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The organizational science of disaster/terrorism prevention and response: Theory-building toward the future of the field†

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Summary The organizational science of disaster and terrorism is underdeveloped. In an effort to help promote it and, based on a review of existing literature as well as lessons learned from the process of developing the special issue, two models and derived sample propositions for future research are offered. The models span multiple levels and use system, network, and identity theories to tie together key constructs. Existing conceptual views of, and research on, organizations and disaster/terrorism are considered, and missing and under-researched concepts are identified. Proposed linkages among constructs are offered to produce nomological networks for the organizational science of disaster/terrorism intended to help guide the future development of the field.

Keywords: disaster; terrorism; planning; response; recovery; systems; networks; multilevel; leadership; identity; goals; technology

Introduction

The safety and success of individuals, families, communities, organizations, and nations rests substantially on the ability of organizations to anticipate and respond to disasters and terrorism (9/11 Public Discourse Project, 2005; Committee on Science and Technology for Countering Terrorism [CSTCT], 2002; Department of Homeland Security, 2009). As is outlined in the Introduction to this special issue (James, 2011), catastrophic events are occurring regularly in every part of the world and are affecting organizations of all sorts, as well as their employees. To this point, however, organizational science has given limited attention to the topics of planning for or coping with terrorism or disaster.

This theory paper is intended to promote development of the disaster/terror thread of organizational science. In line with Lynham (2002) and others (e.g., Peterson & Zimmerman, 2004), I adopt the perspective that theory building in the organizational sciences should serve two interconnected functions. The first is to advance scientific research on, and scientific knowledge about, a topic. The second is to give guidance to application in the field by organizations and organizational-science practitioners. Accordingly, the theoretical models developed and presented are intended to stimulate development of both research and practice on organizations and disaster/terrorism. The literature reviewed and analyzed and the models presented are, therefore, intended to be heuristic toward stimulation of future research, theory and practice on organizations' attempts to deal with disaster and terrorism.

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Two heuristic models and sample research propositions for the science of organizations and disasters/terrorism are presented. In developing the models, I started from the premise—long present in systems theory approaches to organizations (e.g., Kast & Rosenzweig, 1972; Katz & Kahn, 1978; Weick, 1977), and more recently revitalized in the ''multilevel'' (e.g., Cappelli & Sherer, 1991; Hofmann & Jones, 2004) and organizational network (e.g., Burt, 1997; Kilduff & Tsai, 2003) movements—that this topic requires integrative and multi-level organizational science investigation for viable scholarly and applied knowledge.

Systems, multilevel, and network theories are all premised, in part, on the idea that the points of intersection of different organizational levels are: (1) often particularly valuable for illuminating key organizational processes and issues and; (2) frequently under studied (Borgatti & Foster, 2003; Katz & Kahn, 1978). In line with that, and because there has been very limited past research on organizations and disaster/terrorism, the models focus on important intersections among levels and constructs, as well as on constructs that are under-addressed in existing works.

Organizations and disaster/terrorism

Figure 1 contains a first tentative model of organizations and disaster/terrorism. Key points from the figure, and the gaps in the existing literature that they point toward, are discussed in the sections that follow.

Disaster and Terrorism: How Similar, How Different?

Implicit in Figure 1 and throughout this special issue is the idea that there are points of unity to the theory, research, and practice of organization operations relative to disaster, and relative to terrorism. I see them as having common

