is no time to do so once the event starts) but does not want to put their teams is a position where they are likely to make a fatal mistake due to inexperience. This is why simulations make up a crucial phase for critical teams, as they are times for experiential learning.

In the next chapter, I will discuss the second major outcome of training:

communicative decision making. I will also explore the adaptation phase, or how critical

teams make time that is solely dedicated to communicative decisions in the heat of battle.

CHAPTER 6 – TIME FOR DECISION MAKING

This isn't to try to make us sound more badass than we are, but like, a lot of times people look at what we're doing and are like: 'Holy cow, how do you do that?' But for us, it's routine. We've practiced this, we've trained for this. So if something requires us to really stop our work and get together, that means the shit's hit the fan. That means, you're like: 'This isn't normal. This isn't planned for. The fire shouldn't be behaving this way, or the building shouldn't sound this way.' (Ben, Firefighter)

The work of critical teams is marked by finality and epochality. This means that decisions and actions have to be made swiftly and correctly the first time. At the same time, decisions are not always easily apparent, especially with a number of variables in critical team work, so teams will often deliberate together to come up with effective ideas. While this sometimes happens concomitantly with taskwork, sometimes it cannot, and sometimes it should not. The need for effective, situation-based, team-oriented decisions is so important that action teams will sometimes stop what they are doing to come together and talk about how to proceed, even as a fire rages, as Ben's quote explains. This chapter works towards an understanding of the role of the *timeout* in the process of critical teams as a temporal space for team deliberation and decision making.

This chapter first details two main concepts related to decision making--discursive decision structures and team deliberation—before discussing timeouts. Discursive decision structures are *minimal structures* (Brown & Eisenhardt, 1997; Kamoche &

Cunha, 2001) that both constrain and enable improvisation in critical teams. I also discuss team deliberation as a way to counteract unpredictability of the variables in critical team work. Numerous interviewees highlighted both their training's focus on effective communication principles as well as their own personal regard for communication in their work. Team deliberation is a way to employ a communicative form of decision making that satisfies the requests of the organization as well as the personal preferences of critical team members. Then, I discuss the adaptation phase. The process of action teams contains various iterations of this phase, colloquially known as the "timeout," as a way to counteract the challenges to quality decision making in critical team work. The fact that teams will stop to communicate, even in the face of oncoming dangers, demonstrates the importance of communication in the work of critical teams. The chapter ends with a summary of how adaptation is used as a temporal space for communicative decision making and for the use of discursive decision structures.

Discursive Decision Structures

One of the challenges of critical team work is making the right decisions in time-sensitive, high-pressure situations (Cannon-Bowers & Salas, 1998). To help teams make decisions in such environments, organizations create minimal structures (Brown & Eisenhardt, 1997; Kamoche & Cunha, 2001) that are discursive in nature and help teams make decisions. They both constrain and enable improvisation in decision making processes by containing some structure as well as some room for interpretation. Cooren (2004) argues that texts have agency if people use them to accomplish action in

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organizations. This applies to description of discursive decision structures, which are used by the organization to constrain and enable the actions of its members.

In this section I will talk about three types of discursive decision structures: lists, typologies, and god terms. The types are not mutually exclusive. For example, *safety* is the most popular god term among critical teams, and it also appears in many lists that critical team members use. However, I will address them individually in the following section for the sake of clarity.

Lists

Lists provide formulas for action that lead to predictable outcomes (Browning, 1992). In the world of critical teams, one of the most prominent lists is the 10 Standard Fire Orders used by wildland firefighters across the country. In addition to the 18 Watchout Situations, the 10 Standard Fire Orders are designed to guide the actions of firefighters towards organizationally preferred procedures and routines. While the structure of the 10 Standard Fire Orders has changed multiple times since its inception, the first nine entries serve as prerequisites for the tenth in its current iteration: "If 1-9 are considered, then fight fire aggressively, having provided for safety first." Ziegler (2007) argues that this list is a tool for risk management for critical teams as well as a permission slip for aggression. It is also the opposite of the meaning of hegemony—if you break any of these rules, you have broke them all. This is consistent with the ideas expressed by wildland firefighters in this study, who said they feel the lists first constrain and then enable freedom to act as they see fit. Kim said that learning about the lists early on in

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training was a good way to guide actions for people like her who did not have much experience or understanding of fire situations. Then, as she gained more experience, the lists gave them a license to be flexible—in other words, a permission slip for aggression—because they were made up of concepts as opposed to detailed, specific procedures. This shows how discursive decision structures both constrain and enable flexibility.

A specific type of list, the mnemonic is especially common in critical team work. A mnemonic is a device used to jog the memory, such as using the imaginary name "Roy G. Biv" to remember the colors of the rainbow in order (red, orange, yellow, etc.). Mnemonics are used to by organizations that support critical teams to combat feelings of vu jade and to recall priorities. Kristen said that EMTs will use a certain device when faced with a non-routine scenario:

> The first thing you do when you feel like "I've never dealt with this before", is you go back to basics; you go back to your ABCs. Do they have an airway, are they breathing, and is their circulation effective, meaning they are breathing, they've got a good heart rate, and so on and so forth.

Most of the devices were simple and serve a foundational value in their respective fields. For example, urban firefighting uses "LIP" to help firefighters remember their priorities when fire arriving on a scene. LIP stands for Life, Incident Stabilization, and Property Conservation. Using this mnemonic, a fire crew would first look to save lives when arriving on scene. Then, its attention would turn to controlling the incident, which may be a fire, a car accident, or something else, as urban firefighters respond to a wide range of

event. Lastly, the third priority is saving property. This mnemonic helps firefighters understand their priorities when faced with decisions in the heat of battle. Another mnemonic used by urban firefighters to remind them of their tactical assignments is RECEO-VS, which is less memorable but more specific; it stands for Rescue (of civilians), Exposure (protection), Confinement (of fire), Extinguishment (of fire), and Overhaul (of other potential fires). The last two parts, Ventilation and Salvage, are considered "sliding tactical assignments" (Lee, 2008) that should be considered at all times.

Mnemonics are effective because they are usually simple and correspond to the basics of an emergency member's job. In the case of urban firefighting, LIP reminds a firefighter of his or her priorities. In the medical field, ABC is used to focus a member on the three most important vital signs of a patient. Mnemonics are also always in the background; Kim mentioned that the wildland mnemonic "LCES," which stands for Lookouts, Communication, Escape Routes and Safety Zone, is used to "constantly reassess" to insure crew safety. Organizations must be encouraged by the ever presence of such structural devices that help embedded teams constantly keep their priorities in line, even when in the middle of a non-routine event.

Typologies

Another way that organizations support the decision making process of their embedded teams is by promoting the use of typologies. In their study of communication in emergency departments, Eisenberg and colleagues (2005) found that the challenge of

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triage is determining if incoming patients are either 1) in urgent need of medical care, 2) worried about their status but not in urgent need, 3) lacking another source of medical care, or 3) emotionally disturbed and faking an illness: "triage nurses must be especially skilled at distinguishing between those people who are 'really sick' due to disease or injury" and those who are not (p. 399). This form of typology was referenced regularly in interviews.

By categorizing patients, situations, or adversaries, critical team members are primed to take two actions. The first action is to quickly identify salient characteristics of the current scenario, or as Kristen put it, "to figure out real quick what questions I need to ask and what I need to look for." The second action is to see the current patient, situation, or adversary through the lens of a previous one, thereby lending routineness to what may feel like a non-routine event. For example, Kristen mentioned a saying that her EMT training organization uses to bifurcate situations: "There's two types of patients: sick patients, and not-sick patients." Kristen said they run a game early on in training called "Faking, Sick, or Death," in which the new trainees have to ask questions of a simulated patient to find out who is sick, who is faking it, and who is about to die. This helps to hone the skills necessary to assess situations in the field and echoes the triage process of emergency departments explored by Eisenberg and colleagues (2005). In addition, when I interviewed SWAT team members, they would often uses phrases such as "a barricaded criminal is different than a suicidal citizen." This recalls a study of fire ground commanders by Kaempf and colleagues (1993) in which almost 90 percent of decisions observed were made using situation prototypes. Typologies help an emergency member

to see a new situation through the lens of familiar one by placing situations, patients, or adversaries into categories based on their characteristics.

God Terms

Another type of discursive structure that constrains team decisions is the god term. A god term is the "ultimate motive" of a community of practice (Burke, 1945). It is the most powerful persuasive argument, or an "expression to which all other expressions are ranked as subordinate" (Weaver, 1953). If a person invokes a god term as a support for a decision, the opposite side would have a very difficult time making a compelling argument against them. For example, Lingard (2009) argues that a god term in health care education is *competence*. Certainly, the case can be made that *experience* (which, in critical teams, is sometime conflated with competence) serves as the ultimate persuasive argument within critical teams, and I believe that it has some persuasive value when making decisions. However, in this data set, I found that the most popular god term in critical team work is *safety*. Every single interviewee, without exception, mentioned safety as a consideration of critical team decision making. Not only did each interviewee say that they valued safety, but each person also mentioned that their organization has made safety its top priority: "Every organization has its focus, and first and foremost, ours is safety and that is, like, huge" (Kelly, Wildland Firefighter). The emphasis on safety is usually passed from the organization to each of its members during training: "I guess 90% of everything they do and teach is based on safety" (Kim, Wildland Firefighter). Everything should be done safely, and recklessness is not a valued trait.

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Safety as a god term is also used to justify decisions after the fact. This was especially common among firefighters when explaining a decision to not fight a fire: "Boy, this fire is way too dangerous for us to be close to" (Larry, Smokejumper); "We didn't really have any options—we had to go the one way that was safe" (Kim, Wildland Firefighter); "Your safety is absolutely necessary" (Kelly, Hotshot Crew Leader). By asking their embedded teams to err on the side of safety, organizations accomplish two things: 1) they mitigate the adrenaline rush that comes with critical team work, and 2) they attempt to avoid catastrophic outcomes, including deaths of their own members. Kelly, who runs training as a hotshot crew leader, explained that new members will run into situations without thinking because they are often so "excited and overcharged" to fight fires that they will "run into a road of oncoming traffic." Reminding them that safety is the organization's top priority is a quick and effective way to balance out the distractions in decision making that come from being too inexperienced (or overconfident, at the other end of the experience spectrum). Essentially, instilling safety as a god term in an organization is a form of insurance or risk management.

In other fields, the god term is not *safety* but a mantra derived from it. Sgt. Carey explained that bomb squads say: "It's a bomb until it's not a bomb," reminding everyone not to get too complacent at the risk of being blown up. A few different safety-based mantras were mentioned in the medical field. Some mentioned, "Do no harm," which is part of the Hippocratic oath taken by physicians and other health care professionals. Many interviewees said that decisions are based on the patient's symptomology, saying something to the effect of: "the bottom line here is, what's best for the patient?" (Tamara,

ER Nurse). At the same time, medical professionals were ambiguous in their analysis of this mantra: "You're in essence trying to do what's best for the patient, *whatever that means*" (Miguel, ER Physician's Assistant, emphasis added). Miguel's quote shows that while discursive decision structures are in some sense designed to constrain the potential actions of critical team members, they also allow for flexibility by being strategically ambiguous (Eisenberg, 1984). One can imagine that many different actions could be defended under the umbrella of "what's best for the patient." This shows how discursive decision structures both constrain and enable flexibility.

Summary

Discursive decision structures act as *minimal structures* (Kamoche & Cunha, 2001) in that they both constrain and enable flexibility of critical team workers. In this section, I detailed three types of discursive structures: mnemonics, typologies, and god terms. Much like basic song structures in jazz music (Barrett and Peplowski, 1998), discursive decision structures act as bases for spontaneous actions and decisions. They are a way in which decision making is both simplified and created.

Team Deliberation as a Way to Counteract Variables

Deliberation among critical team members during events is considered a critical component of the decision making process, as it allows teams to share information and regroup effectively. Regrouping, or coming together as a team to decide on the best plan moving forward, is often necessary in critical team work for two interrelated reasons.

First, a correct plan of action is not always readily apparent because of the unpredictability, stress, and complexity of critical team work. Second, team decision making can be more effective than individual decision making (Bonito, Decamp, & Ruppel, 2008; Cannon-Bowers, Salas, & Converse, 2001; Fisher, 1970; Tropman, 1996). Therefore, the process of deliberating together to make decisions is valued in critical teams (Cannon-Bowers & Salas, 1998; Cannon-Bowers et al., 2001; Holzman et al., 1995).

Crossan and colleagues (1996) describe improvisation as where planning meets opportunity, and moments of deliberation serve as communicative opportunities. While I believe that discursive decision structures may constrain flexibility more than they enable it—for example, lists provide structure to decision making (Browning, 1992)-- I argue that deliberation enables more than it constrains. I base this on the quality and quantity of the data in this project in which interviewees said that team decision making led to creative or improvised solutions. In moments of deliberation, teams can choose to re-align onto a previous plan or decide on a new one. Most likely, teams will draw on "available cognitive, material, affective, and social resources" (Cunha et al., 1999, p. 302) to guide "action in a spontaneous way" (Crossan & Sorrenti, 1997, p. 156). Deliberation is often the seed for improvisation in critical team work.

Team deliberation happens regularly because it is considered a valuable aspect of critical team work. Members of all types of teams—fire, medical, and tactical—either directly mentioned or told stories that demonstrated their high regard for communicative decision making. Tom, who is a lieutenant firefighter, referenced "size-ups," which are

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completed by the first members arriving on scene. They will try to get a 360-degree

understanding of the fire, both literally and metaphorically, and then share with everyone

else as they arrive on scene. Decisions will often be made in these conversations. Larry, a

retired smokejumper, said that even two-man teams "would talk over any decision that

potentially had danger involved in it." Tamara, a nurse in the ER, said that she prefers a

style of decision making in which teams do their critical thinking together and out loud.

