Organizing Ambiguity: A Grounded Theory of Leadership and Sensemaking Within Dangerous Contexts

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Leaders in high-reliability organizational contexts such as firefighting, emergency medicine, and law enforcement often face the challenge of making sense of environments that are dangerous, highly ambiguous, and rapidly changing. Most leadership research, however, has focused on more stable conditions. This study analyzed 100 reports of "near-miss" situations in which firefighters narrowly escaped injury or death, drawing upon sensemaking and high-reliability organizational theories to provide a grounded theory of leadership processes within extreme events. Themes related to direction setting, knowledge, talk, role acting, role modeling, trust, situational awareness, and agility were key categories. Further abstraction of the data revealed the higher-order categories of framing, heedful interrelating, and adjusting as key characteristics of the overall social process of leadership within dangerous contexts, labeled *organizing ambiguity*. These findings highlight leadership as a collective sensemaking process in which ambiguity is reduced and resilience promoted in the face of danger via interaction among and between leaders and followers.

During recent decades, researchers have provided a wealth of theory and empirical analysis regarding leadership. The majority of that scholarship, however, has focused on the influence processes leaders employ during relatively stable operating conditions in which ambiguity levels are low to moderate, information used to manage equivocality is relatively accessible, and time for action is plentiful. Many studies involving military leaders have focused on individual- and organiza-

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tional-level attributes such as personality traits (e.g., Ng, Ang, & Chan, 2008) and leadership climate (e.g., Chen & Bliese, 2002). Others have used data from military samples to test general hypotheses (e.g., Saad & Sackett, 2002) regarding antecedents and consequences of leadership. Comparatively few have focused on leadership processes employed within extreme events characterized by high ambiguity, such as those faced by leaders in high-reliability organizations.

High-reliability organizations are those in which disasters are a continual threat but are consistently avoided via effective sensemaking (Weick, Sutcliffe, & Obstfeld, 2005). Examples of high-reliability organizations include naval aircraft carriers, firefighting companies, and nuclear power plants. Firefighting companies, for instance, are commonly cited as high-reliability organizations because they maintain resilience within highly ambiguous and dangerous work contexts due to team members' abilities to make adequate sense of hazards in the early stages of threat emergence when they are still manageable (e.g., Scott & Trethewey, 2008; Weick, 1993; Weick & Sutcliffe, 2007).

Members of high-reliability organizations work in contexts characterized by frequently dangerous, time-sensitive problem situations as well as extreme ambiguity regarding the nature and significance of potential threats and what strategies, tactics, and resources are needed to remedy them (Scott & Trethewey, 2008; Weick, 1993). Thus, leadership within these contexts must involve interactions that facilitate the appraisal of hazards, risks, potential benefits, resources, and solutions with information that is often insufficient and equivocal. The lack of research on this leadership context suggests that we know less about what leadership looks like in the face of life-threatening hazards, unexpected risks, and rapidly unfolding events—presumably when leadership may matter most—than we do about leadership during less extreme circumstances.

The phenomenon under investigation in this study is the social process by which groups make effective sense of the hazards within dangerous contexts such that they avoid catastrophic mistakes. We conceptualize this process as constituting leadership, which we define more specifically as the social process of reducing contextual ambiguity through interaction to achieve goals. Thus, the overarching question that guided our analyses was as follows: What actions or processes characterize and contribute to leadership within dangerous, highly ambiguous, and time-sensitive operations?

DANGEROUS CONTEXTS, AMBIGUITY, AND LEADERSHIP

To conduct an informed analysis, we first sought to identify the key characteristics that differentiate dangerous contexts from stable operating conditions, focusing on aspects relevant to the phenomenon under investigation. A prominent theme

throughout the literature on organizational crisis (e.g., Billings, Milburn, & Schaalman, 1980; Lin, Zhao, Ismail, & Carley, 2006; Pearson & Clair, 1998; Seeger, Sellnow, & Ulmer, 2003) is that crises and other types of dangerous contexts are inherently ambiguous, filled with uncertainty and unexpected events. Furthermore, the literature on high-reliability organizations, which by definition continuously operate in dangerous contexts (e.g., Weick & Roberts, 1993; Weick & Sutcliffe, 2007), suggests that the ambiguity present in these contexts is a common source of potentially disastrous errors. As situations unfold, shifts in the environment implicate potential hazards, but the nature and significance of these hazards are open to multiple and often conflicting interpretations. Thus, we focused our treatment of leadership theory on conceptual frameworks that speak to leadership within contexts characterized by high levels of ambiguity and risk. In doing so, we incorporated insights from the literature on complexity leadership theory, sensemaking, and high-reliability organizations.

Complexity Leadership Theory

Complexity leadership theory (Marion & Uhl-Bien, 2001; Uhl-Bien, Marion, & McKelvey, 2007) addresses the nature of leadership within continuously changing contexts (Weick, 1982). Based upon complexity theory, which stems from work in the physical sciences, complexity leadership theory conceptualizes organizations as complex adaptive systems. Complex adaptive systems are "open, evolutionary aggregates whose components (or *agents*) are dynamically interrelated and who are cooperatively bonded by common purpose or outlook" (Uhl-Bien et al., p. 302, italics in original). Namely, complex adaptive systems comprise interdependent nodes within networks. Complexity stems from the fact that all of the parts within the system are intrinsically intertwined such that their union creates a whole that is distinct from the sum of its individual parts. Considering organizations this way shifts the theoretical grounding of leadership away from a focus on individual leaders' one-way interpersonal influence toward viewing organizational actors enacting leadership through dynamic, multidirectional interaction that fosters effective sensemaking about emerging events (Fairhurst, 2007; Fairhurst & Sarr, 1996; Marion & Uhl-Bien). Given that crises are inherently fraught with ambiguity and unexpected events (Pearson & Clair, 1998), complexity leadership theory's consideration of rapidly emergent conditions (Uhl-Bien et al.) seems to address some of the processes underlying collective action during situations characterized as crises or otherwise dangerous contexts.

Based upon these theoretical frameworks, we anticipated that some themes that might emerge from our data could describe leadership similar to Uhl-Bien et al.'s (2007) notions of adaptive leadership, defined as "an emergent, interactive dynamic that is the primary source by which adaptive outcomes are produced" (p. 306), and enabling leadership, defined as that which "serves to enable (catalyze)

adaptive dynamics and help manage the entanglement between administrative and adaptive leadership" (p. 306). Additionally, we anticipated that Uhl-Bien et al.'s concept of administrative leadership, defined as "the actions of individuals and groups in formal managerial roles who plan and coordinate organizational activities" (p. 306), may also emerge as important aspects of leadership within dangerous contexts given the hierarchical nature of many organizations that operate in these environments.

Sensemaking

Recent empirical research supports complexity leadership theory by suggesting that effective leaders facilitate the process of sensemaking (Pye, 2005) and enable action by encouraging creative problem-solving and new behavior patterns (Fairhurst, 1993; Kapucu & Van Wart, 2008; Plowman, Solansky, & Beck, 2007). In moments of crisis and danger, therefore, leadership may involve more emphasis on questioning and enabling members' interpretations of volatile situations and less on directing and controlling (e.g., Fairhurst & Sarr, 1996). For example, leadership within dangerous contexts may take the form of organizational actors communicating with each other, asking questions such as, "What is going on here?" "What assumptions should we question?" or "How does this relate to what we've seen before?" and so on (Weick & Sutcliffe, 2007).