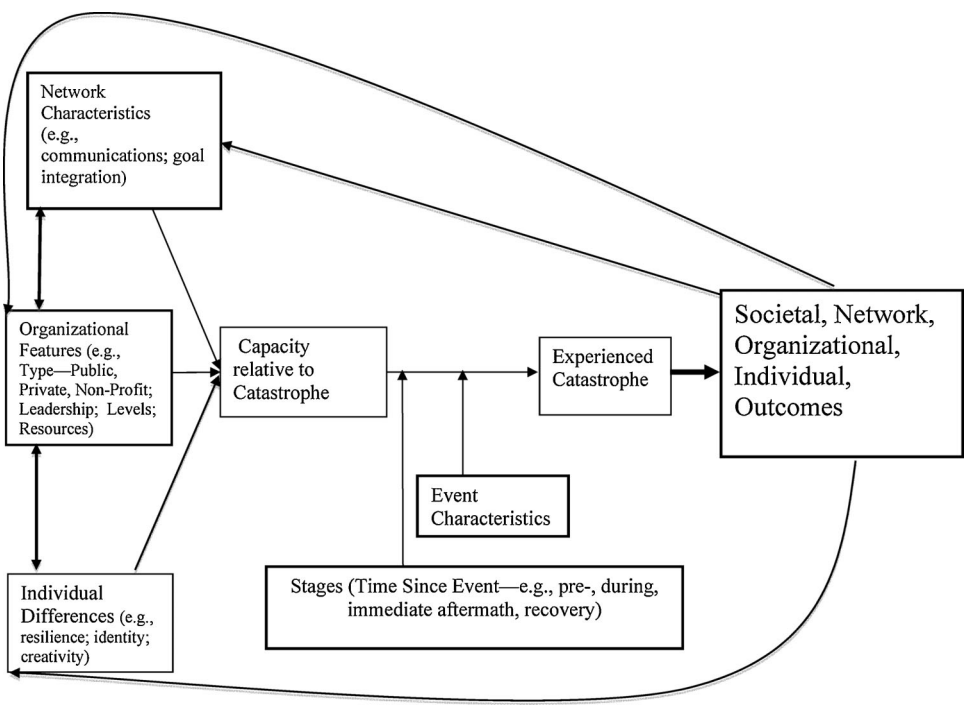

Figure 1. A model of the organizational science of disaster and terrorism

DOI: 10.1002/job

characteristics and implications that make it sensible to consider them together, at least sometimes. But, as is reflected in the ''Event (disaster/terrorism) Characteristics'' box at the center of Figure 1, I also see them as potentially differing in ways that are also important to examine and incorporate into science and practice. Potential similarities and differences in the ''Event Characteristics'' of disaster and terrorism are outlined below.

Similarities

A major source of similarity is that disasters and terrorism are both extreme events in which organizations and their members face dangerous and unpredictable circumstances. Terror and disaster events are, by definition, substantially novel (in some implications for organizations and their members, even if the events—such as floods—themselves, sometimes recur periodically), sudden, and catastrophic (James, 2008a, 2011; Leonard & Howitt, 2007). They also differ from many crises in sharing a substantial component of *impinging external forces*. Even the explosive destruction of the space shuttle Challenger, for instance—while proximally due to a technological failure abetted by problematic organizational (NASA) and network (NASA and its contractors) decision making—was partially the result of unusually cold weather (Vaughan, 1996).

Because they have shared characteristics, terrorism, and disasters are similar in producing high stress and high performance demands for organizations and their members. Successfully addressing either (i.e., positively influencing the Outcomes aspect of Figure 1) tests the resilience and skills of members; stresses the process and performance of organizations and networks (and, sometimes, whole societies); and increases requirements for coordination among organizations.

Coordination by multiple organizations frequently implicates multiple technologies, multiple clusters of personnel, and extreme levels of information exchange and processing (Council on Foreign Relations, 2002; Gupta & Sharma, 2006; Jackson, Baker, Ridgely, Bartis, and Linn, 2004; James, 2008a; Vaughan, 1996). Because of that, outcomes from (end box, Figure 1) and influences on addressing terrorism overlap substantially with those from and for disasters (9/11 Public Discourse Project, 2005; CSTCT, 2002; Jackson et al., 2004; Leonard & Howitt, 2007).

The September 11, 2001 terrorist attacks in the United States, and the Hurricane Katrina disaster have become archetypal for consideration of the two types of catastrophes, and they illustrate both the similarities in, and some difference between, the demands that terrorism and disaster put on organizations and organizational networks. Analyses of each event demonstrated the criticality (for organizations) of similar tasks and actions such as: threat-analysis; advance risk-mitigation; disaster-response strategizing and planning; information gathering and distribution during events; and development of approaches for promoting and coordinating inter-individual and inter-organizational (including technological) efforts to overcome event effects (9/11 Public Discourse Project, 2005; Council on Foreign Relations, 2002; CSTCT, 2002; Gupta & Sharma, 2006; Jackson et al., 2004; James, 2008a; Kapucu, 2006; NCOTAUUS, 2004; Taras, 2006; Torrey, Burke, Lee, Dey, Fussell, & Kiesler, 2008; see also Clarke, 2004; Shirley, 1998). Thus, there is an important place to be filled by theories and studies that examine organizations relative to *both* terrorism and disasters. Because of that and for simplicity, in the remainder of this paper when both disaster and terrorism are being referred to, I will use the term ''catastrophe.''

