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Mindfulness as an Organizational Capability: Evidence from Wildland Firefighting

Mindful organizing has been proposed as an adaptive form for unpredictable, unknowable environments. Mindfulness induces a rich awareness of details and facilitates the discovery and correction of ill-structured contingencies so that adaptations can be made as action unfolds. Although these ideas are appealing, empirical studies examining mindfulness and its effects are limited. This study aims at remedying this situation. We use qualitative and quantitative data gathered from wildland firefighters to empirically examine the extent to which mindful organizing contributes to adaptive performance in these dynamic contexts. The findings appear to support the hypotheses: mindfulness is particularly important for good outcomes when contextual uncertainty is high. We end by examining some theoretical mechanisms through which mindfulness is generated.

Organizations must increasingly manage situations that can be planned for only imperfectly. Whether it is in developing innovative products or services, managing shifting global trends, or preparing for environmental or political upheaval, organizations must be adept at managing situations that are inherently dynamic and uncertain (e.g., Weick & Sutcliffe, 2007).

Managing uncertainty requires organizations to adapt flexibly in real time. Particularly in complex environments, when linear approaches such as scenario planning are insufficient to capture the full range of potential interactions and outcomes, businesses need the capability to make sense of and adapt to what is happening *as it unfolds*. This is not a single response activity (such as having an emergency plan of action) but rather requires organizational capabilities for monitoring internal and external uncertainties, disseminating information about those uncertainties in real time, and acting upon that knowledge in coordinated ways. These capabilities are developed and built over time and scholars argue that these capabilities constitute key processes of organizing (e.g., Tsoukas, 2005).

Fundamentally, adaptability requires that organizations both anticipate or notice the need for change and also have capabilities to enact these changes. In theory this is simple, in practice it is difficult. For decades researchers have recounted examples of successful organizations that have failed at one or both (see Starbuck, Greve, & Hedberg, 1978), often with disastrous consequences. Yet, more recently, organization theorists have begun to recognize that some organizations are more capable of adapting to unexpected events and environ-

mental changes repeatedly with unusual reliability (see Scott, 1994; Weick, Sutcliffe, & Obstfeld, 1999). In fact, some scholars argue that these high reliability organizations (HROs) are "harbingers of adaptive organizational forms" for uncertain, complex, and dynamic environments (Weick et al., 1999, p. 82). High reliability organizations, such as nuclear power generation plants, naval aircraft carriers, commercial aviation and air traffic control systems, and chemical processing are different from ordinary organizations. Their differences lie in the ways that they organize to create collective mindfulness.

Mindfulness, as articulated in this article, is grounded in a Western, rather than Eastern, perspective (see Weick & Sutcliffe, 2006). Mindful organizing induces across the organization "a rich awareness of discriminatory detail and a capacity for action" (Weick et al., 1999, p. 88). Mindfulness is not about single individuals "being mindful," or engaging in meditative practices. Rather it is about patterns of organizing that result in a quality of organizational attention that increases the likelihood that people will notice unique details of situations and act upon them (Weick & Sutcliffe, 2006, 2007). Mindfulness functions by counteracting the tendency to simplify events into familiar categories and by strengthening the capability to anomalize events (Weick & Sutcliffe, 2006, p. 518). In effect, mindfulness both increases requisite variety and enhances its usefulness.

The law of requisite variety asserts that the variety of a system such as an organization, team, or individual must be as great as the variety of the environment that it is trying to regulate (Ashby, 1956). It is often assumed that random variety is "requisite," but, in fact, the type of variety that is brought to bear is critical (see Dimov, Shepherd, & Sutcliffe, 2007). The variety sought by more mindful organizations is that which provides insight into their particular environments and ongoing activities. In addition, although requisite variety represents critical building blocks of adaptability, the capabilities to use that variety are context dependent. Consequently, mindful organizing is the means by which organizations can create and draw on requisite variety, and in this way it undergirds capabilities for adaptability.

In this paper, we examine mindful organizing as a source of capabilities that can improve adaptability. We start by discussing requisite variety and its potential to improve an organization's adaptability and then describe mindful organizing as the means by which organizations turn this potential into reality. We then develop a set of hypotheses that build on this foundation. Next we describe the uncertain, dynamic context in which we test our hypotheses – wildland firefighting. Wildland firefighting may seem unique, but it is just another context in which teams of individuals come together under very uncertain and dynamic conditions and often have to take quick action. It provides an exceptional context in which to better understand mindfulness and its effects on adaptability. We end with a discussion, delving into the mechanisms through which the effects of mindfulness occur.