Clearly, numerous situations faced by leaders and teams in dangerous environments require immediate, decisive, and directive action. A sensemaking approach toward leadership does not, in our view, imply that leaders should delay taking necessary actions, deliberate all decisions, or relinquish their authority. Instead, sensemaking describes the process by which leaders and those with whom they interact develop fundamental assumptions about a number of attributes such as the level of risk present in a situation (Scott & Trethewey, 2008) and the range of behaviors available for use within given situations (Weick, 1993).

For example, consider a newly formed military combat team that is just beginning to conduct patrols in an unfamiliar geographical region. They are likely to develop assumptions about the riskiness of certain areas based upon formal briefings, formal and informal discussions with more experienced teams, and through stories traded among each other about previous experiences. As they begin conducting operations, they are likely to adjust their assumptions based upon instances of trial and error, and when they encounter unfamiliar situations they are likely to draw upon parts of their collective experience and their previously established patterns of interaction to react effectively. These activities provide opportunities for leaders to frame for followers how to make constructive sense of ambiguous environments and problem situations (Fairhurst, 2007; Fairhurst & Sarr, 1996). Rather than delaying action, effective sensemaking results in the ability to quickly recog-

nize environmental cues and anticipate team members' actions and intentions, thereby creating the necessary structures for rapid-yet-mindful responses.

Through participating in these interactions, organizational actors enact the social process of leadership. Furthermore, complexity leadership theory allows us to think of leadership as a process that can occur from even the lowest levels of an organization's hierarchy (Osborn & Hunt, 2007). In this sense, every member of the organization—regardless of rank, status, tenure, and age, for example—has the potential to act and influence as a leader, and we anticipated that our data may speak to this point.

High-Reliability Organizations

Within high-reliability organizations, leaders face a unique dilemma. Although charged with official responsibilities and held accountable for outcomes, they often must act on inadequate information (Weick, 1993). Furthermore, leaders in high-reliability organizations frequently face competing goals (Eisenberg, 1986; Weick, 1978)—for example, the goal of speed and efficiency versus the goal of safety—which they must continually negotiate (Weick et al., 2005). As such, leadership and decision making necessarily involve continual sensemaking within organizational cultures that are sensitive to frontline operations and defer authority to those with the most expertise (Weick & Sutcliffe, 2007). Therefore, a thematic analysis of leadership processes within a high-reliability organization is useful for identifying the range of factors that enable and constrain leadership in these contexts. Based upon this stream of research, we thought that some themes within our data could speak to the organizing processes through which leadership occurs within ambiguous situations.

THE PRESENT STUDY

This study investigated the phenomenon of leadership within the fire service, an occupation within which participants frequently face threatening, dangerous, and ambiguous conditions. We used a grounded theory approach (Glaser & Strauss, 1967; Strauss & Corbin, 1990), which is a qualitative methodology that involves allowing data from natural settings to form the foundation from which theory emerges rather than imposing an analytic scheme from an existing paradigm (Lindlof & Taylor, 2002). It is an inductive process, whereby one can directly link the theory that emerges to the unstructured data and the categories into which the data have been coded. We define *leadership*, for the purposes of this study and in keeping with this special issue, as the social process of reducing contextual ambiguity through interaction to achieve goals. Building from participant observation and relevant leadership theory, this study reports common themes from 100

near-miss reports in which firefighters provided retrospective accounts of dangerous situations in which they or other personnel were injured or almost injured in the line of duty. In keeping with a grounded theory approach, we inductively derived themes and potential theoretical relationships from the data rather than testing extant theoretical frameworks through deductive hypothesis testing. Therefore, the purpose of this analysis was to use qualitative data obtained from natural field settings to develop concepts and propositions that could be tested deductively in future variable analytic work.

These near-miss reports are invariably descriptions of highly ambiguous and emergent crisis situations, because they necessarily involve unexpected, dangerous circumstances in which participants personally faced threats to both their physical well-being and cognitive information-processing abilities. Such threats are exacerbated by extreme levels of ambiguity or *equivocality*, defined here as the presence of multiple, plausible interpretations of what is going on in the environment (Scott & Trethewey, 2008). Near-miss reporting is a process used by many organizations in attempt to facilitate organizational learning and improve operational reliability and occupational safety. In general, the theory behind near-miss reporting is that organizational members can make constructive sense of the mistakes of others and incorporate those lessons into their daily work to improve sensemaking in future incidents (Jones, Kirchsteiger, & Bjerke, 1999). In terms of leadership, examining near-miss reports provides unique insight regarding ways in which organizational members accomplished leadership and thereby avoided an accident or how leadership failures contributed to a near-miss situation.

Although grounded theory methodology suggests that scholars avoid deductive, a priori imposition of extant theories and concepts on data, it also acknowledges that existing knowledge can and inevitably will provide sensitizing concepts for analysts to use as points of comparison. Our knowledge of relevant literature led us to anticipate a few general themes that could emerge from our data. First, the notions of leadership described above suggest an often loose coupling between organizational position (e.g., supervisor, line worker, officer, enlisted person) and the capacity for initiating the social process of leadership during extreme events. Many modern organizations designed to face extreme events, however, have strict hierarchical structures that imply leadership from the top of the organization. For example, a clear chain of command and control exists in most military and emergency response (e.g., law enforcement, fire service) organizations. Additionally, these types of organizations typically have many formal procedures and guidelines intended to enable and constrain crisis responses. Participants in these types of organizations, therefore, must negotiate the shifting demands of crisis situations with respect to a variety of formal structures.

Furthermore, within the complexity leadership framework, leadership involves the process of creating structure through social interaction (Marion & Uhl-Bien, 2001), and specific types of interaction appear to bolster organizational reliability

(Weick & Roberts, 1993). Thus, we can expect that leadership during extreme events will involve a variety of informal patterns of behavior in addition to those that may be expected due to a person's position in the organization or standard operating procedures. Moreover, the sensemaking process involves retrospectively interpreting events through social interaction (Weick, 1993). This notion implies that sensemaking processes and interpersonal communication may play a role in how people behave during extreme events.

METHOD

Informants and Data Sources

The first part of this project involved a series of participant-observation visits (Emerson, Fretz, & Shaw, 1995) and ethnographic-style interviews (Kvale, 1996) conducted by the first author in a firefighting company within a large metropolitan fire department located in the Southeastern United States. According to departmental records, the fire station from which the company is based averages approximately 1,500 fire and emergency medical service calls per year, making it one of the busiest fire stations in the region. The high level of activity made this specific firefighting company ideal for observation given our research questions. The purpose of these visits was to observe the firefighters in their natural context to develop a basic understanding of the work context from which firefighter near-miss reports are generated. This knowledge informed our analysis of the near-miss reports in the second part of our study. The station visits ranged from 3 to 12 hours in duration and involved direct observation of 20 calls, totaling approximately 40 hours of direct participant observation. The emic, or insider, approach during this phase of the study provided data collected in the form of field notes that would later provide insight regarding the coding methods used to analyze the near-miss reports.