Darren, a member of a SWAT team, said that team leaders will eschew the radio and

meet face-to-face (if the situation allows) with people in the command post so that they

can have as many communicative resources (e.g. nonverbals) as possible at their disposal

when making decisions. Lastly, Nancy told a story that demonstrates how communicative

decision making applies in life-changing situations:

> A guy came in; he was at the court house and he had just had a domestic violence
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> charge against him. He was in handcuffs with the cops after the hearing and he
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> got away—I don't know how but he got away from the cops—and jumped out of
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> the second story of the court house. Paramedics brought him in, obviously wasn't
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> breathing. So we intubated him put the breathing tubes down and put him on the
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> breathing machine and we did a cat scan of everything, his head, his neck, his
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> chest, his skull, his pelvis. He cracked his ribs, he had a hemothorax—he was
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> bleeding internally, bleeding in his brain, oh and he cracked his neck—his spinal
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> cord was completely severed.
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> While we were waiting for a bed, I was waiting for results from the CAT scan to
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> come, well the results from the CAT scan showed he had air trapped inside and

outside of the lung, and blood in the lung, too. Half and hour later I was looking at the monitor and the guys pulse goes from 90 to 30 to 20. So I am like okay well let me call the trauma surgeon. So I called him and he said: 'Look, we are not going to save this guy. He is bleeding in his brain, he severed his spinal cord, he cracked his neck, he's got a hemothorax and he broke both hips, so he is probably bleeding into his pelvis, too' and it was not operable.

We didn't have family there to tell us do everything or do nothing, so we kind of took it upon ourselves. He said: 'Look, I don't think it is worth trying to use all these [resources].' We had already given him so many units of blood, and these are all resources we are using. So the question is, you know…this is where it gets difficult because we are technically kind of playing God, but we are not God. The question comes: 'Well, do I do everything to save this mans life even though I don't think he will live or live past an hour or not?' So we decided not. We decided: 'You know what?' Because his heart stopped in a minute after I got off the phone with [the surgeon] and the surgeon said: 'Let him die, let him go,' and I said 'fine.' You know, it made sense to me since we had already used all these resources, and his outcome, even if he had made it he would be a vegetable on a ventilator, so we stopped CPR and his heart rate went to zero and that was it. We called it and let him die at that time. So that is a situation where you have to decide: what do we do? Do we do everything, do we do nothing, do we do something? So I tried to do something, you know we put a chest tube in and we

intubated him but with all his injuries there was no way that guy was going to

walk ever.

The way we make decisions is based on a lot of things. It's based on his injuries

and what his outcome would have been. You know, it is based a lot on the mantra:

'First, do no harm' and so we do we first do no harm. And a lot of the training

and this comes in the middle of experience. We don't have classes on this. I

mean maybe we did in medical school, I can't remember. This kind of stuff

comes with experience.

Nancy's story highlights a critical value of communicative decision making. The more

people that are involved in a decision, the more experience is brought to the table when

making the decision. She had to make a difficult decision, which she later mentioned can

be complicated by emotions and stress. She called on a surgeon who had experience with

the outcomes of similar patients, which helped her connect her decision to his experience.

By including a small group of experienced members in a conversation, teams can connect

relevant, expert experiences to the situation at hand. As Kim, a wildland firefighter, said:

"as you build relationships and come to know an individual's experience, what decisions

are made can vary based on those relationships and knowledge of yours and others

experience" (Kim, Wildland Firefighter).

The challenge for teams that want to deliberate is finding time to deliberate.

Making decisions, or *team process* (Marks et al., 2001), in a stressful environment can be

difficult on its own; on top of that, it is important to remember that critical teams are also

tasked with the physical work as well, known as *taskwork* (Marks et al., 2001).

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Taskwork, by itself, requires focus and attention--for critical team members, this includes spraying water on fires, making incisions, and positioning a team around a building with a suspect in it—but teams also have to interact and make decisions as well. If critical team situations are intricate, time-sensitive events, how do teams make time for critical thinking and deliberation among members?

Time for Decisions: Adaptation

Based on the nested phase model (Ishak & Ballard, 2012), critical teams make time for deliberation and decision making during the adaptation phase. The adaptation phase is a chance for teams to "realign members onto a previously determined trajectory or to discuss coordination onto a new path" (Ishak & Ballard, 2012, p. 19). It is a slowing or stopping of work so that teams can engage in communicative decision making and decision hearing. For critical teams, the fact that they would stop their work or slow it down to communicate—even though the fire or heart attack will not stop—is a sign of how much they value focusing on deliberation. Other types of action teams can pause the event, meaning that the rules of the "game" cease to govern proceedings (Coleman, 1969); this includes sports teams (calling a timeout) and legal teams (calling for recess). Critical teams cannot do that. Instead, they have two options: 1) deliberate and perform tasks at the same time, or 2) stop their work to communicate while the "adversary" (e.g., fire, heart attack, or opposing military unit) continues its progress. The latter option, taking a *timeout*, is the focus of this section, as emergency teams use timeouts as a temporal space to promote deliberate, communicative decision making.

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To be clear, teams do not always use the term *timeout* when their work is paused to deliberate. As I will explicate in this section, teams in this study used the terms *regroup, crew brief, after action review (AAR), huddle, assessment, deliberation,* and others to denote a pause in work used to adapt as a team. In addition, the term *timeout* refers to something different in the medical field; it is a pre-event discussion designed to align a team before a procedure (a concept I will discuss further in this section). However, I use the term *timeout* because its popular definition, derived from sports, has a strong fit with the concept that I am discussing: when action teams deliberate during a voluntary or involuntary pause in their taskwork during a production event. A timeout is an implementation of the adaptation phase in the process of action teams (Ishak & Ballard, 2012).

Taking a timeout is a chance for teams to regroup, assess the situation, and consider alternatives. Leaders of multiple units including a bomb squad, SWAT team, and a wildland fire crew, said that the mere act of taking time to discuss work is beneficial because it gets team members to think critically about their work. This is consistent with Okhuysen and Waller's (2002) stance on temporal pacing; by evaluating progress, they "consider alterative paths and determine the direction their group should follow in the subsequent work period" (p. 1057).

A bomb squad that I observed used a timeout in exactly these ways (regroup, assess, consider alternatives, think critically) during a simulation. After using their robot and new X-ray to find information about a potential improvised explosive device (IED), they met at the back of their command truck. Sgt. Carey said they do this to "brief

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everyone on the situation and discuss options" (they do not specifically call them *timeouts*). A few members stood on the truck and some stood on the empty robot lift. In this case, they wanted to find an option that would separate the cell phone detonator from the IED but still preserve evidence, which was especially important. Why? Because in this scenario, the IED was the latest in a string of explosives that had been placed behind mostly-black churched in the South, which meant that the evidence could help prevent another attack. One member pulled out a whiteboard and started drawing a crude diagram of the package for everyone else. He said he was thinking about something called a "PAN shot", which is essentially a shotgun barrel full of water (because liquid does not compress, it gets in between all the components and split them apart). They considered other options, but in the end, they agreed that a PAN shot would be the best course of action given their goals. The timeout took about four minutes. Everyone returned to their stations and continued their work.

Not all critical teams can take four minutes for a timeout. Sgt. Carey described bomb squads as slower and more methodical than other tactical teams, at least after a perimeter has been created so that no human lives are at stake. However, other teams still use timeouts, both formal and informal and of varying lengths, as a way to "counteract variables." Heath said that he has seen nuclear environments in which regular "crew briefs" are called to "assess conditions" during a real-life event:

> And so right in the middle of it they would be like: 'CREW BRIEF.' And everyone would stop what they were doing, and they would chatter back and forth and they would say: 'Let's assess all conditions right now," and just go down:

'boom, reactive powers this, pressure's this, we have these assets, we don't have

these things, boom boom boom. What do we have, what we do need, what do we

don't have?'

This shows how a timeout might be more regulated and formalized than that of the bomb

squad. At the opposite end of the spectrum, multiple wildland firefighters said that their

breaks to discuss strategy were on an as-needed basis. They were not formalized in any

way and varied in length depending on the complexity and containment of the fire. This

shows how different organizations will apply a different level of formality to planning

timeouts.

The difference between informal and semi-formal adaptations in the medical field

is worth noting. Informal moments for deliberation occur all the time and may only

involve as few as two members discussing the next steps. One member may consult

another while physically standing over a patient in the ER, or they may choose to leave

the room; this of course depends on the urgency of the patient's health. Informal

deliberations may also include people who are remotely located. In some areas of the

country, EMTs en route to a hospital can phone a physician on call to discuss options.

There is no term to describe informal deliberations, but critical team members would call

it "making decisions as a team," "team discussions," "deliberating," or simply "talking

about" the situation and its elements.

Semi-formalized adaptations also occur in ERs. While other teams refer to such

pauses as timeouts, briefs, crew briefs, recesses, conferences, consultations, or breaks, in

the medical world they are called *huddles*. While there are many studies of team

communication in ERs, there only a few mention of huddles and a dearth of formal definitions. They are referred to as a tool to "regain situation awareness" (Salas et al., 2008, p. 340) as well as a time for team members to determine a strategy that best meets the needs of the patient through organized collaboration (Shafer et al., 2006).

In this data set, the interviewees define a huddle in this way: "When we stop to talk about decisions, we call it huddling" (Tamara, ER Nurse). Huddles are a time to "have some creative thinking" (Tamara, ER Nurse), a way to "re-group" (Sarah, ER Nurse), a time "in the midst of a crisis situation" to "huddle for a second and say: what are your thoughts? What are your thoughts? What are your thoughts?" (Tamara, ER Nurse. Multiple ER Physicians (Magda, Nancy, Frank) confirmed these ideas about the usage of huddles and the commonality of the term itself (standardization of the term is certainly beneficial to physicians and nurses who work multiple shifts at different hospitals). Nancy said: "The huddle is a communication and a consultation among your colleagues about what to do when something is either going wrong or you've had a situation you haven't dealt with before." A huddle is a site of improvisation in the medical world, a form of adaptation used to deliberate, extend critical thinking, and make decisions.

While the standardization of term *huddle* across may make things simpler for medical professionals, another standardized ER term presents problems for temporal scholars (especially those who are sports enthusiasts). In the medical world, a pre-surgical meeting used to make sure all participants are on the same page is referred to as

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a *timeout.* Note that this is not an in-event phenomenon; medical timeouts occur just before events.

Medical timeouts are structured verbalizations of checklists used before procedures to ensure accuracy and understanding among team members, or "just a verification basically of the correct patient, the correct body part, correct procedure" (Nancy, ER Physician). One of the more popular checklists has been developed by Haynes and colleagues (2009), and it is used internationally. This checklist includes multiple phases, including a "Time out" portion that is to be completed by the entire medical team before skin incision.

Medical checklists have been implemented in most hospitals over the last decade: "They're officially called timeouts in the hospital. And you document that in the medical record, you know: the timeout was done before surgery. You're required to do it" (Sarah, ER Nurse). They have been widely implemented because routine checklist briefing is both feasible (Lingard et al., 2008) and effective at reducing communication failures (Haynes et al., 2009; Lingard et al. 2008). Every person I interviewed for this project who has worked in an ER (8) praised the value of the checklists, saying that the time saved by not making communication errors more than makes up for the nominal time that the timeout takes. However, time also plays a role in the feasibility of timeouts. Tamara said that they are required by the state "unless it's an emergency situation." This shows the pressures on critical teams: even when something is seen as saving time, lives, and probably money, it may be eschewed if time pressures are too great.

I have brought up medical timeouts for three reasons. First, from a scholarly standpoint, they are an interesting topic at the intersection of temporality, communication, and critical teams. Lingard and colleagues (2008) argue that they have positive perceived effects on team communication and teamwork. Second, the terminology is of interest to a study of teams. Exponentially more people are familiar with sports than are familiar with the standards of care in an emergency departments operating room. Because the term *timeout* colloquially refers to a break in the action, it is worth discussing how its meaning is different within the setting of this study. Third, the difference in meaning is relevant and thought-provoking. Medical timeouts act as sort of a pre-brief and actually may negate or reduce the need for medical huddles because it "groups" before there is a need for a "regroup." In other words, a pre-brief is a sort of adaptation before the adaptation phase. There may be something to learn here for other critical teams.

Summary

In this section, I have discussed how critical teams use the adaptation phase as a time for deliberation and communicative decision making. Taking a *timeout* is a chance for a team to regroup, assess the situation, and consider alternatives. They will do this even in the face of emergent danger because of the value of communicative decision making. I also discussed the difference between medical huddles and medical "timeouts." What is referred to as a timeout in the medical field is actually a pre-brief of sorts; medical timeouts are checklist-based meetings that occur prior to production phases. It

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can be argued that the act of grouping before an event negates some of the need to regroup during the event itself. Medical huddles are similar to what would be considered a timeout in other fields; they come in the middle of the production phase and they are used to regroup the team. The act of stopping taskwork to focus on team processes, including decision making, is a critical aspect of critical team work.

Chapter 6 Summary

In this chapter, I have explored decision making, the second major outcome of critical team training, and the adaptation phase, an opportunity for critical teams to engage in team deliberation. I explored two main concepts related to decision making: discursive decision structures and team deliberation. Discursive decision structures are minimal structures (Brown & Eisenhardt, 1997; Kamoche & Cunha, 2001) that both constrain and enable improvisation in critical teams. I also discuss team deliberation as a way to counteract unpredictability of the variables in critical team process. hen, I discuss the adaptation phase. The process of action teams contains various iterations of this phase, colloquially known as the "timeout." The fact that teams will stop to communicate, even in the face of oncoming dangers, demonstrates the importance of communication in the work of critical teams.