Requisite Variety and Mindfulness

Recall our earlier argument that to perform reliably under uncertainty requires that organizations both anticipate or notice the need to adapt and also have the capabilities to do so. Requisite variety is critical to both processes. Organizations with access to a variety of expertise and perspectives are likely to monitor the environment more broadly and thus are more likely to notice cues signaling the need for adaptation (Sutcliffe, 1994, 2000). This occurs in two ways. First, different perspectives on the environment are likely to uncover different cues. For example, an expert in marketing is more likely to notice that customer preferences are changing, whereas an operations expert may notice that manufacturing requirements are likely to slow down future production. Second, different people are likely to frame the organizational situation from their own worldview, providing insight into potential problems or opportunities that others may not notice. Requisite variety not only creates a broader coverage of monitoring, it also is likely to result in earlier discovery of the need for adaptation. The first cues that adaptation is necessary are often very small, visible only to certain parts of the system. For example, the loss of a small customer may be insignificant to the organization overall, but to someone who knows that that customer represents the new target market for the organization, such a loss is a cue that the new value proposition is not working. Recognizing this cue early can mean the difference between a small shift in strategy early versus an enormous recovery effort later. Thus, requisite variety can improve not only the breadth of environmental monitoring, but also the depth of mon-

itoring, allowing organizations to recognize and understand earlier the need to adapt.

Requisite variety also contributes to an organization's capability to make adaptations once the need is recognized. Groups that can generate diverse perspectives, ideas, knowledge, and skills may have access to a greater arsenal of responses when faced with the need to adapt (Ely & Thomas, 2001; Hargadon & Sutton, 1997; Sutcliffe & Vogus, 2003). This occurs in several ways. First, when the organization is made up of individuals and groups with a variety of knowledge and experiential backgrounds, it has access to a larger pool of potential responses to any given situation (Sutcliffe & Vogus, 2003). Second, such organizations may be better equipped to create entirely new responses. Creativity research suggests that groups composed of individuals with diverse knowledge and expertise have access to a greater variety of cognitive elements which can then be combined and recombined into novel solutions (Amabile, 1983). Finally, requisite variety may improve adaptability by encouraging divergent thinking during problem solving (West et al., 2006). It is generally held that divergent thinking increases the potential range of novel solutions (Leonard & Swap, 1999; Nemeth, 1997; Nemeth et al., 2001).

It seems evident, therefore, that requisite variety increases capabilities to notice and respond to subtle cues that adaptation is necessary. Without supporting organizing structures and processes, however, organizations are unlikely to be able to generate or draw on them.

Organizing Structures and Mindfulness

Mindful organizing is enabled by organizing structures that both develop and draw upon requisite variety as a means of maintaining adaptability (see Weick et al., 1999). In particular, these are structures that allow organizations to (a) find and use expertise wisely, (b) seek out and encourage alternative perspectives and frameworks, (c) focus on the potential for failure, and (d) learn from mistakes. Recent empirical evidence suggests that to the extent that organizations or groups engage in mindful organizing, they are more likely to catch and prevent errors (Vogus & Sutcliffe, 2007). We consider the same set of behaviors with respect to adaptability.

In addition to organizing structures, leaders play a critical role in creating and maintaining a context for mindful organizing. When leaders seek out and use vari-

ety in their decision making, they create a mechanism for incorporating the benefits of that variety into organizational outcomes. By doing so, they also model the behaviors needed from organizational members to ensure that such variety continues to make its way into the system. For example, when a leader asks for feedback on a decision or seeks input from others, she is providing a channel for that information to make its way into the organizational response. Perhaps more importantly, she is demonstrating that varied perspectives are valued and should continue to be presented.

In addition to organizing structures, leaders play a critical role in creating and maintaining a context for mindful organizing.

Hypotheses

Our basic argument is that mindful organizing is an unusually adaptive organizational form for uncertain environments. Organizations and groups faced with uncertain contexts will be more adaptable and better able to perform to the extent that they engage in mindful organizing. Thus,

H1. *Mindful organizing will be positively associated with performance.*

However, the environment is not the only source of uncertainty for groups and organizations. The nature of a group's task and the nature of the group itself can also generate uncertainties and adaptive challenges.