The primary data source for this study was a set of near-miss reports obtained by the authors from the National Fire Fighter Near-Miss Reporting System, a database supported by the U.S. Department of Homeland Security (2009). This electronic reporting system allows all firefighters from across the United States to anonymously submit detailed descriptions and lessons learned from incidents that involved injury or could have resulted in injuries or death. The system is designed to provide a way to disseminate information regarding occupational safety practices that could potentially reduce firefighter injuries and fatalities. Any firefighter in the United States can submit a near-miss report through the system's Web site. According to the site

> The National Fire Fighter Near-Miss Reporting System is a voluntary, confidential, non-punitive and secure reporting system with the goal of improving fire fighter

safety. Submitted reports will be reviewed by fire service professionals. Identifying descriptions are removed to protect your identity. The report is then posted on this web site for other fire fighters to use as a learning tool. (U.S. Department of Homeland Security)

Other than to provide lessons learned to other firefighters, we are aware of no incentive for firefighters to participate. Given that the system is voluntary, submissions may exclude those incidents that are particularly complex or difficult to remember. The reports also may contain retrospective bias, given that submissions are naturally accounts of historical events. Furthermore, the reports typically only provide one viewpoint of the event and lessons learned. These limitations aside, however, the system assures participant confidentiality and allows a unique insight into numerous aspects worthy of research on dangerous contexts.

As such, this reporting system provides a novel set of data to learn about what aspects of leadership prevented mishaps or, due to their absence, contributed to the dangerousness of the event. Given the large volume of reports available, we specifically limited our search to reports that submitters designated as a "Fire emergency event: structure fire, vehicle fire, wildland fire, etc." This search criterion allowed us to focus on events in which the participants were most likely to have been facing direct physical danger and higher levels of ambiguity regarding the problem situation, in contrast to other common, less equivocal (although sometimes dangerous) situations faced by firefighters such as emergency medical calls, automobile extrication, or training exercises.

Limiting our search to the most dangerous types of events resulted in 963 reports. The nature of constant comparative qualitative data analysis, however, is intense and time consuming. It requires the data analyst to examine the data, line by line, and assign plausible themes to sections of text. At the same time, the analyst must compare each coded piece of data with previously created categories to decide whether the data fit in one of those categories or a new category must be created (Lindlof & Taylor, 2002). Therefore, we reduced the data set to a more manageable quantity by selecting 100 of the reports at random. To do this, we assembled the identification numbers for all 963 potential cases in a single column within a Microsoft Excel 2007 spreadsheet. We then used the software's random number generator to assign each case a random number. Then, we sorted the list by the random numbers and chose the first 100 cases. This random selection gave us some measure of confidence in the fact that any individual variations or disparities among our cases should be approximately the same as that in the whole potential sample.

The reports represented all 10 of the U.S. Federal Emergency Management Administration's geographic regions and a wide range of fire department types (urban, suburban, rural, paid municipal, volunteer, etc.). Submitting personnel were also diverse, representing a wide range of tenure, position (rookie firefighter to

veteran fire chief), and age. Furthermore, this wide range of department types, geographic distribution, and submitter characteristics provided a similarly wide range of viewpoints about what happened and lessons learned from the near misses reported.

Procedure and Data Analysis

The data collected during participant observation, in conjunction with guidance from the theoretical frameworks of complexity leadership theory (e.g., Marion & Uhl-Bien, 2001; Uhl-Bien et al., 2007) and sensemaking (e.g., Weick, 1993; Weick & Roberts, 1993), provided some focus regarding how we approached coding the near-miss reports. In keeping with the tradition of grounded theory, however, we relied primarily on the reports themselves to drive our coding strategy. This process allowed our theory to emerge from the primary data source while at the same time being rooted in data collected during participant observation and relevant organizational theories.

Data were analyzed via the constant comparative method because it requires the analyst to allow for the possible shifts in code and coding categories until the project nears completion (Lindlof & Taylor, 2002). At the most basic level, coding involves assigning labels to sections of text that have some distinct meaning (Miles & Huberman, 1994). Given grounded theory's inductive approach, data should drive the coding categories primarily, although due attention is given to relevant research literature. During and after the initial coding, the analyst should be comparing each code with other codes, redefining categories as necessary, to appropriately assign text to a code. Analysis begins with open coding as the researcher codes as many categories as possible line by line and then proceeds to higher levels of abstraction as codes are eliminated, combined, and united under higher order categories, a process known as *hierarchical coding* (Strauss & Corbin, 1990).

We used QSR International's NVivo 8.0 qualitative data analysis software to assist in the organization of the coding process (Richards, 1999). Like many other computer-assisted qualitative data analysis software tools (e.g., NUD*IST, Atlas.ti, Ethnograph), NVivo 8.0 does not code the data for the analyst but rather provides a means for the user to organize coded data in a manner that fosters higher levels of abstraction. First, all 100 near-miss reports were imported into the software platform as text documents. In total, the reports comprised more than 5,000 lines (approximately 120 pages) of single-spaced text. In this project, we had the added benefit of participant observation to guide our coding efforts. The perspective gained during participant observation provided reference points against which to compare data. In other words, participant observation provided a means for us to understand how operations typically function so we could discern the significance of passages of description in the near miss reports (e.g., why it mattered that a particular standard operating guideline was not followed). Furthermore, the insider

perspective gained during participant observation provided a rough, broad outline of key themes to use in the initial coding process. Specifically, these themes broadly dealt with the highly ambiguous nature of firefighting operations, the necessity of individual action balanced with organizational control, and the role of policies and procedures in shaping behavioral responses.

Using this preliminary coding scheme, the data were analyzed line by line. Sentences and phrases from the text were assigned codes based upon their meaning, taking into account the larger story being described by the text and being guided by our research questions. Therefore, special attention was paid to text that described how the actors positively influenced circumstances to avoid injury or death. Likewise, text that demonstrated ways in which actors failed to positively influence the situation or acted in a counterproductive manner was coded appropriately. As such, it is important to note that the codes used to describe themes in our data describe both instances in which firefighters described both positive and negative influence, namely, cases in which participants did something that helped the situation and cases in which participants worsened the situation either through acts of commission (actions they performed) or acts of omission (actions they failed to perform). For example, many reports discussed how firefighters narrowly avoided personal injury or death by following set procedures or how failing to follow procedures nearly caused them to suffer disastrous consequences. In relation to our research questions, both types of data would be coded similarly because they describe a similar theme regarding actions that the firefighters took that positively influenced the situation by preventing disaster or actions they identified as being lacking and thereby contributing to the near-miss event. All lines of text were eventually assigned a code that spoke in some way to our research question.