In the next chapter, I will discuss the third major outcome of training: sensemaking through situational awareness. I will also explore how teams engage in learn through narratives and engage in retrospective sensemaking through the debriefing process.

CHAPTER 7 – TIME FOR SENSEMAKING

On some of the coffee cups at a downtown fire station in the Southwest, the words *mortui vivos doscent* are printed in bold block letters. The Latin phrase is translated as "The dead teach the living," a saying often used to justify the use of cadavers for learning in the medical field. In a firefighting context, it serves more as a reminder to those in the station: be aware of those who have died doing the very things that you do every day. Organizations want their members to know past tragedies so that they do not repeat them. More accurately, to be prepared for upcoming events, the organization wants members to "comprehend, understand, explain, attribute, extrapolate, and predict" based on past events (Starbuck & Milliken, 1988, p. 51). In other words, they should engage in sensemaking (Weick, 1993; 1995) by understanding what has happened in the past, from the deaths of their predecessors in previous years to a change in weather that happened a split-second ago.

Sensemaking is a continuous process in which people retroactively create rational order from their context (Weick, 1993; 1995; Weick, Sutcliffe, & Obstfeld, 2005), or a way to "structure the unknown" (Waterman, 1990, p. 41). It has been deemed crucial in critical team work (Weick, 1993; Landgren, 2005), especially with regards to teamwork, as it allows critical team members to turn complexity into something that is "comprehended explicitly in works and that serves as a springboard into action (Weick et al., 2005, p. 409). Weick (1995) argues that organizations can be good at decision making but still make major mistakes due to poor sensemaking. Therefore, organizations that

support critical teams strive to develop situational awareness in members much in the same way that they do with communication decision making skills.

In this chapter, I will discuss how critical teams use sensemaking principles to enhance the quality of their work during the production phase. I will explore how critical teams engage in three types of sensemaking. First, I will discuss the concept of situational awareness, which is a form of sensemaking that is widely prescribed in critical team training. Second, I will examine how teams learn by sharing and making sense of narratives related to their work. Third, I will explore the debriefing process in which teams engage in retrospective sensemaking to synthesize the details of a just-past event. This last section will include an examination of the debriefing process in scenario-based training as well. Then, I will summarize the findings of this chapter on sensemaking and the debriefing process.

Situational Awareness: Making Sense of Surroundings

Along with experience and communicative decision making, situational awareness is considered by critical team members to be one of the key outcomes of training. To be situationally aware is to perceive elements in the environment defined by a volume and space, to comprehend their meaning, and to have the capacity to project their status in the near future (Endsley 1987, 1988, 1995a, 1995b). It has been recognized as a crucial component of flight crews as far back as World War I (Press, 1986). As Endsley (1995b) explains, situational awareness is especially critical for critical teams

because of the dynamism of their environments as well as the potentially catastrophic outcomes:

> Firefighters, certain police units, and military command personnel rely on SA to make their decisions. They must ascertain the critical features in widely varying situations to determine the best course of action. Inaccurate or incomplete SA in these environments can lead to devastating loss of life. (p. 33)

It has been argued that the main challenge of critical team work is in fact having good situational awareness and being able to recognize decisions and their variables (Endsley 1995b, Kaempf et al., 1993).

How is situational awareness different than sensemaking? After all, sensemaking has been defined as a way to "comprehend, understand, explain, attribute, extrapolate, and predict" (Starbuck & Milliken, 1988, p. 51). This sounds very close to the definition of situational awareness by Endsley (1995b), in which one perceives, comprehends, and projects. I argue that situational awareness is a *form* of sensemaking that is both focused and unfocused at the same time. What I mean by this is that one must focus on relevant tasks and situational elements, but not to the point where other elements may go "unsensed." This idea is exemplified by a quote from Spencer, a firefighter:

> One of the big things they teach is to use situation awareness, which is very broad idea. The idea of situational awareness is that you kind of like don't want your head to get lost in the fog, or you don't totally focus on exactly on what you're doing, but you want a general idea of like: okay I know the car is right there, the person is right here, there's um, a propane tank over there.

Therefore, to be situationally aware, one must not just "focus on exactly what you're doing." There is no specification of sensemaking to say that it is always focused on all situational elements; a person could conceivably engage in sensemaking of a task while being unaware of surroundings. However, situational awareness is a process that requires simultaneously focusing on the task at hand and perceiving, comprehending, and projecting the statuses of relevant situational elements. In some sense, it requires unfocusing on the task at hand. Consider this explanation from Larry, a retired smokejumper:

> In any big fire, there's going to be retardant bombers that are coming in from some direction and dropping retardant, which is essentially wet cement. When it hits the ground, it's cold and sometimes it's heavy muddy stuff. And if it hits you it could knock you—it could kill ya. So what do you do to make sure you're not in the path of that, but you know, you're fighting the fire, and every so often a plane goes by and drops this shit on you. And so you have to be very situationally aware and know what you're supposed to do. In this case, what you're supposed to do is get behind a big tree, face the direction the plane is coming, lay down with your helmet pointed at the plane, so that if some of this horrible stuff hits you, it doesn't crush your skull.

In this situation, a person could be so focused on making sense of the firefighting aspect of the job that they overlook the other elements, including the retardant bombers. This is why situational awareness, as a more *unfocused* form of sensemaking, is highly necessary in critical team work.

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Wildland firefighters were most vocal about their training being focused on situational awareness. Kelly said that the term comes up in "your first ever class in the forest service." She said that they cover situational awareness because most fatality fires result from a chain of events that could have been broken with stronger awareness of both environmental and teamwork elements, such as weather, fire behavior, terrain, and communication patterns. Kelly said they use the phrase "Is your SA up?" as a reminder to perceive and comprehend surroundings, and that being able to demonstrate situational awareness (e.g., pointing out important details) will give someone more credibility that rank during a debrief. Kim said being situationally aware is "a huge thing" in wildland firefighting, especially in leadership—because the situation should guide actions. She said that training is critical in developing this concept. For example, Kim talked about how tabletop simulations gives team members the opportunity to see scenarios from multiple viewpoints, and she implied that this helps build awareness:

> You can kind of see it from a different perspective of, well, if the fires over here and this is the access road, and you have, you know, houses over here, and this is where you are, you know, what do you do? Or where would you put a look out?

This highlights one of the unique aspects of situational awareness: it is a highly spatial concept, and having a better understanding of space is useful for determining which aspects of the environment are critical and which are not (Endsley, 1995). Kim implied that she gained an understanding of different spatial perspectives in with the use of sandbox simulations, which is critical to her awareness during events. This demonstrates how training is often focused on developing on situational awareness.

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Spencer said that the concept of situational awareness was "hammered" into them during his firefighter training. Trainees in Spencer's program, and in others, were constantly reminded to be mindful of environmental elements while working on particular tasks, "whether it be the weather, or the behavior of the fire, or the terrain, or the fuel type, or you know, the people you have with you, what their training level is, what their experience is" (Kim, Wildland Firefighter). The firefighters who led his training program were very conspicuous about the point of such drills, and they told trainees that situational awareness was the goal. In particular, Spencer learned that it's now *what* they are teaching you to be aware of, but *how* they are teaching you to be aware of it that was important: "Yes, it's important to know where the bag [with the firefighting tools] is, but the general idea that they're teaching you to be successful is that you need to be aware of everything that is going on." Mac's comment about training was that the reason firefighters train so much is to be prepared for the situations that they have not been trained for; Spencer echoed this statement by saying that "you can't train for that exact situation when you are thrown into an unpredictable situation…but you've trained yourself to be aware." One of the benefits of situational awareness is that decision making and improvisational processes are improved when variables are accurately assessed. By training their members to be aware, organizations that support critical teams train them to be better decision makers and improvisers.

Summary

In this section, I have argued that situational awareness is a form of sensemaking that is particularly important to critical team members. This is because it involves both focusing on the task at hand and being aware of situational elements. As a concept, it is promoted heavily by organizations in training as a tool that members should use to make sense of their surroundings. While good situational awareness does not guarantee good performance (Endsley, 1995b), it increases the chances that critical team members will make good decisions in unpredictable circumstances.

Sensemaking and Organizational Narratives

Another way that critical teams use sensemaking to improve their decision processes is by making sense of organizational stories. This is a form of narrative rationality (Fisher, 1970; Browning, 1992) that helps shape future decisions and protocols. As Boje (1991) explains: "Stories are to the storytelling system what precedent cases are to the judicial system" (p. 106). In the same way, stories serve as precedent for actions among critical team members.

The temporal coupling of sensemaking and decision making is different for narrative learning than it is for situational awareness. In this case, sensemaking and decision making are loosely coupled, meaning that the process of sensemaking is separated temporally from the decision making processes it will eventually impact. In the case of situational awareness, sensemaking and decision making are tightly coupled, meaning that critical team members make sense of what happened moments ago to make

a decision moments from now. Both types of sensemaking contribute to decision making, with situational awareness as a way to perceive variables, and narrative learning as a form of surrogate experience for members.

When telling me a story about fighting a fire in Alaska, Larry, a retired smokejumper, mentioned how important it was to make sense of past disasters when making decisions. Specifically, Larry referenced the Mann Gulch disaster, a story that has an indelible place in organizational communication research, in which 13 firefighters died in part because of poor decision making. In Alaska, Larry said his department dropped "24 of us" on a fire, and they realized that they were majorly undermanned to fight the now 100-acre fire by the time they hit the ground. Larry described the spread of the fire as "a fast walk in all directions:" "so we simply looked at the fire and said 'no way are the 24 of us going to put this fire out.'" The crew members knew that they were in severe danger, so they had to act quickly. They looked around for the safest place and saw a snowfield on top of a small hill five miles away. They ran, with their gear, straight to the field, "and when they came to get us three days later, that fire was probably 200,000 acres and still growing!" Larry pointed to learning about the Mann Gulch disaster in training as a critical factor in his crew's decision to run:

> Basically what happened [at Mann Gulch] was, they hit the ground, decided to
> fight it, and the fire was running too fast and they had landed in the wrong place
> and the fire was coming up the hill towards them, and they couldn't run uphill and
> they couldn't run downhill fast enough to get away from the fire and seven (sic)
> guys lost their lives. And that's a place where training should have said: run

sooner, run sideways, don't try to run uphill because you can't outrun a fire

uphill, you might be able to get out of its way if you run sideways.

In part because Larry's team leaders had previously spent time making sense of the Mann

Gulch disaster, they made the right decisions in Alaska. And because the crew members

had become familiar with the disaster during their training, they knew which actions

seemed like the right ones—or more accurately, they were familiar with the wrong ones.

This is an example of how making sense of organizational stories can help critical teams

avoid mistakes in their work.

Narrative learning also exists within the artifacts of organizations that support

critical teams. Trent talked about a notebook in the ski patrol locker room in which

important information about that day's events are written. The notebook is designed for

people who were not able to attend the debrief that day, and it includes both technical

information that all patrollers on the mountain should know (e.g., a part of a certain ski

run has had multiple accidents), as well as stories that patrollers can learn from (e.g., we

had Situation X and we handled it in this way—here was the outcome). This is consistent

with the notion that teams can engage in cognitive shadowing (Mendonça, Beroggi &

Wallace, 2003) by reviewing logs. Trent notes that the book has been around for a long

time: "It's called Chalkboard News (laughs). The patrol's been around since '64. There's

a lot of cool history. I do not know the origins but it's called Chalkboard News. It's

literally a spiral notebook sitting on the table." The notebook incudes reports of accidents

and fatalities, and it serves as a physical repository of "precedent" for ski patrollers to

access. Much like the Latin phrase, *Mortui vivos docent,* on the coffee cups at the fire

station, the notebook is an artifact of the way in which organizations encourage their members to learn from past narratives.

Another way that members learn from stories is through the embedding of real-life scenarios into training. Many organizations teach new members by packaging previous experiences as learning opportunities in what is often referred to as Scenario-based Training (SBT). In SBT, scenarios can be culled from many resources, including textbooks. However, Kristen, who works both as an EMT and as an instructor for aspiring EMTs, noted that most instructors use stories from their own careers:

> As instructors, we try to teach them how to get experience. And basically, we do
> that through scenario-based education… you just try to paint the picture by just
> giving them scenarios. You know, there's plenty of educational books that will
> give you scenarios, but a lot of instructors will try to pull from their experiences.

In this way, stories are used to build the decision making frameworks of new members in a structurational pattern (Giddens, 1984). This is an example of the iterative relationship between technical and narrative rationality in critical teams (Browning, 1992; Eisenberg et al., 2005).

Kristen's assessment of stories as a source of training structure is supported by my observations of a bomb squad's weekly simulations. This particular squad performs hands-on simulations every Wednesday morning, and it generally bases their simulations on recent real-life scenarios. On one Wednesday I spent with the team, they were replicating a series of church bombings in the South. The training facilitator took me out before the rest of the team to place the improvised explosive device in a delivery package

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and to place it near the back door of "The Parachute Hangar of Christ." This "church"
was actually a dilapidated World War II parachute hangar on the grounds of a defunct Air
Force base where the bomb squad trains. Then, when the rest of the team arrived, the
facilitator explained the value of this scenario to them (i.e., why a church bombing is
unique and why they are training on it now), and then let them go to work. He also played
the role of preacher to give them a witness to talk to. This shows how an immersive form
of SBT can include learning from narratives, even when the narrative is an amalgamation
of others.