Task Uncertainty. Theory and research highlight a central distinction between situations described as certain, analyzable, routine, or predictable and those situations described as uncertain, unanalyzable, nonroutine, and unpredictable. Task uncertainty increases the complexity and open-endedness of coordination requirements (Thompson, 1967). An implication is that while more certain activities can be accomplished through the use of systematic, routine, rational, bureaucratic procedures, uncertain conditions require more flexible, experimental, and improvisational approaches embodied in mindful organizing. When goals are unclear it becomes

more difficult for teams to coordinate, communicate, and perform. Similarly, when tasks are complex, it can be very difficult for teams to plan and coordinate. Thus,

H2. *Goal clarity will be positively associated with performance.*

H3. *Task complexity will be negatively associated with performance.*

Group uncertainty. The composition of a group can also increase contextual uncertainty. When group members know one another well, they are better able to anticipate and make use of the skills and expertise on their team. They may be better able to communicate and understand the nature of the task. However, when group members do not know one another, uncertainty increases. We would expect, therefore, that knowledge of the group will have a positive impact on performance.

H4. *Knowledge of the group will be positively associated with performance.*

When task and group uncertainty are high, groups must expend even more effort to make sense of and adapt to events as they unfold. It is likely, therefore, that mindful organizing is particularly critical to performance under these circumstances. We thus expect an interaction effect with each aspect of the uncertainty described above.

H5. *Mindful organizing will be more strongly associated with performance when goal clarity is low.*

H6. *Mindful organizing will be more strongly associated with performance when task complexity is high.*

H7. *Mindful organizing will be more strongly associated with performance when group members do not know one another well.*

Finally, as discussed earlier, leaders play a critical role in creating and maintaining a context for mindful organizing. In particular, leaders who seek input and feedback on decision making create and demonstrate the processes of mindful organizing. We therefore expect:

H8. *Leader openness to input and feedback will be positively associated with mindful organizing.*

Wildland Firefighting as a Research Context

We tested our hypotheses in a context in which adaptability is a critical organizational capability: wildland firefighting. Normally wildland firefighting is reactive – people literally put out fires. In recent years wildland firefighting in the United States has become more proactive and preemptive to manage forests that have become filled with dead trees and debris on the forest floor. Wildland fire management refers to efforts to extinguish wildfires, to purposely set fires to reduce hazardous fuels (prescribed fire), and to oversee but not interfere with naturally occurring wildfires to reduce hazardous fuels. Oversight of these three types of events is by a team of individuals structured within a formal hierarchy, called an Incident Command system.

The team is led by an Incident Commander (IC) (called a "Burn Boss") who has full responsibility for managing the response to the fire. In larger suppression fires, an "overhead" team consisting of individuals responsible for planning, operations, finance, logistics, and safety assists the Burn Boss. In smaller fires, the IC handles these functions. Various other team leaders, each of whom coordinates the activities of an engine crew, ground crew, or other resource, report to the head of operations (and ultimately to the IC). In larger fires, additional levels of oversight may be added. For example, crew bosses will report to division supervisors, who in turn report to the head of operations.

Researchers have paid significant attention to the incident command system (e.g., Bigley & Roberts, 2001) and have noted that *in theory,* this structure puts into place much of what is required to perform reliably. Yet in practice, this doesn't always work. In part this is because individuals must carry out the work of the system, frequently in decentralized groups that often differ in their behaviors, expertise, and interactions. Moreover, an incident command system takes place within a larger social context in which politics and power come into play.

Good fire outcomes differ for different situations, but in general, wildfires are successfully managed to the extent that they are put out quickly with the least amount of property or other damage. Fires initiated or managed after naturally occurring are considered successful to the extent that the planned area is burned thoroughly and that the fire does not "escape" into areas not scheduled for burning. Should this happen, it is declared a wildfire and must be extinguished as quickly as possible. In all cases, firefighter and civilian safety is the top priority (in theory) and should the situation result in any type of injury, deployment of emergency fire shelters, or even unsafe conditions or behaviors, this would also be considered a "bad" outcome.