The next step, given the constant comparative method, was to compare a code given to a passage of text with the other existing codes to determine whether the text best fit the assigned code or should be assigned to a different code, multiple codes, or a new code should be created altogether. Although this step is conceptually distinct from the first step, it typically occurs in tandem with the first step because the grounded theory approach challenges the data analyst to seek continuously not only raw themes within the data but also to consider the themes in relation to each other. The primary goal at this stage of analysis was to generate a large quantity of codes that would begin to elucidate themes within the data. For example, after eliminating the codes that were unrelated to our research questions, our code list comprised 19 distinct themes. Table 1 lists these themes as the "lowest-order categories" because these were initial codes from which we abstracted higher-order codes.

After creating a large set of initial codes, the next step was to examine the codes to determine potential connections among categories and to collapse codes into manageable categories as warranted. This process, taking into consideration all of the previous steps, continued until the codes and categories coherently explained

TABLE 1
Lower-Order Themes From Firefighter Near-Miss Reports

Secondary Categories	Definition	Lowest-Order Categories
Situational awareness	Maintaining cognizance of surroundings and the environment	Continually assessing environment for surprises
		Challenging assumptions and double-checking work
Direction setting	Use of formal and informal authority to influence adherence to policies and procedures, encouraging vigilance as a social norm, and properly directing actions of those involved in the situation	Ensuring personnel follow safety procedures
		Maintaining knowledge of team members' actions
		Reminding team members of situational priorities
Talk	Facilitating sensemaking through verbal cues	Repeating reports until meanings are shared
		Negotiating instances of conflicting information
Knowledge	Using information from both prior experience and training to purposefully guide action	Comparing current hazards with prior experiences
		Reminding team members of situational expectations
		Relying on those with the most expertise
Role acting	Reducing ambiguity through behaving in accordance with expected roles and using the expected division of labor to anticipate others' behavior	Performing tasks expected due to positional title
		Assigning specific roles to divide and control work
		Acting appropriately in relation to others' roles
Agility	Rapidly adjusting behavior due to changing conditions	Thinking and acting quickly when plans go awry
		Readjusting priorities in the face of change
Role modeling	Personally enacting examples of mindful behavior	Wearing personal protective equipment
		Following policies and procedures
Trust	Believing in the reliability of coworkers and depending upon them when necessary	Staying together as a team, in proximity and goals
		Avoiding lone actions that jeopardize others

Note. N = 100 near-miss reports. The 19 lowest-order categories constitute leaders' actions, and the secondary categories comprise both leaders' actions (direction setting, role acting, and role modeling) and leadership as a collective process (situational awareness, talk, knowledge, agility, and trust).

the data. In this study, for example, data analysis continued until the set of codes and categories sufficiently describe the phenomenon of leadership, defined as the social process of reducing ambiguity in the environment to achieve goals, as set forth in the near-miss reports. The data collected during participant observation

was also used throughout the process of analyzing the near-miss reports to provide some measure of contextual information regarding operations within the fire service and to validate the coding categories used to describe the near-miss report data. For example, participant observation suggested that one way in which firefighters deal with the ambiguity of their environment is through maintaining situational awareness. Thus, the two lowest-order codes of "continually assessing environment for surprises" and "challenging assumptions and double-checking work" were combined into the secondary category of "situational awareness" (see Table 1).

RESULTS

The extreme situations described by firefighters typically involved events in which the reporting firefighter, coworker, or company of firefighters narrowly missed suffering serious physical injury. A number of the reports mentioned incident commanders (ICs) and their role in the extreme situations described. Within the fire service, incident commanders play a specific leadership role in the management of emergency operations (Brunacini, 2002). When a company of firefighters arrives on the scene of an emergency incident (e.g., a house fire), their captain (sometimes called a company officer) acts as the IC as other companies of firefighters continue to arrive at the scene and until a battalion chief arrives. At this point, a battalion chief (BC) becomes the IC and supervises all the firefighter companies involved in the incident. The prescribed physical location of the IC during fire events suggests critical elements of his or her role. In most contemporary fire departments, the IC does not enter a burning structure with subordinate firefighting companies but instead commands the incident from the outside. Typically, ICs communicate via radio with companies of firefighters from within their own separate command vehicle. Companies of firefighters are to remain together and continuously report conditions, actions, and needs to the IC via radio communication. Because the IC is interacting with several companies of firefighters, he or she manages the "big picture" of operations, collecting information from firefighting companies and directing the progress of command strategies and tactics.

Analysis of the near-miss reports revealed 19 categories of behaviors and characteristics of interpersonal interaction that exemplify leadership at the lowest level of abstraction. Through comparing and aggregating these codes in a process similar to that described by Kan and Parry (2004), we collapsed these 19 categories into eight secondary categories (see Table 1). In order of prevalence, the eight secondary categories are situational awareness, direction setting, communication, knowledge, role acting, agility, role modeling, and trust.

The lower-order categories (comprising both the lowest-order categories and the secondary categories listed in Table 1) that emerged from our data deal with

specific behaviors and processes that suggest the basics of what leadership within dangerous contexts might look like at the surface. A much closer look at our data, however, revealed relationships among these categories of behavior. These relationships indicated higher-order themes within our data—themes that speak both to categories of actions (*leading*) and to collective processes (*leadership*) within dangerous contexts. For example, the similarity between passages coded as "ensuring personnel follow safety procedures" and "maintaining knowledge of team members' actions" is that both are ways in which firefighters engage in direction setting. Therefore, we consider direction setting to be a secondary category of leaders' actions, or leading. Likewise, passages coded as pertaining to the actions of "continually assessing environment for surprises" and "challenging assumptions and double-checking work" have the leadership process of situational awareness in common.

Additionally, we examined the eight secondary codes for similarities and relationships. It became apparent that firefighters' accounts of direction setting and knowledge encompassed ways in which they set assumptions as they first encountered an incident. Thus, it emerged that these two categories could be abstracted to a higher level, a leadership process that we labeled *framing*. Likewise, in the passages coded as situational awareness and agility, it became clear that the two codes had in common a notion of both being cognizant of the evolving situation and initiating appropriate actions accordingly. We therefore abstracted these categories to the higher-order leadership process of adjusting. The third higher-order theme of heedful interrelating emerged as we analyzed relationships among the codes of talk, role acting, role modeling, and trust. What these four codes appear to relate was a close attention to both verbal and nonverbal interpersonal communication that served to assist in the sensemaking process. As such, the similarities among these codes has much in common with Weick and Roberts' (1993) notion of heedful interrelating, which is why we labeled this leadership process as such. We address each of these three higher-order categories in more detail below.

Framing: A Higher-Order Category and Leadership Process

A number of the reports described processes through which firefighting teams were able to place the ambiguity of their situations into an initial context, or frame. As a higher-order category and leadership process, framing appears to be a means through which group members enact what is important and what is not important about the event, thus helping them to focus their attention. For example, some participants used or failed to use knowledge gained from prior experience or from schools and training exercises to appropriately frame the event. The process of framing necessarily draws upon prior experiences of team members. For instance, one report stated, "The first-in captain was recently promoted to captain from the rank of firefighter. He is still gaining experience. He had the sense to report the

stairway was burned away, but he decided to try and use them anyway." This example demonstrates how not having sufficient experience may lead to more risk-taking behavior or inappropriate framing. The new captain's lack of experience provided an insufficient foundation for him or her to appropriately organize environmental stimuli. Framing involves effectively gauging the level of risk present in the environment, and this example illustrates how being inexperienced can result in an inability to recognize the full extent and implications of hazards and effectively portray those risks for followers. By trying to use the stairway despite the fact that he had just reported they were "burned away," the inexperienced captain in this example failed to engage in the constructive framing needed to provide leadership within this dangerous context.