Implementing stories into training and simulation is a way to combine the effects
of narrative and experiential learning. Regarding the use of stories in SBT, Sgt. Carey,
head of the bomb squad, explained that being familiar with relevant national and regional
events is critical to the squad's work because there are trends in the variables involved in
IED events. This idea was supported by a SWAT teams' use of recent events in their
training as well. Using stories is an effective way to create a dual learning process in SBT
and simulations.

Summary

Critical teams make sense of organizational stories as a way to improve decision
processes. This is a form of narrative rationality (Fisher, 1970; Browning, 1992) in that
stories serve as guides for future decisions and actions. Numerous interviewees
mentioned the value of making sense of past disasters so that they are not repeated. This
is how the "dead teach the living" for critical teams. Narrative learning also exists within

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artifacts of organizations as well as in scenario-based training, both of which are examples of the continual relationship between technical and narrative rationality in critical team work.

Time for Retrospective Sensemaking: Debriefs

In the nested phase model (Ishak & Ballard, 2012), we highlighted two phases as being of special interest to team communication scholars. These two phases, simulation and adaptation, have been explored in the Chapters 5 and 6 as incubators of experience and communicative decision making, respectively. Earlier in this chapter, I discussed sensemaking as the third desired outcome of critical team training. The stage that corresponds with this outcome is actually a subphase of a larger phase (preparation). In this section, I will discuss how the debriefing process—a subphase of preparation—is a time for retrospective sensemaking.

It may seem counterfactual to say that an activity coming *after* action is a part of the preparation phase, as I am arguing with the debriefing process. However, it is important to note that the work of critical teams is marked by finality. In other words, anything that happens after the end of the event has literally no effect on the event itself. It simply cannot have an effect because the event is over. Therefore, debriefing about an event is, instead, a form of preparation for events that follow. That is why I am categorizing the debrief process as a component of the preparation phase of the nested phase model.

This does not mean debriefs are inessential to critical teams; in fact, the opposite is true. Debriefs are necessary because critical teams often cannot stop during events to discuss how to make sense of what is happening. Debriefs help transform experiences into learning opportunities (Proctor & Gubler, 2001) by having members engage in retrospective sensemaking. Here, the coupling between sensemaking and decision making falls in between that of organizational narratives and situational awareness. Organizational narratives demonstrate a loose coupling between sensemaking and decision making, and situational awareness is marked by tight coupling. Debriefs demonstrate coupling that is as loose as the time between one event to the next.

Also, I should note that it may seem redundant to add the modifier *retrospective* in front of sensemaking. This is because, as Weick and colleagues (2005) argue, *all* sensemaking is retrospective, even sensemaking that happens in the heat of the moment. As support, Paget (1988) argues that an act can only be seen as a mistake *after* it is made. However, this is where I believe the coupling of sensemaking and decision making to be a salient relational variable. When sensemaking is enacted as situational awareness, the one making sense of the situation is doing so in order to take almost simultaneous action. Weick and colleagues (2005) explain tight coupling of the two processes: "If the first question of sensemaking is 'what's going on here?,' the second, equally important question is 'what do I do next?'' (p. 412). This demonstrates how situational awareness is equally concerned with the past/present and future. However, sensemaking in a debrief session does not ask the second question literally, or immediately, because the time for action has finished. This is a unique feature of action teams, in that they can really only

take critical action during the production phase. If the first question of sensemaking in debriefing is "what happened here?," the second question is "what do I do next *time*?" In this way, sensemaking during debriefing sessions deserves the *retrospective* modifier because it is more concerned with the past (and to a lesser extent, the future) than the present.

Debriefs play out in variety of ways. On one hand, SWAT teams and bomb squads generally have formal reviews in which certain questions are mandated and interpretations are recorded for posterity. On the other hand, most members of fire teams said that they only have serious debrief processes after a non-routine or casualty event. Kelly described debriefs as "a way for people to come together and look at something that has happened to make things better without pointing fingers at people." This is the essence of the debrief process for most teams.

Some fire crews and tactical teams use something called an after-action review (AAR), a process designed by the U.S. Army to enable soldiers to discover "for themselves" what happened during an event, why it happened, and how they can improve their work (U.S. Army, 1993, p. 1). AARs were initially designed to play out in a formal manner and provide three things: 1) insights into strengths and weaknesses from various perspectives, 2) insights critical to training, and 3) details that may not be found in evaluation reports (U.S. Army, 1993). Kelly said that her wildland crew uses the AAR process, but it is not always formalized. When it is formalized, everyone must speak and there are certain questions and details that must be covered. When it is not formalized, there is less structure. Kelly said team leaders use the informal AAR on smaller or routine

fires. This distinction was echoed by Trent, who said that his ski patrol unit has an end-of-day meeting that can be as short as a few minutes or as long as 30 (with recordings in the Chalkboard News notebook), depending on what had happened that day.

Teams debrief because there is always something to be learned from critical events—or in the words of Lt. Denton of the SWAT team: "The day we have a perfect callout, I'll turn in my shit and leave." Lt. Denton's statement was a response to why his team has debriefing sessions after each callout. He explained that debriefing is a process that helps his team members get better by analyzing their actions as well as the team's. This fits Dismukes, Gaba, and Howard's (2006) argument for the value of debriefs:

> For trainees to become true experts and to continue their professional growth
> beyond formal training, they must also develop subtle metacognitive skills.
> Among these skills is the ability to critically analyze one's own performance
> retrospectively—not just what went well and what went wrong, but why it went
> that way (p 23).

Dismukes and colleagues' statement that trainees must develop metacognitive skills to continue the learning process beyond formal training is exemplified in action by what I observed during a SWAT team simulation debrief. After 30 minutes of simulation exercises, the team gathered around the truck for discussion. Without being prompted, a newer team member pointed out his own mistake during the simulation and explained what he could have done differently. Another member then chimed in with another potential strategy based on something he had read about a SWAT team in California. This interaction demonstrated to me that open, honest criticism was the norm with this

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team, especially self-criticism and analysis. As Lt. Denton told me: "Typically they'll dime themselves out beforehand" when people make a mistake. The goal of debriefs is to make sense of the situation by organizing, comparing, evaluating, and analyzing (Raths, 1987), and to understand how the experience can improve future processes.

Debriefs in Simulations

Debriefs do not only occur after real events. Organizations also use debriefs after simulations as a site for organizational and member learning (Lederman, 1984; Petranek, Corey, & Black, 1992; Savoldelli et al., 2006). Much of the literature on simulation debriefs argues that they are essential to the training process. Debriefing after simulations is a reflective method of learning (Lederman, 1984) through which the student absorbs information and "makes sense" out of experiences by mutual sharing of ideas with teammates (Petranek et al., 1992). Simulated crisis training offers less benefit to medical trainees if they do not include constructive debriefing afterwards (Dine et al., 2008; Savoldelli et al., 2006). And Harry (1971) simply said: "a post-game discussion is necessary for maximum effectiveness of any simulation game." Despite all this, the debriefing process during simulation-based education has been understudied and underused (Savoldelli et al., 2006).

By reviewing actions after a simulation, team members can focus on areas for improvement and make connections between classroom and hands-on learning. Sometimes trainees are told what they have done wrong. Sarah said her medical training facilitator gave her "a lot of input" on how she "handled things" in a one-way

conversation during her skills update day. In other cases, trainees are asked to do the reflecting on their own. Mac said that a particularly grueling fire simulation was followed by a period of reflecting on why things went wrong:

> They'll say: okay this scenario's over. Everybody come out. Alright, everybody failed, and this is what happened. You ran out of air, you didn't report, you spent too long trying to get through here, you know, you didn't handle the stress well, you freaked out, and you kinda forgot all your training. Why did this happen?

By asking Mac and his teammates to reflect on *why* something happened—not just that it *did* happen—the training facilitators are pushing them to practice making sense of their environment, their actions, and other variables in the scenario. This is something I noticed in a bomb squad's simulation debrief as well. After disarming the mock explosive, the team went over to the site of the disarming and scanned the area for the detonator, the explosive itself, and other evidence. Sgt. Carey asked questions of Michael, the newest member of the team: "Why do you think the grenade ended up over there?" and "What should you do with it now?" There was not necessarily one right answer to each question. These questions were designed to elicit Michael's critical thinking skills in a communicative environment, encouraging a thoughtful sensemaking process next time Michael has a role in the disarming.

Summary

The debriefing process is a form of retrospective sensemaking in which teams ask two questions: "what happened here?," and "what will we do next time?" Teams run

debriefs in a variety of ways, including the after-action review, which is a formalized process adapted from the U.S. Army. Debriefing comes after events and is technically part of the preparation phase because it occurs after the finality of critical team work. It is a valuable process in that it helps transform experiences into learning opportunities (Proctor & Gubler, 2001) and it allows a temporal space for discussion about what happened, what it means, and what should be changed for the future. Dismukes and colleagues (2006) argue that trainees should develop metacognitive skills so that debriefs serve as reflective learning processes. This includes debriefing after simulations, in which members can practice making sense of the environment, actions, and other variables to help improve their work going forward.

Chapter 7 Summary

In this chapter, I have explored sensemaking as a major outcome of critical team training, as well as the debrief process, a time for teams to engage in retrospective sensemaking. I examined the concept of situational awareness, which is a form of sensemaking tightly coupled with decision making. Situational awareness requires unfocusing, in that attention should be paid not only to the task at hand, but to all situational variables. I also discussed how organizations that support critical teams encourage the concept of "the dead teach the living," which is to say that teams should make sense of organizational narratives to improve their own processes. Then, I explored how the debrief process allows for retrospective sensemaking of events.

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In the next chapter, I will introduce a model that examines the interaction between critical-interactive phases of critical team work—simulation, adaptation, and debriefing—and training outcomes: experience making, decision making, and sensemaking. I will also explore how phases are constructed to support other phases in the process of critical teams, as well as examine a structurational perspective on improvisation. In addition, I will introduce an adapted theory of critical team experience.

# CHAPTER 8 – IMPROVISATION: TEAMS, TIMES, AND TRAINING OUTCOMES

In this chapter, I explore the contributions of present research project to the fields of organizational communication, team communication, and chronemics. I do this in part to satisfy the qualifications of a well-constructed study (Richardson, 2000). The central purpose of this study was to answer the following question: Are critical teams primed and prepared to deal with improvisation by their parent organizations, and if so, how? I believe the analysis of this study creates a useful middle range theory of improvisation planning in critical team work (Charmaz, 2000; Glaser & Strauss, 1967), the purpose of which is to explain a set of communication practices to a limited range of data (Weick, 1974). Diagrams and models can serve as a "possibly helpful way of generating concepts from what otherwise might be a chaos of data" (Bryant and Charmaz, 2007, p. 24). Therefore, I introduce the Critical-Action-Response Training Outcomes Grid, or CARTOG, which is designed to help scholars understand how the three main outcomes of critical team training—experience making, communicative decision making, and sensemaking—interact with each of the three critical team-specific phases discussed in Chapters Five through Seven (the name comes from the idea that the grid can apply to critical, action, and response teams). These interactions are theoretically valuable because well-constructed grounded theory elucidates relationships between various internal elements of the theory (Kearney, 2007). Each of these interactions is helpful when

implementing the structured yet flexible roadmap-style approach for critical teams

explored in Chapter Four.

      In the following sections, I will explain CARTOG, a grid designed to show how

the main outcomes of critical team training are present in various phases. Next, I will

introduce an adapted theory of critical team experience based on the three main

outcomes. Then, I will explicate these concepts by taking a structurational perspective

(Giddens, 1984) on improvisation. This is followed by practical training

recommendations, implications for researchers, limitations, and future directions for

research. However, because the data and models in this study use the nested phase model

as a framework (Ishak & Ballard, 2012), I will first highlight three phases, explain how

debriefing fits into the nested phase model, and summarize how certain phases are used

overtly by critical teams to support others.