Method

We tested our hypotheses using qualitative and quantitative data obtained from a sample of wildland firefighters in three U.S. agencies (National Park Service, National Forest Service, and the Bureau of Land Management). The population for this study included individuals involved in U.S. fire management "on the ground." The management of fire involves many people in a wide variety of organizations, a large number of whom provide critical infrastructure, planning, and support but do not physically become involved in a fire incident on the ground. Much of the work of fire management occurs long before any flames are seen. However, since we were interested in the ongoing action of managing a fire on the ground (and when that action did or did not change), we chose to focus exclusively on the activities of people who are called upon to physically manage or suppress a fire.

Procedure

The study involved two phases of data collection. We first conducted interviews with 28 firefighters and then designed and administered a survey to collect quantitative data from a larger sample.

In the first phase, we collected qualitative data from a purposive sample of 28 firefighters using a semi-structured interview protocol. Interviews lasted between 60-90 minutes. We asked respondents to narrate their experiences on a particular fire event, from start to finish. By focusing on a specific event, respondents were more able to delve into the details of their experience rather than provide generalized responses which may have been biased towards "by-the-book" actions. We were more interested in what individuals did rather than what they were supposed to do. Moreover, by relating their step-by-step actions within a specific event, we gathered data that are rich in behavioral information rather than only attitudinal. We collected additional information from secondary sources such as fire manuals and peer reports of near misses which provided useful contextual information. The purpose of this phase was to ground our understanding of the context and potential factors influencing mindful organizing in wildland firefighting.

In the second phase, we collected data using a telephone survey. A total of 665 surveys were conducted: 37 percent of respondents worked for the United States Park Service, 24 percent worked for the Bureau of Land Management, and 39 percent worked for the United States Forest Service. Seventy-six percent of respondents were male and the average age was 41 years (ranging between 22 and 65).

Analysis

We began with an analysis of the qualitative data. Within the interview transcripts, we identified every unique "story" or description of a particular fire event and developed them into a set of 62 case studies. The case approach allowed us to focus our efforts on conceptually useful stories (those describing some kind of ongoing action) while still retaining theoretical flexibility around the elements that made up that action. We then used a case analysis methodology (Eisenhardt, 1989; Yin, 1994). Beginning with within-case analysis, we examined each story, mapping out what occurred over the course of the fire and what factors appeared to influence the behaviors of those involved. We incorporated as much detail as possible into each case, including such things as the type of fire incident, the behaviors and stated beliefs of the individuals involved, and the outcome of the event (e.g., whether the fire was contained or escaped its boundaries). The purpose of this stage was to allow the unique patterns of each case to emerge before generalizing across cases.

The described incidents varied widely in terms of the size of the fire (from a few acres to tens of thousands of acres) and in terms of the degree to which the activities were routine (from relatively uneventful prescribed burns on small plots of land to stories of desperate and unsuccessful attempts to stop runaway fires). The outcomes of these incidents varied as well. A few individuals described horrific outcomes in which people were badly injured, had to run for their lives or take shelter in portable "fire shelters."[1] A few individuals described extremely successful outcomes – fires were successfully managed within the planned burn area or were rapidly extinguished. The majority of the described incidents, however, fell in the middle. They had good outcomes, for example fires that remained within planned areas or were eventually suppressed but only after significant struggles or operational mistakes. Or they had poor but not disastrous outcomes, such as escaped fires

that were eventually caught or "near misses" – fire events that were becoming very dangerous but curtailed in time, either through the actions of the fire crews or by sheer luck (e.g., heavy rains). We assessed an outcome as poor or bad if the incident resulted in deployment of shelters, injury, escaped fires, fires jumping lines, financial loss, or safety violations. We assessed an outcome as good if the incident did not result in any of these. Of the 62 incidents recounted by our respondents, 24 incidents had good outcomes, 36 resulted in poor or bad outcomes, and 2 incidents did not include enough information to judge the outcome. The final dataset, therefore, included 60 cases.

... we looked for instances of seeking out relevant expertise, using alternative perspectives, focusing on the potential for failure, and learning from mistakes ...

We then conducted a thematic analysis of the cases, looking for cross-case patterns. We derived these patterns by traveling back and forth between the data and our emerging theory, refining and adjusting our theorized framework and going back to the data to check new interpretations (Charmaz, 2004; Glaser & Strauss, 1967). We paid special attention to themes relating to mindful organizing. For example, we looked for instances of seeking out relevant expertise, using alternative perspectives, focusing on the potential for failure, and learning from mistakes, and noted to what extent these were associated with good or bad fire outcomes.