Additionally, the framing process requires leaders to draw on lessons retained from prior equivocal experiences, using past successes and failures to contextualize what type of situation the group faces. This involves recognizing potential hazards based on similarities common to the current event and those of the past. For example, one report mentioned, "We recognized the construction type as one that was similar to a home we responded on last year, which had a pitched roof attachment to the front of the house, which resulted in a collapse on an interior crew." As such, the firefighting team in this scenario must have had sufficient prior experience to recognize an otherwise hidden danger. Because lessons learned in previous sensemaking with this construction type alerted them to the possibility of a high-risk situation, they appropriately framed the context as one containing a hazard worthy of their attention and subsequent caution. This recognition, by a member of the firefighting crew, allowed them to begin making sense of the ambiguity they faced through framing the environment as one with a hidden hazard that, if unheeded, could result in disaster. Additionally, we can see in this example a process of vicarious learning, as the report mentioned a previous collapse on a different crew. Thus, they had evidently become aware of this previous instance and used it to frame what they encountered.

The leadership process of framing is intrinsically bounded by not only the group's collective experience but by specific organizational structures that often dictate what behaviors are even within the realm of possibility. Several reports mentioned how policies, procedures, and formal reporting relationships influenced the framing process. For example, a captain of a firefighting company described how he imposed a frame of caution upon a less-experienced firefighter, stating, "I leaned in to him, grabbed his shoulder, and stated, 'Slow down, take it easy, and make sure you get everything on right.'" In this instance, the captain is attempting to frame the firefighter's perception of the event as one that should involve a measure of caution and attention to detail in spite of its seeming urgency. Because the captain has both more experience and more formal authority than the less-experienced firefighter, he is likely to have a greater influence on the framing

process for not only this individual firefighter but for the group at large. The captain was able to capitalize on his status—and, by implication, the policies, procedures, and organizational charts that reinforce and communicate his high-status position—and use it to exert influence on the framing of danger and risk in the environment. Therefore, it is likely that power and status differentials within groups play a role in the framing process.

Heedful Interrelating: A Higher-Order Category and Leadership Process

Whereas the framing process functions somewhat like a series of snapshots regarding what the group believes to be the pertinent aspects of the situation, the process of heedful interrelating deals with how the group members come to conclusions about what is plausible in their environment. Heedful interrelating is largely a communicative process, but it is more than information transfer (Axley, 1984). Rather, heedful interrelating describes the process by which group members engage in sensemaking, not as a lone, cognitive act but rather as an interactive process through which they develop assumptions about the level of risk present in the situation. This process involves group members trying to fix meaning, or pinpoint what is going on, while recognizing that each action they take changes the rules of the game. As such, group members must pay close heed to how their actions may have unintended consequences.

For example, several reports discussed the importance of questioning assumptions. One report stated, "Always repeat the orders told. If you feel they were changed, don't assume. Question the change to make sure you are on the same page of information." This passage highlights the need for repetition, which appears to be an important part of heedful interrelating. By repeating orders, team members engage in social interaction that pays heed to the interconnectedness of their actions. The firefighter quoted above describes the importance of being "on the same page," which is highly relevant to the notion of heedful interrelating because to interrelate with heed requires team members to consider the potential influence that their assumptions and actions may have on others. In this example and several others, the focus was on talk as the method for communication, but other examples demonstrated how the division of labor itself could relate to heedful interrelating. Due to the high level of ambiguity present in dangerous contexts, particularly those described within our data, it appears that group members attempted to reduce this ambiguity in multiple ways.

In addition to talk, firefighters discussed how they used their roles as a way to form assumptions and effectively negotiate situational uncertainty. For example, a number of firefighters wrote about how expectations about other crew members' behaviors may have compromised "crew integrity." For example,

> Crews need to operate as a crew throughout the incident, especially when operating in an IDLH [immediately dangerous to life or health] atmosphere … crew integrity is routinely broken up due to the lack of sufficient manpower and firefighters try to do more with less … A separate, designated accountability officer needs to be established as early as possible for all working fires to track firefighter entry into the IDLH area.

The passage quoted above, written by an experienced (17–20 years) fire chief, suggests that heedful interrelating is a multifaceted process of ambiguity reduction. First, the chief highlights that high levels of danger from environmental hazards make sticking together as a crew even more important. The increased levels of risk and ambiguity create an even greater need for careful behavior, making heedful interrelating a crucial necessity. Additionally, the chief stated that low staffing levels are potentially detrimental to crew integrity because it leads to firefighters trying "to do more with less." Therefore, having sufficient personnel in assigned roles should alleviate some of the contextual ambiguity and allow for more effective sensemaking to occur. Having crews stick together, in spite of urgent, attention-seeking circumstances that would seemingly draw them apart, sustains the interactive process of heedful interrelating. Furthermore, maintaining a distinct division of labor allows for crew members to be able to know what their fellow members should be doing without further investigation.

Additionally, actions themselves communicate specific information about the nature of what is going on in an environment, giving cues that, if heeded, contribute to reliability. Enacting mindful behavior—actions that take into account the complexity of the situation and the possibility of unintended consequences—serves as a way to build trust among crew members while at the same time assisting in sensemaking processes. For instance, a report stated, "I was lucky that I was working with a good crew that stayed together and helped me out" and "I learned the hard way not to go in without back-up." This quote highlights the importance of social interaction as part of effective ambiguity reduction. Without others around to assist and highlight situational contingencies, the quoted firefighter would have likely suffered negative consequences. Similarly, another report described an instance in which crew members interacted during an extreme event that required them to mutually believe that their partner was reliable:

> My partner and I did not have clear vision of each other at this point but were able to communicate by voice without shouting and we were able to coordinate the handoff of the nozzle at this point … without warning the floor around me suddenly collapsed. I immediately found myself falling into the seat of the fire … I called out to my partner, "firefighter down," and to help me out of the hole.

This passage illustrates the importance of interpersonal trust and coordination within the process of heedful interrelating. Despite the high levels of ambiguity

and danger present in this context—virtual blindness within an unfamiliar context—the firefighters stayed together, remained calm, and made progress by handing off the nozzle. Then, when the floor collapsed unexpectedly, they were able to remain intact as an operating team, continuing the process of sensemaking as one of the firefighters rendered assistance to the other in need. This instance exemplifies elements of constructive sensemaking because it involves interactive efforts to makes sense of and adapt to a rapid shift in physical and situational contingencies by maintaining collective resilience. Indeed, prior research suggests that heedfulness often deteriorates when people respond poorly to such rapid shifts by doing the opposite of what happened in this example—breaking the collective frame and pursuing uncoordinated individualized responses (Weick, 1993).