Highlighting Critical-Interactive Phases, Including Debriefs

      The meaning of an activity that takes place in a particular moment must be

considered within the context of other timescales (Streeck & Jordan, 2009). This is the

basis of the nested phase model, which posits that that nested timescales (van Orden and

Holden, 2002) are of high importance to the process of action teams, including those in

critical teams. In the case of the nested phase model, the action/transition setup of the

recurring phase model (Marks et al., 2001) is nested within itself to contextualize action

and transition phases within larger phases of action and transition. And although infinite

Figure 2. A sample process of the Nested Phase Model (From Ishak & Ballard, 2012)
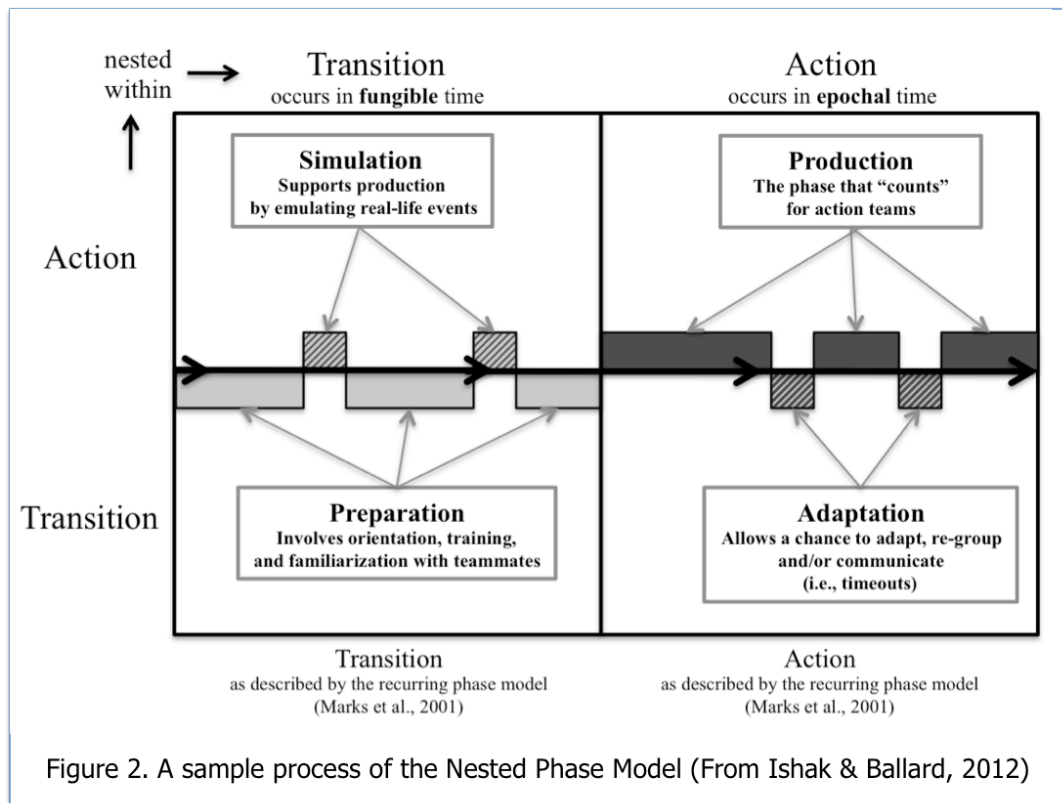
nesting of phases is both possible and intriguing, we used a single nesting to create four

distinct phases as shown in Figure 2 (Ishak & Ballard, 2012).

There are three features of the nested phase model that are especially salient for

the purposes of this section. First, the production phase is where critical teams do the

work they are paid to do (e.g., put out fires, apprehend suspects, perform surgeries).

Second, simulation, preparation, and adaptation phases all exist to support the production

phase, because success for critical teams is generally measured by what happens during

production. Third, production phases are marked by finality: once they are over, they

cannot be redone in any way.

I highlight these three features because the emergence of debriefs as an essential

activity in this study is problematic for the nested phase model. They are not part of the

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production phase because they occur directly after events, and the end of an event is marked by finality. In addition, they are not part of the adaptation phase because there is no event left to adapt for, and they are logically not part of the simulation phase.

I argue that a debrief session acts as a firm start to the next preparation phase, which in turn is used to support the following production phase. The work of critical teams is marked by cycles (Ishak & Ballard, 2012; Marks et al., 2001; also see Ancona & Chong, 1996 and Ballard, 2009 for more about cycles). In some sense, debriefs act as links between phase cycles; they connect the end of one event to preparation for the next one. The critical use of debriefs is that they are used to identify potential organizational learning opportunities based on the particulars of just-past events (Proctor & Gubler, 2001). In addition, discussing thought processes after non-routine events can lead to improvements in training for decision making for those situations. (Edelson et al., 2008). Therefore, what is discussed in a debrief may end up is likely to end up future training activities as well as real-life event decisions. In this way, the debrief session is used to support the other phases.

I argue that the debrief subphase, along with simulation and adaptation, are phases of particular importance to critical team scholarship, highlighting them here as *critical-interactive* phases. I use this term to say that they are specific to action and critical teams, and they are specifically used to engage in interaction as a valued component of team process.

If the production phase is the only phase that "counts" for action teams, including critical teams, why highlight three other components of team process? Essentially, it is

the ways in which certain phases are used to support other phases that makes the process of action teams so rich as concept. Simulations exist only to help teams be better in the production phase. Adaptations exist because something in the current production phase needs to be determined, corrected, or continued. Debriefs exist so that teams can gain a better understanding of how they work in events for the next production phase. Of additional interest to communication scholars is that each of these phases is defined by team communication: simulations are opportunities to familiarize with interaction, adaptations are chances to deliberate as a team, and debriefs are used for teams to review their actions together. In this way, they are forms of communication used to support action.

In the next section, I explicate paths of phase support as a useful concept in understanding the process of critical teams. And even though I argue that debriefs are contained within the preparation phase, I think it is useful to show debriefs as a subphase from a diagrammatic perspective. This is in order to better understand the implications of debriefing for critical teams. In Figure 3, I demonstrate the paths of phase support. Because part of this research study involves the exploration of the debriefing process, I include it in the explication of phase support in order to further understanding of this important communicative activity.

Paths of Phase Support

I offer a qualitative model of phase support in order to better understand the processes of critical teams. In this model, I demonstrate how each phase of the nested

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phase model (Ishak & Ballard, 2012), as well as the debrief subphase, supports the others. To determine paths of support, I examine the process of critical teams by asking: which other phases is this phase designed to support?

The most obvious form of phase support is that which preparation provides to three other phases. First, the preparation phase exists for support of the production phase, a connection that has been made previously (Ishak & Ballard, 2012). Second, the preparation phase is used to improve upcoming simulations. Mac, a firefighter, said that full-scale or functional simulations take "considerable pre-planning." Mac said that his department's quarterly full-scale exercise with other departments in the area are "usually much better than our usual weekly trainings because there's so much preparation put into them, so they're real thought out, they're efficient. They're actually very, very good." This demonstrates how preparing for simulations can increase their effectiveness. Third, adaptations are prepared for by familiarizing members with teammates and discursive decision structures.

The simulation phase also supports three phases: production, adaptation, and debriefing. Simulations are used to support the production phase by increasing member experience, familiarity, and decision making abilities. They are used to support adaptations by practicing and developing skills related to decision making and communication. In addition, although teams I observed did not simulate the debriefing process that is used after real events, they did engage in simulation debriefs. This creates the expectation that members will discuss their actions, thus supporting the debriefing phase.

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Production and adaptation are more focused in the phases they support. The production phase is not used to support other phases, at least overtly. This is because the production phase is most time-limited and most important—it is the celebrity of critical team phases. The focus must be on the phase itself. The adaptation phase is used solely to support the production phase, also because of its time-limited nature

Debriefs support all four main phases of the nested phase model in some way. They are used to support preparation and simulation phases by establishing the ways in which critical teams need to prepare for and simulation future events. Debriefs support production phases by calcifying just-past experiences as inputs for future experiences. Lastly, the debriefing process supports future adaptations because a review of decisions during a debriefing may lead to different decisions the next time.

I have mentioned the ways in which certain phases support others in the process of critical teams because an understanding of these relationships will help in interpreting the value of the model that I introduce in the next section.

Critical/Action Response Training Outcomes Grid

In this section, I introduce the Critical/Action/Response Training Outcomes Grid (CARTOG) and its components. CARTOG is designed to help scholars understand how the three main outcomes of critical team training (experience, communicative decision making, and sensemaking) are utilized within the three critical team-specific phases (simulations, adaptations, and debriefings). All nine interactions created in CARTOG act as forms of structure while concomitantly creating avenues for improvisation for critical

teams. Therefore, these interactions are valuable in implementing the structured yet flexible roadmap-style approach discussed in Chapter Four.

To be clear, the true main outcome of training is to make critical team members better at their jobs, which is to say that organizations train teams to be better at taskwork

	Chapter 5	Chapter 6	Chapter 7
Critical-specific phase➜ Training outcomes (Tools) ⬇	**Simulation**	**Adaptation**	**Debriefing**
Experience	Becoming experienced	Using experience as decision framework	Translating experience to future events
Communicative Decision Making	Developing decision making abilities	Making decisions communicatively	Reviewing decisions as a team
Sensemaking	Sensemaking prospectively	Being situationally aware	Sensemaking retrospectively

Figure 3. Critical-Action-Response Training Outcomes Grid (CARTOG)

and team process within the confines of the production phase. Organizations want members to be experienced so they know how to do things. They want them to make sense of their surroundings to avoid catastrophic decisions. And they want them to engage in communicative decision making so that decisions are as effective as possible. What makes CARTOG valuable, then, is the fact that training outcomes designed to make members more effective in support phases eventually have an effect on the production phase. Consider that a team may not have the time or available channels to consult with its parent organization by the time it is engaged in a production phase. In

addition, by the time a team is in a production phase, there is generally no time to develop decision heuristics or create communication patterns from scratch. I argue that most of the legwork of critical teams is completed by the organization in the support phases, much in the same way one might argue that most of the legwork of parenting is completed before children find themselves in "non-routine" events (e.g., they are offered illicit drugs at school). With regards to critical team training, each phase supports production, so how the training outcomes affect each phase matters.

In the following sections, I define each of the three main training outcomes and explain their status within each of the three critical-interactive phases. Then, I discuss how the three outcomes interact with each other.

Experience

I define experience for critical teams as *involved familiarity*. This means that one must participate to gain experience, as opposed to simply being exposed to something. Experience is a unique conceptual term in the process of critical teams because it plays multiple roles. Members engage in simulations to gain experience—or to "get *experienced"* (adjective), in the words of an EMT training facilitator. In adaptations, members draw upon their *experience* (noun) to make decisions. In the debrief process, members ask: "what did we experience?" (verb). I will discuss the role experience in each of these three phases.

Simulations are a time for *becoming experienced*. Simulations are a kind of temporal workaround for critical teams in that they allow organizations to get their

members experienced without exposing them to the risk and responsibility of production phases. The existence of simulations constitutes a reaction to the finality and epochality of critical team work (Ishak & Ballard, 2012). Simulations are used to familiarize members with situational environments and variables (Aggarwal et al., 2004), and to instill and maintain procedural memory (Moorman & Miner, 1998) in members.

Simulations cannot perfectly replicate experience that would be gained during a production phase. Nancy, an ER physician, said that real events have more stress but less direct critique than simulations. Speaking about a recent simulation, she said that knowing she was being videotaped and critiqued made her act differently than she would during a real event. This is a drawback of simulations and something I will discuss in the Limitations and Future Directions section in this chapter.

Adaptation is a time to *use experience as a framework for decisions*. During the adaptation phase, a member may draw on the structure of past experiences when making an individual decision or when engaging in communicative decision making. By doing so, a member calls on procedural memory. Alternatively, a member may use their experience as a form of confidence in deciding to improvise. Experience is the basis for improvisation, as "what you already know" is used to "go beyond what you currently think" (Bruner, 1983, p. 133). Improvisation is not "making something out of nothing" (Berliner, 1994, p. 492); it is always based on some sort of structure, which includes past experiences for critical team members.

Debriefing is a time to consider how to *translating experience to future events*. By this, I mean that debriefs are the cognitive link between just-past event and future events.

One must first review decisions and engage in sensemaking—both discussed below—before understanding how to create value out of a just-past experience. For the next production phase, past experiences only matter insomuch as they are used to shape actions and decisions. Starbuck and Milliken (1988) argue that people automatically consider subsequent events when creating memories of past ones. Therefore, it is how experiences are remembered, not what actually happened, that matters. With regards to critical teams, members translate and encode the memories of a critical event in debriefing while accounting what they expect to happen in the future. This generally means that experiences are turned into prototypes (Kaempf et al., 1993) for future events.

Communicative Decision Making

Communication decision making is a process by which a member deliberately interacts with teammates to draw on their resources, as well as his own and those of the teams, in order to improve decision quality. Resources include personal heuristics, discursive decision structures, experiences, and situational awarenesses. While I have explicated communicative decision making from the individual perspective to be consistent with the other sections, this is a tool whose effectiveness is heavily reliant on the participation and quality of one's teammates. In the following paragraphs, I will discuss how communicative decision making comes into play during the three critical-interactive phases.

Simulations are a time to *develop decision making abilities* in a low- to no-risk environment. One of the main benefits of scenario-based training is that it provides a

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space for mental experimentation and formulation of strategic options, which leads to increased confidence in decision making (van der Heijden et al., 2002). Decision making in real events is stressful and time-limited, and therefore must take place with as little drag as possible. This is not the case for simulated decision making, in which options can be discussed, explored, projected, and magnified. Put another way, members can explore the contexts, variables, and outcomes of a variety of decisions in simulations, whereas they can only do so for one in a real event. As van der Heijden and colleagues (2002) explain: "The significance of scenario thinking lies in its ability to help overcoming thinking limitations by developing multiple futures" (p. 7). Simulations act as a safe space for the decision making process. However, due to the explorative nature of simulated decision making, it is sometimes carried out more informally than in real events (Goodwin and Wright, 2001; Wright, 2005).

From a teamwork standpoint, practicing communicative decision making fosters team trust. Trust between teammates helps limit concerns that might arise from improvising during non-routine events. Multiple interviewees, particularly in the firefighting field, noted that having consistency of personnel was critical to making decisions and acting quickly. By having the same training, members are more likely to be able to predict what their teammates will do. Otherwise, "they might be using a different decision making process" and respond in an unpredictable way (Larry, Smokejumper). One way to promote trust between teammates is to go through certification programs, training sessions, and/or simulations together in which decision making skills are practiced. Kelly, who leads an elite wildland firefighting crew, said that she prefers when

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personnel on her hotshot crews remain consistent so that she can trust their decision making skills sets. Therefore, practicing decision making together has a positive effect on the speed in which decisions are made in real events.