Based on this initial analysis and drawing on existing theory of mindful organizing, we then designed a survey to test our emerging hypotheses. The qualitative component of the study also allowed us to better contextualize the survey by providing language that best reflected the reality of firefighters' day-to-day experiences.

The survey containing 90 items was conducted by telephone. After asking for basic demographic data, we asked respondents to think back to their most recent fire event. The dates of these events ranged from the day of the interview to 6 months earlier; most occurred within 2 or 3 months of the interview. Respondents provided

basic data about the fire event, the size of the fire, and the location. They were then asked to respond to a series of questions about their experiences of the fire, using Likert-type scales. For questions relating to a respondent's perceptions about his or her work crew, respondents were asked to »consider the people with whom you interacted most frequently (e.g., your unit)« and to answer the questions as they related to this particular group.-

We created indices to assess the six key variables. *Performance* of the group was assessed with six items (Cronbach's alpha of .68) and included statements such as "overall, how would you rate the performance of your group" and "our activities had a positive impact on the outcome of the fire." *Mindful organizing* was measured with nine items (Cronbach's alpha of .86) modified for the fire context from the mindful organizing scale developed by Vogus & Sutcliffe (2007). Items included such statements as "we talked about mistakes and how to learn from them" and "we discussed what to look out for when giving reports to new teams or units." Goal clarity was assessed with three items (Cronbach's alpha of .77), such as "our mission and objectives for each day were clear throughout the day." *Task complexity* was measured using two items (alpha = .63), "the tasks we were involved with required a broad range of skills and functions" and "the tasks we were involved with were quite complex." Task interdependence was measured using three items including "each person's performance was dependent on others performing well." *Knowledge of the group* was measured using two items that asked respondents to indicate approximately how many of the group they had worked with before and the extent to which they knew the skills and abilities of the group (alpha = .84). *Leader openness* was assessed with seven items (alpha = .87). Items included such statements as "my boss actively sought input from a broad range of folks when making decisions" and "my boss responded defensively to feedback from others" (reverse coded).

To test our hypotheses, we used a series of linear regression models. To facilitate testing of interactions, we centered all the data. Thus, coefficients should be interpreted as distance from the mean. We assessed the effect of *mindful organizing* on *performance*. We then added in the

1 The deployment of fire shelters is considered an extreme measure and is treated almost as seriously as the loss of life, requiring extensive and formal inquiries into the operations on the fire.

task context measures. In a second analysis, we assessed the impact of *leader openness* on *mindful organizing* also controlling for the task context measures.

Results

Wildland firefighting is a highly complex and uncertain activity: on average, respondents rated fire events as "very" complex, and the uncertainty was particularly evident in our qualitative analyses. Respondents were quick to point out that no matter how much planning is put in place, fires can, and frequently do, behave in totally unexpected ways. As one very experienced firefighter put it:

> As old as I am and as experienced as I am in relationship to these large fires, the next fire that I walk into initially I won't know anything.

Given this uncertainty, we have suggested that organizations must be prepared to adapt, that is, to change their actions in real time. In the qualitative data, of the 36 events that ended badly the vast majority (29 events) involved situations in which the firefighting organization failed to adequately adapt their actions to a changing situation. In contrast, of the 24 events that resulted in good outcomes, the majority (19 events) involved situations in which the firefighting organization had to change their action in some way, and did so successfully. It seems, therefore, that the ability to adapt is critical to performance. Moreover, we suggest that this ability hinges on the extent to which a team mindfully organizes. Results of the quantitative analysis support this idea.

Table 1 shows the means, standard deviations and correlations for all variables prior to centering the data.