Relatedly, heedful interrelating appears to be hindered by lone actions that hold the possibility of putting others in danger. Some reports mentioned the danger of this type of heedless behavior, calling it *freelancing*. For example, a firefighter wrote, "We were freelancing. The company officer was not aware of our location. Had we fallen in, it would have been a long time before anyone missed us." These firefighters' actions not only endangered themselves, but such actions could be construed as endangering the safety of others who may be counting on them for backup. Heedful interrelating, therefore, is a key leadership process through which people working together in dangerous contexts are able to continually make sense of their environment through communication while simultaneously having the foresight to keep the potentially dangerous unintended consequences of their actions in mind.

Adjusting: A Higher-Order Category and Leadership Process

In the descriptions of near-miss events and lessons learned from them, firefighters frequently mentioned the importance of continually maintaining a flexible posture toward their environments, always being ready to reevaluate and change the course of action if necessary. This higher-order category of adjusting describes the leadership process by which firefighters represented in our data not only maintain awareness of their surroundings through continual interaction but continuously remain poised for a shift of action should their assumptions turn out to be erroneous. For example, firefighters frequently mentioned how remaining mentally aware of changing circumstances allowed them to avoid disaster. One fire company encountered hostile gunfire on a call and discussed how remaining psychologically vigilant regarding the situation allowed them to adjust and sidestep injury. The submitting fighter wrote the following:

> The lessons we learned are again that every scene must be treated in accordance to current policies, but still understanding that any scene can change at an instant. We

> have no suggestions to prevent a similar attack as this was a very unusual situation. Actions used to correct the situation are not something that we are really trained to do. We are not supposed to secure scenes of violence. Again, without any clues this was going to unfold in our crews being shot at, there is nothing else we could do. …
> Our members did their best to cover and conceal behind their apparatus.

This example demonstrates how the quick, mindful recognition of danger allowed the firefighters to rapidly change their initial plan and seek safety. Faced with a sudden, threatening, unexpected event, they were able to adapt and improvise, doing "their best to cover and conceal behind their apparatus." This passage highlights how adjusting as a leadership process facilitates novel actions that fall within previously determined priorities for action. Namely, through prior interactions, the team developed a level of understanding regarding what types of risks were unacceptable in the attempt to respond to a call. When they encountered a clear risk to their physical well-being outside of the realm of fire, they fell back on the assumption that they should adjust their plan of action. Without a consistently vigilant approach toward assessing contextual hazards, the likelihood of a negative outcome for the firefighters would have been high.

Furthermore, adjusting also involves the process of initiating alternate courses of action once a situation appears to have changed dramatically. Because the near-miss reports focused on situations where mishaps nearly occurred, many of the situations described are ones in which conditions quickly shifted in unexpected ways. Thus, the leadership process of adjusting was highly prevalent. For example, a firefighter wrote, "Moments later conditions instantly and dramatically changed. Smoke conditions turned black with extreme heat. Members were burning up!! Communications was ordering members out and they escaped with assistance." This example shows how leadership within this near-miss situation included the need for someone or some group (in this case, the central communications team) to rapidly redirect the crew. Without the adjusting process among the central communications team, they may not have shifted their attention to ordering the firefighters out quickly enough to avoid disaster.

Organizing Ambiguity: A Basic Social Process Within Dangerous Contexts

Finally, we sought to provide an additional level of abstraction regarding the themes that emerged from our data. After further examination of the higher-order categories of framing, heedful interrelating, and adjusting, it appeared that a common origin existed for these three processes. Namely, it became clear when examining these three categories that they suggest the existence of what appears to be the underlying social process of what we termed *organizing ambiguity*. Figure 1 displays this one underlying social process as the key construct that emerged from
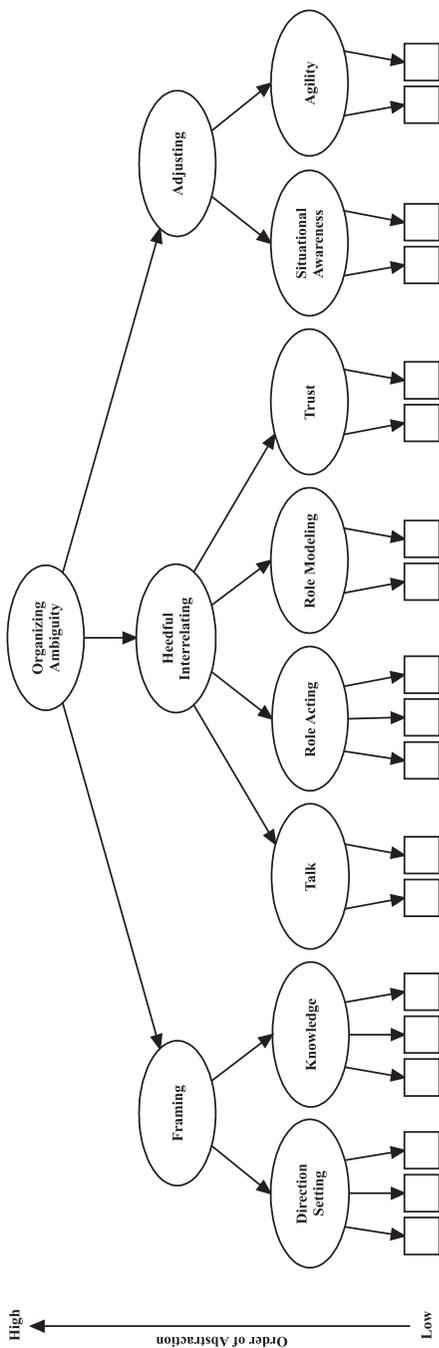
FIGURE 1   Model represents abstraction order of thematic categories that emerged from the data. Squares represent the 19 lowest-order themes relevant the study's research questions. The 19 lowest-order categories constitute leaders' actions, and the secondary categories comprise both leaders' actions (direction setting, role acting, and role modeling) and leadership as a collective process (situational awareness, talk, knowledge, agility, and trust). Framing, heedful interrelating, adjusting, and the overarching category of organizing ambiguity are all aspects of leadership as a collective process.

our data, which in turn drives the three processes of framing, heedful interrelating, and adjusting. From those three processes, our data suggest, stem the secondary and lowest-order categories of leadership behavior.

We make the distinction between the categories depicted in Figure 1 such that the 19 lowest-order categories describe leadership behaviors, and the 8 secondary categories describe five leadership processes—situational awareness, talk, knowledge, agility, and trust—and three sets of leaders' actions—direction setting, role acting, and role modeling. The three higher-order categories and the category of organizing ambiguity describe leadership processes. We posit that dangerous contexts, because of their necessarily ambiguous nature, require leadership to involve a fundamental process of organizing ambiguity. As displayed in the process model of Figure 2, social groups within dangerous contexts must continually negotiate the ambiguous nature of their surroundings in an attempt to make sense of what is going on, what it means, and what the group should do next. Upon encountering ambiguity, the process of organizing ambiguity begins. This process involves the subprocesses of framing, heedful interrelating, and adjusting. All three of these subprocesses are interdependent, in that they all influence each other and no true beginning or end of the process necessarily exists. Group members build upon cues from each other and their past experience to engage in sensemaking.