Adaptations are a time to *make decisions communicatively*. They are opportunities for members to re-align "onto a previously determined trajectory or to discuss coordination onto a new path" (Ishak & Ballard, 2012, p. 19), and they give temporal space to team members to determine a strategy that best meets the variables of the event (Shafer et al., 2006). While it is possible for members or leaders to make decisions without any input from others during the adaptation phase, decision making that involves interacting with others is the norm for critical teams; it is also considered good practice (Bonito, Decamp, & Ruppel, 2008; Cannon-Bowers, Salas, & Converse, 2001; Fisher, 1970; Tropman, 1996). This is why I use the term *communicative* decision making, since considering the resources of others in the decision process is one of the benefits of working in teams.

Debriefs are a time as a team to *review the quality of decisions made* in the just-past event. The benefit of hindsight allows members to ask questions about the decision process that could not be asked before the effects of the decision played out. In other words, now that we know what we know, what do we think about what we thought we knew then? Debriefing allows for a review of perceptions and decision techniques, whether the results of the event are considered good or bad (Starbuck & Milliken, 1988). The review process, along with retrospective sensemaking which I will discuss in the

next section, is an input into translating experiences to improve the quality of future events.

Sensemaking

Simulations are a time for *sensemaking prospectively* about future events. Wright (2005) supports the claim that scenarios can be used for prospective sensemaking, and Gioia and colleagues (2002) argues that making sense of the future requires an ability to envision the future as if it had already occurred. I believe that simulations can create a world in which it is easier to envision future events as having occurred, due to having been simulated. And Godet and Roubelat (1996) use the term *la prospective* to define a future oriented attitude that encapsulates making sense of the future: rather than focusing on a single future, *la prospective* is an outlook that is sensitive to relationships and phenomena that are really important, as well as a natural attenuation to weak signals. In this way, simulations are used to develop a sense of situational awareness, a form of sensemaking, for future production phases.

Adaptations are a time to *be situationally aware*. Situational awareness is seen by critical team members as one of the key elements of their work in being able to understand what to do and when to improvise. I argued in Chapter Seven that situational awareness is a type of sensemaking that involves unfocusing. This means that a person has to simultaneously focus on the task at hand and perceive, comprehend, and project the statuses of relevant situational elements. An example from an ER physician shows how adaptations can be used to become situationally aware. Nancy talked about a time

when she was about to intubate a patient (i.e., remove fluid from a patient via a tube), and all of a sudden she forgot how to do what she was doing. She said she froze and could not think of what to do next. Carla, her nurse, noticed this and said: "hey, do you want to get a bougie?," which is a long wire used to help in intubating. Nancy said she would have forgotten this critical step because "all of a sudden my brain went away." Nancy said that everything went back to normal after that. By talking with her nurse, Nancy was able to adapt and regain the situational awareness that she had lost earlier. This demonstrates how adaptations can be beneficial with regards to situational awareness.

Here, in the adaptation phase, I argue that it is wise to leave the *retrospective* modifier off of the sensemaking concept. Weick (1995) says that decision making and sensemaking occur in an almost simultaneous fashion, but that people are making judgments about the causal relationship, making it retrospective. However, as Wright (2005) says about sensemaking: "It is its retrospective nature that results in its practical benefits being questioned. For if sensemaking is exclusively retrospective what advantage could there be to developing the capacities that comprise it?" (p. 91). Therefore, I feel it is valuable to exclude the term *retrospective* when referring to sensemaking that is tightly coupled with decision making, as it is in the adaptation phase.

Debriefs are a time for *sensemaking retrospectively*. While Weick and colleagues (2005) argue that all sensemaking is retrospective, it is in the debriefing process that sensemaking truly looks backward towards decisions made in the previous phases. Here, sensemaking is more concerned with the past (and to a lesser extent, the future), than the present. If the first question of sensemaking in debriefing is "what happened here?," the

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second question is "what do I do next *time*?" By sensemaking retrospectively, members demonstrate subtle metacognitive skills that help them critically analyze the outcomes of their actions and decisions as well as the reasons for the outcomes (Dismukes, Gaba, and Howard, 2006). Retrospective sensemaking, when combined with reviewing decisions as a team, helps members translate their experiences to improve future events.

An Adapted Theory of Critical Team Experience

Here I would like to return to Dewey's (1938) theory of experience to understand how the three main training outcomes are connected to each other. Dewey argued that there are two main inputs into present experiences: continuity and interaction. Continuity's effect on present experience is that past experience are accounted for, and interaction's effect is that present experiences are based on situational elements. Dewey argued that current experiences are understood as the interaction of these concepts: past experiences and situational elements. I believe this can be applied to the three training outcomes.

In addition to the relationship between continuity and interaction, Dewey also makes a distinction between primary and secondary experience. Primary experience is a gross, crude experience of subject matters, meaning it is based on interaction with physical senses, and not a process of reflection (Dewey, 1958). By contrast, secondary experience is the reflection on primary experience; it is a rational process that involves making mental sense of the interactions with one's environment or situation (Dewey, 1958). In Dewey's (1958) words, secondary experience comes out of "the intervention of

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systematic thinking" (p. 4). Dewey (1958) argues that primary and secondary experience have a symbiotic relationship with one another. For one, the reflection of secondary experience is based on the interactions of primary experience. In addition, the sensemaking process of secondary experiences feeds into primary experiences.

The distinction between primary and secondary experience helps me to explicate what I am referring to as experience in this project. Dewey says that the distinction is relative, not absolute. Therefore, in some sense, experience (as it is being defined here) contains components of primary and secondary experience, meaning that it is both physically experienced and mentally reflected upon. It involves doing (decision making and/or acting) and sensemaking.

Dewey (1958) also argues that the distinction is "purely relative to the intellectual progress of an individual; what is abstract at one period of growth is concrete at another." To experience something in the primary sense is to experience it concretely, whereas to experience something in the secondary sense it to synthesize it in an abstract way. Therefore, just as one of the goals of training is to turn the non-routine into the routine, one of the goals of experience is to make the abstract (secondary experience) into something concrete (primary experience).

The distinction of primary and secondary experience can also be viewed as parallel to the distinction between continuity and interaction. The more useful comparison for the purposes of this argument is that of the latter terms: interaction and secondary experience. Dewey's (1938) concept of interaction is that experiences are created by one's relationship with situational elements in the present. In a similar way,

secondary experience involves reflection upon what is happening in the current situation. Interaction and secondary experience, then, are both processes of sensemaking, which helps teams enact new processes when necessary.

In summary, Dewey's (1938, 1958) view of experience lends support to the idea that the two goals of critical team training are 1) to turn the routine into the non-routine, and 2) to help teams enact new processes when necessary. The concept of continuity shows that present experiences are based on those in the past, with abstract (secondary) experiences becoming concrete (primary) over time and repetition. The concepts of interaction and secondary experience demonstrate a process of critical thinking and/or sensemaking that helps teams enact new processes—or improvise—in situations that necessitate it. Therefore, Dewey's perspective on experience in education is inline with the data on critical team training gathered and analyzed in this project.

Based on Dewey's (1938, 1958) ideas of experience, I put forth an adapted theory of critical team experience. In this version, the concepts of continuity and interaction are still present, but the inputs have changed. In addition, the output is now actions, decisions, and outcomes, which are processed through the way in which teams make decisions together. These outputs then become experience and are cyclically fed back into experience as an input for future events.

Figure 4. An adapted theory of critical team experience
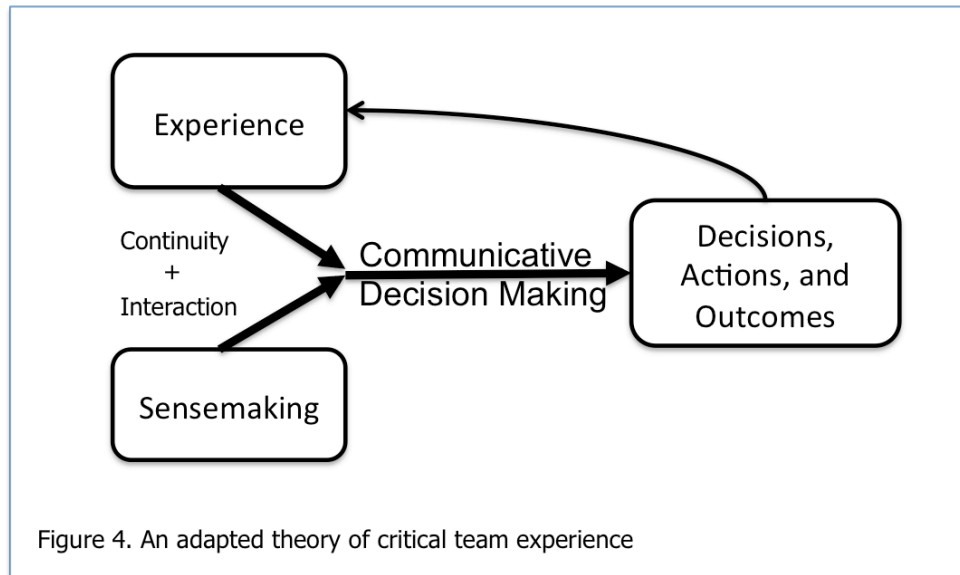
In this adapted theory, continuity refers to the idea that past experience has an effect on how teams make decisions in the present. Interaction refers to the concept that teams make sense of their current situation when making decisions. Experiences and sensemaking abilities of team members interact through a process of communicative decision making, which leads to team decisions. *Experience* include past experiences, familiarities, and procedural memories. *Sensemaking* includes what members "comprehend, understand, explain, attribute, extrapolate, and predict" (Starbuck & Milliken, 1988, p. 51) in the current situation. *Communicative decision making* is the process by which teams move towards decisions, actions, and eventually event outcomes, as decisions made have an effect on actions taken and outcomes produced. I believe these interactions are theoretically valuable because well-constructed grounded theory elucidates relationships between various internal elements of the theory (Kearney, 2007).

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A Structurational Approach to Improvisation

I believe there is value in exploring the contributions of this project to the dialectical nature of training for improvisation. I believe the middle-range concepts explored in the previous section can be contextualized within structuration (Giddens, 1984). The two complementary components of structuration theory are rules and resources. Rules are seen to constrain behavior and are made up of principles or routines that guide human action (Poole and McPhee, 2005). Resources are enablers of behavior, comprised of physical and mental elements that people can use in their actions (Poole and McPhee, 2005). In organizational communication, the interplay between rules and resources is referred to as the "action-structure dialectic" (Conrad & Haynes, 2001, p. 56). Both action and structure are readily apparent in any understanding of training for improvisation by organizations that support critical teams.

What makes the work of critical teams so intriguing with regards to structuration is that many concepts act as both rules and resources at the same time. In other words, there are numerous concepts I have discussed in the last five chapters that both constrain and enable improvisation.

For example, experience's main role is that it acts as structure for current decisions for critical team members. This is in line with Dewey's (1938) conceptualization of experience. At the same time, members with more experience are given more freedom and autonomy in their decisions, according to interviewees. For

example, Kelly said that new members of her fire crew are expected to protocol more than more experienced members are.

Another example is discursive decision structures, such as lists, typologies, and god terms, which are seen to constrain the decisions of critical team members. In the case of lists, they do this by providing formulas for action that lead to predictable outcomes (Browning, 1992). At the same time, because they are minimal structures (Brown & Eisenhardt, 1997; Kamoche & Cunha, 2001), they are designed with a certain amount of flexibility, sometimes in the form of strategic ambiguity (Eisenberg, 1984). For example, some lists (e.g., LIP, RECEO-VS) provide guidance for top level priorities but allow freedom in terms of the procedures used to follow them.

The aggregate result of these dualities is that organizations prime, prepare and equip their embedded critical teams to take an approach to improvisation that is structured and flexible at the same time. Returning to the example of the driving analogy in Chapter Four, organizations give their critical team members roadmaps, as opposed to detailed single-route directions. They teach them how to read the map, they ask them to go on test drives, they show them what to look for, and they have them update the map with their own perceptions. They show them the routes that have been proven effective and they also show them small detours along the way. Suppose that sections of the fastest route are unavailable; organizations give critical team members the freedom to take the most logical path in a scenario given the situational elements. When improvising a path, critical team members draw partially on the structure of the map, their experiences, and other variables, but also on the *flexibility* of the very same elements. This detailed, single-

route directions are not appropriate for critical teams. Too little structure makes it difficult to improvise because there is nothing to base the improvisation on, but too much structure makes it hard to move (Brown & Eisenhardt, 1997, p. 29).

The roadmap approach is further explicated by the thoughts of two interviewees, Kim and Miguel, on the interplay between structure and flexibility in their work. I would describe Kim, a wildland firefighter, and Miguel, an ER physician's assistant, as the most interested and thoughtful interviewees because they continued thinking about meaningful constructs well after their interviews ended[4]. Kim wrote me an email the day after our interview expressing thoughts about structure and flexibility, while Miguel surfaced ideas during a meal we shared for non-research related reasons.

Kim and Miguel explained that improvisation is both constrained and enabled by the structure in their work processes. Kim said the structure was a "base line" that everyone starts from, and things like experience, personal relationships, and personalities "build on that foundation." Here she explains how the foundational structure in training also has a flexible nature:

I would look at it more as providing structure in how to learn different

components and what they are, what they mean, what they're gonna do, how it's

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[4] Kim and Miguel's expressions of interest in these underlying concepts was Throughout the interviews, in asking directly about structure and flexibility, I never pushed anyone to give construct-based answers as Kim and Miguel offered. Most responses fit one of four prototypes: 1) "I guess we have structure sometimes and flexibility other times," 2) "Structure is there in some components and we can be flexible in other components," 3) "We do what we need to do to get the job done," or 4) "I don't know." I present these four statements here in a casual tone because this is how they were spoken to me. It is important to note that while some interviewees expressed interest in my research questions from a theoretical standpoint, most of them felt like approaching them from a pragmatic perspective, and they were doing so for the first—and maybe last—time. To them, the way they work may be complex, but it is matter-of-fact at the same time.

gonna affect you and your decisions, how they interact with each other, whether with fire behavior, or terrain, and those kinds of things. And I think when you put it all together and make a decision is where the flexibility comes in, where you know, you might not being able to have a structure to tell you what that decision is going to be.