Table 1

Variable	Mean	s.d.	1	2	3	4	5
Goal Clarity	4.56	.72					
Task Complexity	4.02	.94	.10*				
Knowledge of the Group	3.74	1.31	.17**	.08*			
Leader Openness	4.01	.69	.28**	.13**	.05**		
Mindful Organizing	4.21	.58	.22**	.35**	.11**	.41**	
Performance	4.25	.55	.59**	.09*	.24**	.35**	.22**

** p<.01, * p<.05

Means, Standard Deviations and Correlations

Table 2

	Model 1 Performance	Model 2 (interactions) Performance				Model 3 Mindful Organizing
		1	2	3	4	
Mindful Organizing	.087**	067*	.102**	.085*	.087*	
Goal Clarity	.544**	.504**	.537**	.530**	.495**	.077*
Task Complexity	-.002	.013	.012	.005	.030	.294**
Knowledge of Group	.138**	.134**	.134**	.135**	.128**	.059†
Goal Clarity x Mindful		-.103**			-.081*	
Task x Mindful			.065*		.072*	
Knowledge x Mindful				-.086**	-.061†	
Leader Openness						.352**
Model R-squared	.371	.379	.374	.378	.386	.272
Adjusted R-squared	.367	.374	.370	.373	.380	.268

Note. All values are standardized beta coefficients.
All data has been centered.
** p < .01, * p < .05, † p < .10

Regression Results

The results provide support for our hypotheses that mindful organizing facilitates performance and that this relationship is influenced by task and group factors such that mindfulness is critical to performance when uncertainty is high. Specifically, we found support for H1. *Mindful organizing* is positively and significantly associated with performance. Similarly, goal clarity and knowledge of the group are associated positively with performance, providing support for Hypotheses 2 and 4. Task complexity did not appear to affect performance, thus Hypothesis 3 is not supported.

We turn next to the interactions between mindful organizing and task and group uncertainty. As Table 2 shows, all three hypothesized interactions (Hypotheses 5-7) are significant and positive. We examined interaction plots, splitting the data into high versus low categories for each of the relevant variables (based on whether the data were above or below the mean for that variable). These confirmed that when goal clarity is high (i.e., above the mean), mindful organizing has a minimal impact on performance. However, when goal clarity

is low (i.e., below the mean), mindful organizing has a much stronger impact on performance. Similarly, when knowledge of the group is high (i.e., above the mean), mindful organizing has a minimal impact on performance. However, when knowledge of the group is low (i.e., below the mean), mindful organizing has a much stronger impact on performance. Finally, when task complexity is low (i.e., below the mean), mindful organizing has a minimal impact on performance. However, when task complexity is high (i.e., above the mean), mindful organizing has a much stronger impact on performance.

Finally, we found support for Hypothesis 8. We argued that leader openness is a possible antecedent to mindful organizing. Specifically, when leaders seek out and are open to input and feedback from their team and others, they create a context in which mindful organizing can occur. As Table 2 shows, the results support this idea: leader openness was positively and significantly associated with mindful organizing, even when controlling for all the task and group variables.

As uncertainty and unpredictability become an increasing part of the everyday, a capability to adapt flexibly in real time is critical to assuring high performance.

Discussion

As uncertainty and unpredictability become an increasing part of the everyday, a capability to adapt flexibly in real time is critical to assuring high performance. We proposed that this capability results from a style of organizing that fosters collective mindfulness. Mindfulness, with its rich awareness of discriminatory detail, enables people to more quickly sense and manage complex ill-structured contingencies. Although theory suggests the kind of infrastructure it takes to achieve mindfulness, empirical evidence in support of these ideas is just emerging. We sought to remedy this by investigating empirically some effects of mindfulness as well as its antecedents. In the dynamic context of wildland firefighting, processes of mindful organizing were positive-

ly associated with fire outcomes. Moreover, these effects were even stronger when contextual uncertainties increased. We also found that team leadership played a key role in fostering mindfulness.

We proposed that mindful organizing influences performance by creating requisite variety and that it is this variety that both allows teams to notice when they need to change and provides some options for engaging in that change. Our qualitative data shed additional light on some key theoretical mechanisms.

In particular, mindful organizing appears to create requisite variety through four recurring organizing practices: respecting expertise, seeking alternative perspectives, looking for potential trouble spots, and learning from failure. Each of these practices contributes to a crew's capability to notice when adaptation is needed and to make changes to their ongoing actions. Importantly, the absence of these practices also appears to be associated with poor performance.