In so doing, they are providing an organization of sorts to the ambiguity that surrounds them. The process of organizing ambiguity encompasses all of the pro-
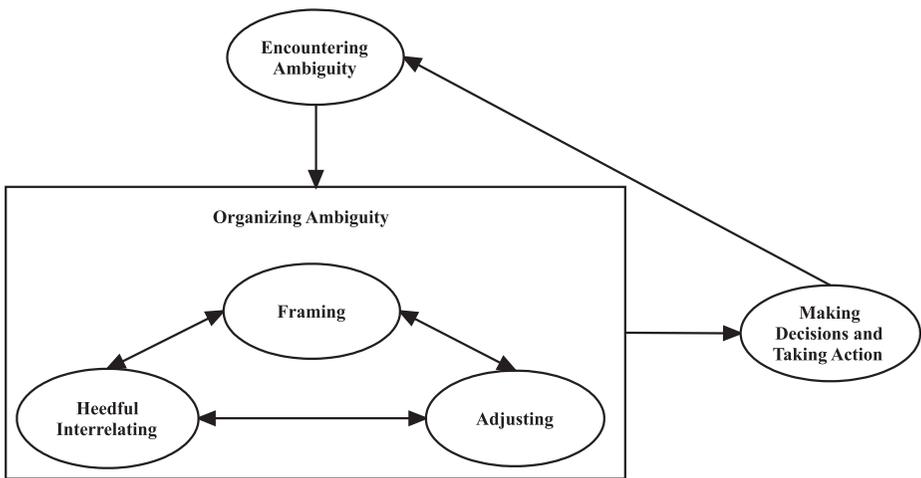

FIGURE 2   Model represents leadership processes within dangerous contexts characterized by high levels of ambiguity. Organizing ambiguity comprises three primary interrelated processes comprised of subprocesses and leader behaviors. Organizing ambiguity contributes to making decisions and taking action, which necessarily alters the ambiguous context that leaders and teams face, suggesting a continual reevaluation of environmental criteria and collective sensemaking.

cesses and behaviors described in Table 1 and Figure 1. As Figure 2 suggests, organizing ambiguity necessarily influences making decisions and taking action, by both group members and groups as a collective. Those decisions and courses of action, themselves situated in the context, change the nature of the ambiguity being faced. Therefore, these decisions and actions necessarily influence the nature of encountering ambiguity itself. As such, the process of organizing ambiguity continues until event resolution allows enough ambiguity to evaporate.

DISCUSSION

Through an analysis of 100 near-miss reports depicting dangerous events within the fire service, this study provides insight regarding both the processes and behaviors relevant to leadership within dangerous contexts. In addressing our overarching research question, we provide an account of some of the actions or processes that may characterize and contribute to leadership within dangerous, highly ambiguous, and time-sensitive operations. The secondary and lowest-order categories that emerged from the data are highly similar with prior research about leadership behavior. Leadership research, for example, has demonstrated the importance of various leadership processes and behaviors including those related to trust (Dirks & Ferrin, 2002), interpersonal communication (Penley & Hawkins, 1985), response flexibility (Zaccaro, Foti, & Kenny, 1991), and initiating structure and consideration (Kerr & Schriesheim, 1974; Kerr, Schriesheim, Murphy, & Stogdill, 1974; Korman, 1966; Lowin, Hrapchak, & Kavanagh, 1969; Petty & Pryor, 1974). Therefore, we consider the secondary and lowest-order categories that emerged from our data, though not surprising, important in that they highlight specific behaviors and processes that may hold particular importance within dangerous contexts.

The contribution of our study, however, is that we identified a set of interrelated processes that help advance theory on leadership within dangerous contexts. Because dangerous contexts inherently embody a high degree of ambiguity, leadership within these circumstances requires processes that encourage collective sensemaking and ambiguity reduction. The fundamental process of organizing ambiguity—and its subprocesses of framing, heedful interrelating, and adjusting—serve to provide unique insight into how goal attainment occurs within dangerous contexts. By integrating the interdisciplinary perspectives of sensemaking, ambiguity, and high-reliability organizing into our theoretical framework, this study makes a unique contribution to the study of leadership.

As we expected, a number of reports made reference to formal positions held by firefighters and how those hierarchies influenced leadership processes in dangerous, ambiguous contexts. A potential answer from our data is that formal managerial and leadership structures both enable and constrain the ability of groups to en-

gage in effective sensemaking. For example, the process of heedful interrelating that emerged speaks to the use of different roles by firefighters as a framework for interpersonal communication. Specifically, one's role may affect their expectations of others, how others may perceive them, and how they interact with structural aspects of the organization such as policies and procedures.

Furthermore, formal positions appeared to function as symbolic resources through which organizational actors reduced ambiguity, a view that is consistent with prior research on sensemaking (e.g., Weick, 1993). In fire departments, law enforcement agencies, and military organizations, people frequently may find themselves in an extreme situation surrounded by coworkers who they may not know to a great extent. The actors in these situations, however, are able to interact productively because they have a reasonable sense of how the other group members will think and behave given their role. This type of interaction is akin to Eisenberg's (1990) idea of nondisclosive intimacy. Using jazz musicians as a metaphor, Eisenberg suggested that musicians who know very little about each other personally are able to organize and create music because they interact with each other on the basis of each person's role in the group. Guided by the structure of specific musical rules and norms, they are able to interact without needing to participate in personal self-disclosure. Hence, nondisclosive intimacy is a type of close interaction that can occur among specialists. Leadership among firefighters appears to have as part of its foundation the recognition that different people play different roles and the interaction of those roles allows for successful collective activity.

Additionally, our data suggest that formal policies and guidelines, like formal role positions, provide a stabilizing force that alleviates some of the ambiguity inherent in dangerous contexts. Alternatively, leadership involves recognizing when policies and guidelines no longer fit the environment and remaining able to shift action when necessary, relating to the leadership process of agility. For example, numerous firefighters reported the need for strict adherence to policies regarding wearing personal protective equipment, which appears to increase safety, and following standard procedures and guidelines, which give the firefighters a template of sorts regarding how they should coordinate action. Many firefighters also reported, however, that circumstances sometime arise in which no standard procedure applies or exists. For instance, no guidelines existed for the firefighters mentioned previously who encountered gunfire during a call; rather, they were forced to exercise their operational agility by changing their plan and finding protective cover.

A number of informal patterns of behavior appear to characterize the leadership process in dangerous, ambiguous contexts. Given the complexity of dangerous contexts, it is understandable that firefighters appear to rely upon numerous informal mechanisms through which they make sense of events as they unfold. This notion strikes at the core of the central social process that emerged from our data: or-

ganizing ambiguity. Our data suggest that within dangerous contexts, group members engage in the subprocesses of framing, heedful interrelating, and adjusting as informal patterns of behavior to organize the ambiguity that they face.

Finally, past experiences appear to play a role in shaping leadership processes within dangerous, ambiguous contexts. The higher-order category and leadership process of framing provides insight regarding this question by suggesting that an important part of leadership is having a sufficient knowledge base and using that knowledge to inform action within the crisis. Weick and Sutcliffe (2007) claimed that one of the ways in which organizations maintain high reliability is through deferring to those with the most subject-matter expertise, and our findings support this notion. Within emergent, time-sensitive situations these data suggest that both having expertise and enacting it when appropriate are important aspects of leadership. Likewise, leadership may only be accomplished in extreme situations when those who do have the requisite expertise are given the latitude to direct action, regardless of their positional authority.