Kim also said that there are common factors in each situation, like communication, equipment, and fire behavior, but that no two situations are alike. This demonstrates how structure and flexibility are not seen as opposed concepts in the work of critical teams

Miguel's perspective on his work as a physician's assistant was consisted with Kim's thoughts. When assisting on surgeries, he said that and said that 80 percent of his work is routine. The flexibility in procedures comes from the details, which will change depending on the patient's symptoms and on the preferences of the physician, or in Miguel's words, "you're just gonna adjust the minute things:"

Where (it) is becomes different microscopically is, once you get in there doing the case, the construction part of it, is different per patient because, one might have more osteophytes (bone spurs), one might have less osteophytes. One might have more bone degeneration on the tibia on the medial side, one might have more bone degeneration on the lateral side of the tibia. So you have to make adjustments in your cuts.

Miguel also pointed out that the strategically ambiguous wording of the PA Scope of Practice—"the physician assistant is allowed to do anything that the doctor deems fit"—

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allows for a large amount of flexibility. This is an example of how critical teams are marked by a structured yet flexible approach to their improvisation.

The challenge for organizations that wish to promote a structured yet flexible approach for their embedded critical teams is that they have to consider each of the three training outcomes at each of the three critical-interactive phases described in the CARTOG model. Some of these considerations are easier than others. For example, *becoming experienced* is a relatively simple outcome of simulations because simulations are usually run for the expressed purpose of building experience. In comparison, *developing decision making abilities* and *sensemaking prospectively* are outcomes that take conscious effort, both by the organization in facilitating the training and by members in engagement. By considering each of the nine interactions created in the grid, critical team members will be better equipped to handle the unpredictable events that are inevitable in their work.

Training Recommendations

Based on my observations, findings, and analysis, I detail three practical recommendations that may be of interest to those involved in the training of critical teams.

1. Practice timeouts. If teams ever take time to make decisions as a team during real events, they should practice doing so in simulations as well. I noticed that teams generally simulate in chunks, meaning that, from time to time, they stop to talk about what they are doing in a way that pauses the simulation. This is

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fine some of the time, but teams should also practice the moments when they have to recover when something goes wrong by engaging in team deliberation.

2. Add simpler simulations to the schedule. The value of scenario-based training is being able to practice the skills that are necessary in critical events. In addition to regularly-scheduled functional exercises, schedule simpler, shorter simulations that allow members to engage team process skills together or alone. For example, members can sit together and read through scenarios in textbooks and discuss what they would do to develop decision making skills. Or, they could work on their communication skills by sitting in different rooms and using the radio to work through a simulation. Most mistakes made in the work of critical teams have to do with decision making and miscommunication, so practicing these skills is of the utmost importance.

3. Encourage analysis of temporal and communicative aspects of work. One of the most common responses to questions I asked in the interview process was: "I've never really thought about that." While the job description of most critical team members does not include analyzing the conceptual roles of time and communication, I feel that consideration of these constructs could help some team members gain a deeper and more holistic understanding of their work. Specifically, I believe that analysis of temporal and communicative aspects of work can help in the processes of situational awareness and retrospective sensemaking.

4. Consider outside facilitators for simulations. One wildland firefighter noted that debriefs are better when run by an outside facilitator because of their objectivity. This concept can be applied to simulations as well. I noticed that simulations are almost always run by members of the applicable team or organization, and many members of tactical teams told me that simulations can become unpredictable when run by an outside member. Unpredictability is the point, from my perspective. The problem with only using inside members is that they have the same mental models as the rest of the team and their actions can be predicted, to an extent. Utilizing an outside member—for example, a member of a SWAT team from another city, or a retired firefighter— from time to time could help in replicating the unpredictability of emergency response. This will also help in exploring and developing decision making processes.

5.

I believe that these simple enhancements of the training process can improve teamwork and effectiveness for critical teams.

Implications for Research

In addition to the middle range theory and practical recommendations explored in this chapter, this study has multiple implications for our understanding of organizational communication and improvisation.

One important implication of this study is that it strengthens the understanding of how teams train for improvisation. Many of the previous studies of team improvisation are on improvisational jazz (Berliner, 1994; Nettl, 1974; Weick, 1998). While these studies have analogical value for critical teams, there are critical differences between jazz groups and critical teams. First, the weight of the outcomes associated with critical teams and musical groups are completely different, as people can die if critical teams perform poorly. Second, improvised jazz musicians *desire* to improvise because it part of the performance, whereas critical teams only employ improvisation as a means to an end. Third, musical groups have different communication patterns than critical teams, especially in relation to verbal communication. Fourth, the skills of emergency management are not easily borrowed from other professions (Dynes and Drabek, 1994). Fifth, and most important from an organizational communication standpoint, jazz groups may exist without organizational context, whereas critical teams are almost always trained by a larger organization. For these reasons, this study is valuable as a study of bona fide (Putnam & Stohl, 1990) critical teams.

The question that led me to this study was: do organizations that support critical teams encourage or discourage improvisation? The answer is both and neither, which is confusing, but here is what I mean: What I found is that they first discourage it. Organizations create structure in the actions of their critical team members so that simple events are seen as routine events. Then, they try to get members as much experience as possible to turn previously non-routine events into routine events. While the non-routine-to-routine process is well under way, organizations also encourage critical team members

to gain a holistic understanding of their work in case they need to deviate from procedures. This is how organizations both encourage and discourage improvisation.

At the same time, this is my—the researcher's—interpretation of what happens. As I mentioned, most interviewees were technical and pragmatic in their responses and did not express feelings one way or the other about improvisation. In sum, their response to the above question was: *we do what makes sense given our experiences and the situation*. For the most part, they did not look at what they do as improvising or not improvising until I brought it up in that way. While it is true that many interviewees discussed improvisation, they used the term loosely and sparingly. More salient to them was the distinction between routine and non-routine events.

An implication of this study for chronemics and scholars interested in organizational training is the way in which phases interact with training outcomes. This study posits that improvisation is a function of experience, sensemaking, and communicative decision making. This complements and extends the arguments that improvisation involves using knowledge, intuition, or experience to meet the demands of the given situation (Mendonça et al., 2001; Crossan & Sorrenti, 1997; Weick, 1998). However, there could be a tendency to say that these inputs only occur during events themselves. One of the findings of this study is that experience, sensemaking, and communicative decision making are functions and features of multiple phases, including three critical-interactive phases: simulation, adaptation and debriefing.

Scholars of organizational training can take note that the three training outcomes for improvisation are present in the simulation process. This is where many team

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members get their first experiences, start to make sense of events, and develop their decision making abilities. Therefore, organizational scholars should consider the simulations as a multi-faceted input of team effectiveness.

Chronemic and communication scholars may find value in how each of the three critical-interactive phases interacts with training outcomes. These three phases are communicative by nature for teams and there is value in understanding their role in the process of critical teams. Studies of bona fide simulations are rare, as most studies are experimental and take place in aviation and surgery. This study observed and interrogated bona fide simulations of multiple types of teams. Studies of adaptations are even rarer, and while this project delves into the phase, I look forward to future research on the topic as I believe it is ripe for theoretical findings about the value of communication in critical teams.

As for the debriefing process, almost all studies pertaining to the phase have been conducted on simulation debriefs. This study illuminated what I think is a fascinating activity. Especially when one considers that the work of critical teams is final, meaning that it cannot be redone, the fact that most critical teams still take time out of the schedule to discuss what has happened is a testament the value of retrospective sensemaking and the review of decisions for future events. In simple terms, the debrief is a time to discuss what just happened, but when considered within the cyclical, stressful, phase-based context of critical team process, it is much more than that. In the next section, I call for future studies on the debriefing process as well as other concepts that have sprung from this project.

Limitations and Future Directions

I see this study as an early step in a series of research projects dedicated to creating understandings of the communicative and temporal processes of action teams, specifically critical teams. In addition to the findings of the current project, this study points to future directions for the development of organizational and team communication research on action team processes. Most of the future directions are borne out of the limitations of this project, so I will discuss limitations and future directions together in the form of questions for future research projects.

First, what is actually happening during timeouts and debriefs for critical teams? One of the limitations of this study is that most critical teams perform work this is highly guarded (e.g., military units), private (e.g., surgical teams), or dangerous (e.g., police squads and fire crews). Therefore, it is hard to get access to those events. In this project, I was able to observe some timeouts and debriefs, but most came during simulations. In addition, the "real" timeouts and debriefs that I did witness were few and far between. This is because the work of critical teams can be fairly mundane most of the time. For example, during a 12-hour ride along with a fire station, there were four callouts, and one was a false alarm. The other three callouts were for routine traffic (2) and medical (1) reasons. Most of the time was spent observing members in the station and conducting impromptu interviews with members who were interested in the project. The challenge for me may be one of patience, as engaging in enough ride-alongs would eventually

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result in desired observations. Observing actual timeouts and debriefs would be both beneficial and intriguing for this line of research.

Second, what are the parameters of team deliberation, and what marks the start of an adaptation phase? There are two limitations of this study with regards to deliberation and the adaptation phase. The first limitation is that it was hard for interviewees to express if deliberation occurred at the same time as action. This is one of the challenges of phase models, as it can sometimes be hard to delineate where one phase stops and another starts. The second limitation is that "timeouts" are sometimes taken for physical rest as well, due to the physical demands of the work of critical teams. So if a team takes a timeout to rest, and—while resting—discusses plans, can we still say that the team took a timeout to adapt? In other words, does the reason they took a timeout matter, or does it only matter that they are deliberating?

Third, how does the concept of team situational awareness play into the processes of critical teams? One limitation of this study is that teams and members were often muddled together. There were times in the interview process when I had difficulty determining if someone was speaking on behalf of the team or simply stating their personal opinion--for example, the phrase "you have to improvise." To this end, I hope to better understand how the concepts discussed in this study are different for teams than they are for individual members. One of the critical concepts in this study is sensemaking, which is examined from the individual perspective. Weick (1995) explored the concept of team sensemaking: "Sensemaking is grounded in both individual and social activity…Sense may be in the eye of the beholder, but beholders vote and the

majority rules" (Weick, 1995, p. 6). The last part of this quote gets at the idea that perceptions of past events are often created together by the team that experienced them. So what does that mean for situational awareness? Endsley (1995b) briefly touched on the concept of team situational awareness, saying: "Overall team SA can be conceived as the degree to which every team member possesses the SA required for his or her responsibilities" (p. 39). At the same time, he argues that the overlap of SA requirements between team members may serve as an "index of team coordination or human-machine interface effectiveness" (p. 39). The concept of shared mental models (Cannon-Bowers et al., 2001, Prince & Salas, 1993; Stout, Salas, & Carson, 1994) in critical teams is relevant here, and the corresponding literature may serve as a good foundation for a study on team situational awareness.

Fourth, what counts as transferrable experience? Here I would like to use a sports analogy that prompted this query. Media members and professional athletes alike often argue that Team B will beat Team A in a playoff game or series because they have more postseason experience, the idea being that they are more used to big pressure games. However, everyone playing in the game is a professional athlete; you cannot get to the Super Bowl by winning a high school football game. Therefore, everyone has experience playing in pressure packed games against the best opponents. If those games do not count for Team A as experience because they are not playoff games, then why would *last* year's playoff games count for Team B? Some situational variables are different and the opponent is obviously different, so why do those experiences count as experience? As it

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pertains to critical teams, I wonder what makes simulations and past experiences count or not count as experience. If a firefighter has experiences from the military, do they count?

Fifth, on the topic of simulations and experience, does realism matter in simulations? Shapiro and colleagues (2004) did not find that high-fidelity simulations improved clinical team performance in emergency departments. In addition, Toups and colleagues (2011) explore the concept of *zero-fidelity*, or *non-mimetic,* simulations as learning opportunities. Zero-fidelity simulations are not designed to mimic concrete characteristics, like the heat of a fire or shape of a patient's body. Instead, they might take the shape of a simple video game that uses dots to symbolize people and boxes to represent locations. Zero-fidelity simulations have two benefits over those that are high-fidelity: economy and focus. They are economical because they are simpler to produce, and they are designed to limit the focus of teams on one particular skill, such as decision making or communication. Toups and colleagues (2011) found that a zero-fidelity video game designed to make firefighters share information with each other was treated by firefighters as if the teamwork and communication aspects were 100 percent real. In a future study, I would like to explore more deeply the concept of simulations that are not made to be real, but instead focus on one skill, such as sandbox simulations as a tool for developing communication, situational awareness, and/or decision making skills.

Lastly, how would my conceptions of critical-interactive phases and training outcomes be different if I had interviewed every member of a single team? My sample was stratified across numerous teams, team types, and roles, and individuals. While there is value in stratification, I would like to examine these concepts again in depth with every

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node within one single team. In this way, I could focus more on intersubjective meaning as opposed to extrasubjective or individual meaning. As a student of team interaction, I believe this is an important next step in this line of research.

Conclusion

This study contributes to communication research by exploring how critical team members are primed, prepared, and equipped to deal with improvisation by the organizations that support them. The data that was collected and analyzed in this project were used to create a model of phase support, a model, and an adapted theory of critical team experience. The model of phase support illuminates how different phases of critical team process are used to support others. CARTOG, a grid designed to show how training outcomes can be used at different phases of critical team process, works within the context of the structured yet flexible roadmap-style approach to improvisation for critical teams. And the theory of critical team experience, adapted from Dewey's (1938) theory of experience, helps to elucidate how experience, sensemaking, and communicative decision making play a role in the outcomes of critical teams.