Respecting expertise. Expertise is critical to firefighting, though not all firefighters make good use of it. By drawing on the experiences and input of others who may have critical information, crew members gained a more complete picture of the fire. One firefighter described his practice of seeking out local expertise to get insight into how a fire is likely to behave in a particular location (and thus how he might best manage that fire):

> I really like going into warehouses, the local unit warehouse … the people who have the bad knees because they fought fire there for 25 years … the dozer operator that's overweight now and cranky … these are the people that have been there for years and years and years and have seen fire burn over time, have probably seen fire in the same drainage …

By drawing on this experience, he is able to anticipate more accurately what might happen and what to look out for. In contrast, another respondent recalled a situation when his crew neglected to seek out local expertise. As he and a teammate stood on a rock, watching a fire unexpectedly burn out of control below them, they noticed signs that someone had been on the rock before. When they brought this up with a colleague, he responded:

> Yeah, that was probably me on the fire in such and such a year that burned up here. It did the same thing. We should've thought about that.

Right there on their crew, they had the expertise of someone who may have known how the fire might behave strangely in this location (since it had before) and yet they did not find or use that information. This expertise could have proved useful both in anticipating how things might blow up, and providing insight into possible actions that could be taken.

Whether or not crews seek out relevant expertise is driven in large part by their leaders' example. As one respondent explained, one of the primary jobs of the leader is to encourage discussion among the experts:

> [You have to] stimulate debate. You encourage it. And you don't enter in as a decision maker. You don't start throwing your knowledge around. You don't want to say, "Well, I did so and so and such and such and blah, blah, blah," because that just shuts them down. What you want is to encourage an open discussion of it among the technical experts, among the people who have knowledge. And if you can do that, it's amazing what you can find out.

Seeking alternative perspectives. Mindful crews also create requisite variety by explicitly seeking it. That is, in addition to seeking out expert perspectives, they seek out *diverse* perspectives. This helps them monitor the fire for possible cues that current activities might need to change. Often this means getting different ideas from other crew members:

> It's that synergy that you get from bouncing ideas off of each other: "What did you see out there? And what do you think is going to happen? And does this make sense?" … That's when you get a really good plan … when you're all looking at it because you all look at things a little bit differently.

Sometimes, however, it means literally to seek out different perspectives on the fire. One respondent described what he viewed as being the best way to size up a fire event:

> The first thing you do is try and understand what the fire is doing and why it's doing it … Get an aerial view first and then view it on the ground and angle back and view it from the air again. Get up because your perspective changes. As you see things on the ground and you see things in the air, you start to have a different perspective [on] what the fire is all about.

By creating alternative perspectives on the fire event, it is often easier to notice cues that the fire is not proceeding as one expects. One respondent talked about looking at the fire from the perspective of the mathematical model of the fire's behavior and then comparing that to his own experience with the fire on the ground. When the two perspectives lead to different expectations about the fire's behavior, he views this as a cue that something isn't going quite right:

> It always helps to have two opinions. And that's what I try and balance in my own mind … [I] keep the modeling and the experience separate. And when they're different, then that should bring up a red flag. Then that's something you have to chase down.

In addition to providing access to important cues about how events are progressing, alternative perspectives also provide insight into possible actions to take.

> I wanted to get input from the other people too, to see if there were any different views on it … I'll ask for other people's opinions, you know, "This is how I think we should do it. What do you think?" And somebody might say, "Well yeah, that's a good idea, but maybe we should do this."

In contrast, almost all the respondents had experiences with a crew or crew leader that neglected to seek out alternative perspectives. These rarely worked out well.

> [The ranger] had the attitude that "I know best." … He had some folks up on this line and he's telling people … "You know, this is going to hold. They have safety zones up there. This isn't going to burn and it's going to be fine." … Sure enough, I think it was within the next day or so it did burn [out of control].

She kind of barks orders … there's no "Let's talk it over a little bit, let's kind of explore it a little bit, let's kind of analyze what we want to do here."

Again, the leader played a critical role in setting this context. In describing a particularly disastrous fire, one respondent suggested that the leader did not do enough to bring in different ideas:

> She kind of barks orders … there's no "Let's talk it over a little bit, let's kind of explore it a little bit, let's kind of analyze what we want to do here."