Implications

The analysis reported here has implications for near-miss reporting in a range of high-reliability organizational contexts. As our analysis suggests, these reports provide meaningful, albeit retrospective, accounts of operational situations. Weick and Sutcliffe (2007) suggested that highly reliable organizations value the organizational learning that may be accomplished by attending to details of near misses. If this study of near-miss reports from fire departments across the United States is any indication, this reporting offers significant insight into the range of factors that enable and constrain leadership processes in emergency operations. Given the potential value of these reports for both theory and practice, therefore, future research should explore how organizations can best capitalize on the hindsight near-miss reports provide. Near-miss reports seemingly have the potential to offer more than interesting hindsight.

In conclusion, our findings appear to support elements of complexity leadership theory (Marion & Uhl-Bien, 2001; Uhl-Bien et al., 2007). Specifically, leadership in the fire service does not focus solely on individual leaders but rather occurs as a confluence of factors within social interaction, a similarity with Uhl-Bien et al.'s notion of enabling and adaptive leadership. This is not to disregard the importance of supervisors, as several themes pertained to the need for officers to initiate the structures of leadership when they are absent; furthermore, formal hierarchy does serve a role in the ambiguity-reduction process. As such, our findings particularly support Uhl-Bien et al.'s conceptualization of administrative, adaptive, and enabling leadership as intrinsically entangled. This entanglement is likely to be present within other dangerous situations such as those encountered by military combat teams for at least two reasons. First, many groups that operate in dan-

gerous situations interact within prespecified hierarchies (e.g., rank structures in military and law enforcement organizations). As such, administrative leadership will likely play a role in shaping behaviors and processes. Second, the dynamic, time-sensitive nature of these types of dangerous situations are likely to require teams to engage in both adaptive and enabling processes as they make sense of the situation, improvising and shifting their approaches as dictated by the context. Additionally, these findings are consistent with the numerous studies that have suggested the powerful influence that supervisors can have over a wide variety of outcomes (Gerstner & Day, 1997). Our findings do suggest, however, that leadership as described in these data necessarily involves all members of the organization with respect to their roles and the context in which they operate.

We do not propose that our theoretical postulations regarding leadership necessarily generalize to all operational settings. Hypothesis testing was not the goal of this study, but it is one that should be taken up in future research. Instead, we propose specific processes that characterize leadership within our data. Because the reports we analyzed were descriptions of highly dangerous circumstances, our findings may provide some insight into how groups negotiate the uncertainty of extreme events. In short, we feel that our findings may apply within other dangerous contexts, but the primary focus of our grounded theory is to provide theoretical development. That is, our data serve as an example of how leadership was enacted within our sample. Leadership may be different in other contexts, but our findings provide a potential theoretical contribution regarding the nature of leadership within some dangerous, highly ambiguous contexts—one that may be tested in future variable analytic work.

These findings are not without implications for the fire service itself. First of all, these findings serve as partial, preliminary evidence of the value of near-miss reporting in this occupational context. Accidents in the U.S. fire service are notoriously costly (Mathews, 1997). If the richness of the data and insight contained in these reports is any indication, they hold significant promise as a procedural tool for continuous learning by captains, incident commanders, and their crews. Near-miss reports may also serve as an excellent narrative tool for the socialization of newcomers to the firefighting profession (Myers, 2005; Scott & Myers, 2005). Given that members of this occupation have historically resisted elaborate bureaucratic procedures that could be used to micromanage and constrain unnecessarily tactical incident management (Cooper, 1995; Kaprow, 1991), the process of studying and discussing internal and external near-miss reports may prove to be culturally acceptable form of continuous learning in the fire service.

Limitations

This study used a rigorous qualitative approach toward inductively generating theory regarding leadership within dangerous contexts via the constant comparative

method. As such, we feel that our results provide insight regarding the ways in which social groups may manage the ambiguity surrounding dangerous contexts, and we suggest several subprocesses through which that may occur. One of the more apparent limitations of our research is that it only investigated near-miss reports within a specific occupation, the fire service. Additionally, to keep the coding process manageable, we only coded a portion of the reports that were available. We are relatively confident, however, that our random selection of cases led to few, if any, systematic differences between our data set and the potential sample. It is possible, however, that the sample we analyzed is not fully representative of the population of incidents. Furthermore, various phenomena could have prompted selective reporting of incidents by firefighters or departments. For example, it is possible that some firefighters submitted their reports following the advice or orders of senior fire captains or chiefs.

Another limitation of this research involves the inability for us to draw any causal conclusions. We feel that our grounded theory approach toward this research was appropriate given the textual nature of our data, the goals of this study, and the nascency of this area of leadership inquiry. We are unable to claim, for example, that the process of organizing ambiguity categorically involves the sets of behaviors and specific behaviors identified in our secondary and lowest-order categories. Quantitative hypothesis testing would be needed to validate that inference. A final concern about our research is that near-miss reports, especially when written after the fact, are inherently subject to a retrospective bias. Although we are confident that the reports used in this study represent the historical views of at least one participant in a near-miss event (which is in and of itself worthwhile), we cannot guarantee the accuracy with which the reporting firefighter recalled the near-miss event.

Future Research

Several avenues exist for future research on leadership in dangerous contexts. In particular, considerable work remains regarding quantitative measurement related to many of the concepts discussed in this study. Because of the study of leadership in dangerous contexts is relatively new, productive research opportunities abound within the qualitative realm. Participant observation and analysis similar to that conducted by this study could provide valuable insight regarding the validity of our findings, and integrating research traditions and theories from the disciplines of organizational communication, social psychology, and organizational psychology may advance this research stream. Another area for future research would be to incorporate descriptive and analytic investigations of how organizing ambiguity influences decisions and actions. We included making decisions and taking action as likely outcomes of organizing ambiguity in our process model (Figure 2); future research could provide insight as to the nature of this relationship and potential

mediators and moderators of this association. Additionally, future research should address the policies and procedures organizations use to convert near-miss data into actionable tools of organizational learning, because this may have implications for leadership development and safety. Finally, future research could compare leadership processes in dangerous contexts among different occupations, which could yield useful theoretical and practical knowledge.

CONCLUSION

From data describing firefighters' accounts of extremely dangerous, ambiguous situations, leadership in the fire service appears to have a number of distinct themes. Those themes include both behaviors—direction setting, role acting, and role modeling—and processes—situational awareness, communication, knowledge, agility, trust, framing, heedful interrelating, adjusting, and organizing ambiguity—that provide insight regarding how leadership occurs in these environments. Our data describe ways in which the overall social process of leadership, which we labeled *organizing ambiguity*, produces positive results during events characterized by high levels of ambiguity and risk, including the threat of personal physical danger. Additionally, the data suggest that neglecting aspects of the central categories mentioned above may result in even more pronounced levels of ambiguity and disaster potential.

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