This study was successful in answering Putnam and Stohl's (1990) call for research on bona fide teams. They lay out three requirements for group research. First, group research should involve the emotional intensity and stress associated with real groups. Because I studied real teams and real critical team members, this requirement was satisfied. Critical teams always have something at stake (e.g. human lives, team victories), and cannot exist without emotions and stress. Second, groups should have

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temporal structures that resemble real life spans. The temporal structure of real critical teams was at the heart of this study. Third, group research should cover a variety of team types. This study involved observations of two SWAT teams, one bomb squad, two fire crews, and two police units, as well as interviews with wildland firefighters, urban firefighters, military members, ER physicians, ER nurses, a ski patroller, and members of SWAT teams and bomb squads. While Putnam and Stohl may not have called for covering a variety of team types in one study, I believe this project benefits from the variety of sites and interviewee types.

In conclusion, I would like to point out that they are called critical teams for a reason. Dawna Ballard and I (2012) chose the term based on a passage from Cannon-Bowers and colleagues (2001) in which they say that "critical performance" depends on the coordinated activity of teams who "operate in situations where ineffective performance can have disastrous consequences" (p. 221). I read this in two ways. First, they are *critical* teams because their work is critical, meaning that they often make decisions and take actions that affect if people live or die. There is no more critical outcome than that. Second, they are critical *teams* because the concept of teamwork is imperative in their process. They are not simply collections of physically fit, intelligent, experienced individuals. Critical teams *must* coordinate their efforts to do work that *must* be done in our society, and as a team scholar, those are my motives for this project.

Thank you for reading.

APPENDIX

Table 1. Interview Participants

Pseudonym	Position/Title	Region of U.S.	Team Type
Alex	Firefighter	Southwest	Fire
Ben	Firefighter	Pacific	Fire
David	Battalion Chief	Southwest	Fire
Kelly	Hotshot Crew Leader	Mountain	Fire
Kim	Wildland Firefighter	Mountain	Fire
Larry	Smokejumper (Retired)	Mountain	Fire
Mac	Firefighter (County)	Southwest	Fire
Russ	Battalion Chief	Southwest	Fire
Spencer	Firefighter (County)	Southeast	Fire
Tom	Firefighter	Southwest	Fire
Frank	Medical Instructor, Physician	Pacific	Medical
Freda	Medical Instructor	Pacific	Medical
Greg	OB/GYN	Pacific	Medical
Jacqueline	ER Physician	Pacific	Medical
Kristen	EMT, EMT Instructor	Northeast	Medical
Magda	ER Physician	Pacific	Medical
Miguel	Physician's Assistant	Pacific	Medical
Nancy	ER Physician	Pacific	Medical
Sarah	ER Nurse Practitioner	Pacific	Medical
Tamara	ER Registered Nurse	Northeast	Medical
Trent	Ski Patroller	Mountain	Medical
Damon	Patrol Officer	Southwest	Tactical
Darren	SWAT Team Leader	Southwest	Tactical
Heath	Nuclear Technician, Navy	Pacific	Tactical
John	SWAT Team Leader	Southwest	Tactical
Jorgé	Bomb Squad Member	Southwest	Tactical
Lt. Denton	SWAT Team Lieutenant	Southwest	Tactical
Lt. Griffin	Police Training Supervisor	Southwest	Tactical
Maggie	Helicopter Pilot, Marines	Deployed	Tactical
Parker	Petty Officer, Navy	Pacific	Tactical
Sgt. Carey	Bomb Squad Sergeant	Southwest	Tactical

Recruitment Blog Post

I need your help making contacts with people who work in emergency response. If that's all you need to know, would you be willing to connect me with your friends, relatives, and colleagues that work in emergency response? If so, you can connect us by email (ishak@utexas[dot]edu) and send your contact a link to this page. Thank you!

I need your help.

As you may know, I am currently working on my dissertation in Communication Studies at UT Austin. I am conducting short interviews with people who have worked in emergency response teams, such as **fire crews, military units, emergency medical departments, first response units, S.W.A.T. teams, and bomb squads.** I have collected a sizable amount of interviews and hours of observations in the field, and many of them have been wonderfully insightful, but I need more. Apparently, a dissertation is supposed to be rigorous. Who knew?
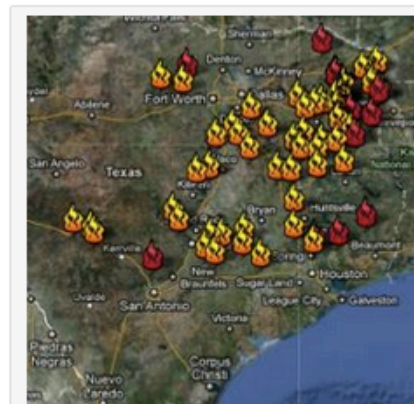
This is where I need your assistance. **I'm asking you to help connect me** to your friend, relative, or colleague who works (or has worked):

- As a **firefighter/wildfire crew member**

- As a **first responder**
- In the **military**
- As an **emergency department medical professional**
- As part of a **bomb squad** or **S.W.A.T. team** (or any other tactical team–search and rescue, exploration, etcetera)

Again, these are very short interviews about their experiences by phone or in person–they can be as short as 5 minutes if that's what works for the interviewee. While I can't promise large sums of money, I will also happily treat any in-person interviewees to coffee or lunch at their convenience. And the hope is that this project will help make emergency response training more effective and "live-saving"–that's an indirect benefit to the interviewee, but one that makes this work worthwhile for me.

A map of wildfires in Texas from September 2011. Interviews with members of wildfire crews have been especially useful for this project.

If you know someone who I can interview for this project, can you do one of the following for me?

Can you introduce me by email? If so, send your friend, relative, or colleague a link to this page, and copy me on the email (ishak@utexas[dot]edu). Maybe you could assure them I am not a crazy person, and hopefully things will go well from there. You could even copy and paste this email:

Subject: Interview Request

Hi _____,

My friend Andrew is working on a dissertation about emergency response teams at the University of Texas (bit.ly/UTemergencyproject). He needs to interview some _____(s), and I think you would be a great person to talk to. The interview can be as short as you want. I cc'd him on this email and his contact info is below. Can you help him out?

Thanks!

_____

Contact info for Andrew Ishak:
ishak@utexas(dot)edu
408-857-4238

Can you ask your contact if you can send me their contact info? If you like this alternative to #1, that's fine with me. Whatever works for you!

Can you post a link to this page on Facebook or Twitter? You can use this shortened link (bit.ly/UTemergencyproject). This is less annoying than you might think for your followers; most people love to help out. Ideally, I would like to finish my interviews this month. If you have a contact, connecting us will only take 30 seconds of your time, I promise. You can do it right now. (I'll wait! Thank you!)

...
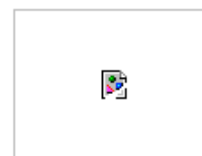
At the interviewee's request, I can promise anyone that their stories and names will remain confidential and anonymous (on top of the fact that no one reads academic articles). If it lends any additional comfort, below are links to a consent form that I use as well as an approved review from UT Austin's institutional research board.

Consent Form

Approved Review from UT IRB

Thank you for your help! I really appreciate it.

-Andrew Ishak

IRB Approval

OFFICE OF RESEARCH SUPPORT

THE UNIVERSITY OF TEXAS AT AUSTIN

P.O. Box 7426, Austin, Texas 78713 (512) 471-8871 -FAX (512 471-8873)
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FWA # 00002030

Date: 09/02/11

PI(s): Andrew W Ishak   Department & Mail Code: Communication Studies   A1105

Title: Investigating Improvised Communication in Teams

IRB EXPEDITED CONTINUING REVIEW APPROVAL: IRB Protocol # 2010-06-0015

Dear: Andrew W Ishak

In accordance with the Federal Regulations the Institutional Review Board (IRB) reviewed the continuing review report for the above referenced research study and found it met the requirements for approval under the Expedited category noted below for the following period of time:
09/28/201 - 09/27/201 . *Expires 12 a.m. [midnight] of this date.*

Expedited category continuing review approval:

☐ **(1)** Clinical studies of drugs and medical devices only when condition (a) or (b) is met. (a) Research on drugs for which an investigational new drug application (21 CFR Part 312) is not required. (Note: Research on marketed drugs that significantly increases the risks or decreases the acceptability of the risks associated with the use of the product is not eligible for expedited review). (b) Research on medical devices for which (i) an investigational device exemption application (21 CFR Part 812) is not required; or (ii) the medical device is cleared/approved for marketing and the medical device is being used in accordance with its cleared/approved labeling.

☐ **(2)** Collection of blood samples by finger stick, heel stick, ear stick, or venipuncture as follows: (a) from healthy, non-pregnant adults who weigh at least 110 pounds. For these subjects, the amounts drawn may not exceed 550 ml in an 8 week period and collection may not occur more frequently than 2 times per week; or (b) from other adults and children2, considering the age, weight, and health of the subjects, the collection procedure, the amount of blood to be collected, and the frequency with which it will be collected. For these subjects, the amount drawn may not exceed the lesser of 50 ml or 3 ml per kg in an 8 week period and collection may not occur more frequently than 2 times per week.

☐ **(3)** Prospective collection of biological specimens for research purposes by Non-invasive means.
Ex
(a) hair and nail clippings in a non-disfiguring manner;

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    (b) deciduous teeth at time of exfoliation or if routine patient care indicates a need for extraction;
    (c) permanent teeth if routine patient care indicates a need for extraction;
    (d) excreta and external secretions (including sweat);
    (e) uncannulated saliva collected either in an un-stimulated fashion or stimulated by chewing gumbase or wax or by applying a dilute citric solution to the tongue;
    (f) placenta removed at delivery;
    (g) amniotic fluid obtained at the time of rupture of the membrane prior to or during labor;
    (h) supra- and subgingival dental plaque and calculus, provided the collection procedure is not more invasive than routine prophylactic scaling of the teeth and the Process is accomplished in accordance with accepted prophylactic techniques;
    (i) mucosal and skin cells collected by buccal scraping or swab, skin swab, or mouth washings;
    (j) sputum collected after saline mist nebulization.

☐ **(4)** Collection of data through noninvasive procedures (not involving general anesthesia or sedation) routinely employed in clinical practice, excluding procedures involving x-rays or microwaves. Where medical devices are employed, they must be cleared/approved for marketing. (Studies intended to evaluate the safety and effectiveness of the medical device are not generally eligible for expedited review, including studies of cleared medical devices for new indications).
Examples:
    (a) physical sensors that are applied either to the surface of the body or at a distance and do not involve input of significant amounts of energy into the subject or an invasion of the subject's privacy;
    (b) weighing or testing sensory acuity;
    (c) magnetic resonance imaging;
    (d) electrocardiography, electroencephalography, thermography, detection of naturally occurring radioactivity, electroretinography, ultrasound, diagnostic infrared imaging, doppler blood flow, and echocardiography;
    (e) moderate exercise, muscular strength testing, body composition assessment, and flexibility testing where appropriate given the age, weight, and health of the individual.

☐ **(5)** Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for non-research purposes (such as medical treatment or diagnosis). (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(4). This listing refers only to research that is not exempt).

☒ **(6)** Collection of data from voice, video, digital, or image recordings made for research purposes.

☒ **(7)** Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(2) and (b)(3). This listing refers only to research that is not exempt).

☒ Use the attached approved informed consent.

☒ You have been granted a Waiver of Documentation of Consent according to 45 CFR 46.117 and/or 21 CFR 56.109(c)(1).

☐ You have been granted a Waiver of Informed Consent according to 45 CFR 46.116(d).

Responsibilities of the Principal Investigator:

1. Report immediately to the IRB any unanticipated problems.

2. Ensure the proposed changes in the approved research during the IRB approval period will not be applied without IRB review and approval, except when necessary to eliminate apparent immediate hazards to the subject. Changes in approved research implemented without IRB review and approval initiated to eliminate apparent immediate hazards to the subject must be promptly reported to the IRB, and will be reviewed under the unanticipated problems policy to determine whether the change was consistent with ensuring the subjects continued welfare.

3. Report any significant findings that become known in the course of the research that might affect the willingness of subjects to continue to participate.

4. Ensure that only persons formally approved by the IRB enroll subjects.

5. Use only a currently approved consent form (remember that approval periods are for 12 months or less).

6. Protect the confidentiality of all persons and personally identifiable data, and train your staff and collaborators on policies and procedures for ensuring the privacy and confidentiality of subjects and their information.

7. Submit for review and approval by the IRB all modifications to the protocol or consent form(s) prior to the implementation of the change.

8. Submit a Continuing Review Application for continuing review by the IRB. Federal regulations require IRB review of on-going projects no less than once a year (a Continuing Review Application and a reminder letter will be sent to you two months before your expiration date). If a reminder is not received from Office of Research Support (ORS) about your upcoming continuing review, it is still the primary responsibility of the Principal Investigator not to conduct research activities on or after the expiration date. The Continuing Review Application must be submitted, reviewed and approved, before the expiration date.

9. Upon completion of the research study, a Closure Report must be submitted to the ORS.

10. Include the IRB study number on all future correspondence relating to this protocol.

If you have any questions call or contact the ORS (Mail Code A3200) or via e-mail at orsc@uts.cc.utexas.edu.

Sincerely,

Jody L. Jensen, Ph.D.
Professor
Chair, Institutional Review Board

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