The respondent compared that leader to another who was able to manage a particularly complex fire with the full participation of the team:

> In essence that team had an atmosphere of trust … and they wanted to communicate about what was going on, and they really wanted to work together. There was this, kind of this atmosphere working together, and it was I think largely premised by the incident commander. He would encourage discussion. He would encourage dialogue … So there was … a clear picture among the team members themselves as to what we were all trying to do …

Looking for potential trouble spots. Perhaps the most striking difference between events that ended badly and those that turned out well was the extent to which individuals and teams assumed that failure was possible. As most of the respondents noted, fire is unpredictable. There is always a possibility that things will go wrong. As one respondent pointed out, when managing a fire, if the hair on the back of your neck doesn't rise just a little bit, you are probably doing something wrong. In other words, you should never feel totally comfortable. There should always be a concern for the possibility of failure. Those teams that performed well tended to be the ones that actively discussed and looked for potential trouble spots. This went beyond creating contingency plans (though those were critical) to constantly monitoring their own management of the fire for possible weaknesses.

> I have this constant thought … "What's the worst thing that could happen here? What could go wrong here? And you know, how are we going to stop that?" And so I'm always kind of imagining down the road … "What are we overlooking? What are we missing? What is going to come back and bite us?"

When firefighters assumed that all was going well, they not only failed to look for cues that events might unfold badly; they also didn't respect such cues when they were pointed out. Again, this was often most evident in the behavior of the leaders.

> The first stage of the wildland fire implementation plan, you ask, basically, "Is everything okay?" Well, it wasn't, but our Line Officer, at that time, really wanted a fire use fire, and just kind of put the blinders on and says, "Well, then we'll keep it on our side of the river." And I said, "You're not going to [be able to] keep it on your side of the river … This is not a good bet." And within two days, it was on the other side of the river …

The most common lesson learned from failure was the idea that individuals need to speak up when they see cues that all might not be well.

Learning from failure. The last theme that emerged with respect to mindful organizing was the idea that learning from failure can also contribute to requisite variety by creating new, experience-based knowledge. Almost all the respondents suggested that they had personally learned from their own mistakes. Having almost been overrun by a fire, one respondent commented that she no longer assumes that fires will continue with their previous level of activity. Another respondent talked about improving his fire behavior models by monitoring what aspects of his model did not match actual fire behavior on the ground.

The most common lesson learned from failure was the idea that individuals need to speak up when they see cues that all might not be well. Several different respondents related experiences in which multiple team members noticed that conditions were not good for a fire and yet failed to voice these concerns. The resulting escaped fires created a strong new incentive in the team members to be more active about their concerns in the future. As one respondent said:

> We fell into a crappy decision trap. So … we simply won't go there anymore … if anybody has concerns, even if they're comparable minor concerns, bring them up now. You know, whether it's a gut feeling or whether you're just sitting there going, "Hey, you know guys, it's 11 o'clock, we're already lighting late, the RH is almost at the bottom. Maybe we need to not do this …"

Although learning from failure is formally encouraged and part of standard operating procedures, very few respondents reported evidence that learning occurred at the organizational level. In many cases, respondents noted that they themselves gained knowledge and learned

from failures, yet this rarely led to changes in operating procedures or even the diffusion of that knowledge across the organization. There were two notable reasons for this. First, the formal means of diffusing learning occurred in after action reviews – a public and ego-laden context. As one respondent recalled:

> It was unfortunately that the after action review was led by the burn boss. My boss is … not real comfortable speaking in public and he doesn't talk a lot … and I think there were mistakes that he made. I think there were mistakes that we all made that … it was just that the decision to do things eventually falls to somebody and it was him … and we didn't let those come out in the AAR … Probably unfortunate but, as the subordinate to this individual, you have to cover your ass. You can't be like publicly, "You're an idiot."

The second reason learning did not always diffuse to the organizational level was because many failures were actually "near misses." They were not technically failures, but rather mistakes that had been made. In these instances knowledge gained was kept within the local team.

> The unfortunate thing is that the lessons that were learned from this never got beyond the people in the burn because there's no process for disseminating information on near-miss fires.

Conclusion

Adaptability in uncertain contexts requires a capability to anticipate or notice the need for change and also the capability to enact change. We proposed that mindful organizing is a means through which these capabilities are created and enacted and found empirical support for our ideas. In particular, we found that mindful organizing was enabled by organizing structures and practices that encouraged the recognition and use of expertise, seeking out and drawing on alternative perspectives and frameworks, focusing on the potential for failure, and learning from mistakes. We hope these findings provide a platform on which future research can build.

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