Differences

There are multiple types of disasters, and multiple potential types of terrorism, such that some catastrophic events are more similar to each other in important characteristics than are others. Hurricane Katrina, for instance, at least *began* as a *natural* disaster—even though some human actions such as construction of and inadequate repair and monitoring of levees contributed to the severity of the *outcomes* (far right box of Figure 1) from it (Gupta & Sharma, 2006; Taras, 2006). The BP oil-platform explosion in 2010, on the other hand, was primarily *human caused*. Small amounts of oil and natural gas may leak naturally from the ocean floor of the Gulf of Mexico, but the major explosion

DOI: 10.1002/job

at the BP Gulf of Mexico oil-platform that killed the workers, and the massive and acute oil leaks that followed would never have occurred had it not been for human and organizational triggers and errors. The BP Gulf of Mexico disaster was, in short, essentially a human-caused, not a natural, disaster.

Although many view pecuniary interests, poor task performance, and mismanagement as having led to the BP disaster, however, the *conscious goal* of the individuals and organizations behind it was clearly not to kill people and disrupt social systems. It was not, therefore, *terrorism* (for discussion of goal-driven negative actions such as terrorism versus unintended negative consequences such as the BP oil platform explosion, see James & Drown, 2008). So, we can distinguish among (primarily) natural disasters, (primarily) human/technology-caused disasters, and terrorism, and there are likely to be differences in how and in what ways organizations need to prepare for and respond to each.

Still taking Katrina as an analytic starting point, in that case there were days of advance knowledge of the pending landfall of the storm (9/11 Public Discourse Project, 2005; Kapucu, 2006; Shai, 2005; Taras, 2006; Torrey et al., 2008). Precise advance warnings do not, though, occur for even every *natural* disaster (e.g., an earthquake)—making them markers of subtypes of disasters. For human-caused catastrophes, on the other hand, some parties may argue for the imminence of disaster but others may disagree (NCOTAUUS, 2004; Taras, 2006). Disagreement on evidence pointing toward potential disaster, or disagreements about risk of and predicted timing for disaster may be, that is, hallmarks of *human-caused* disasters (Tainter, 1988).

For instance, in the case of the explosion of the U.S. Space Shuttle Challenger, dangerous events that had occurred in earlier shuttle launches should have provided evidence of a significant problem. And, several engineers did, at the last minute, recommend to the management of the shuttle program that the combination of cold weather and technical conditions significantly increased the likelihood of disaster for the January, 1986 Challenger launch. Ultimately, however, years of history of misapprehensions and miscommunications about the technical risks combined with professional (i.e., engineering), organizational, and the network (across NASA and shuttle-component contractor firms) cultures to produce the decision to launch Challenger (see McConnell, 1987; Vaughan, 1996). The result was a disastrous explosion that destroyed the shuttle and killed the entire crew.

For terrorism events, acute and specific (as opposed to general as to time and location) advanced information is rarely available. Terrorism risks, therefore, may be even more extremely subject to interpretation and disagreement than even human-caused disaster.

Leonard and Howitt (2007) and Laporte (2007) develop some related ideas about how characteristics of different categories of catastrophic events shape what organizations will need to do to prepare for, survive them, or recover from them. Leonard and Howitt (2007) argued, specifically, that there are *routine* catastrophes, and *non-routine* catastrophes. The former ones are like ''normal'' hurricanes that strike a given region periodically. The impacts that these types of catastrophes will produce, and the demands that they place on organizations and society will be more easily recognized, Leonard and Howitt argue, such that they can be more easily planned for and addressed. Non-routine catastrophes, on the other hand, are ones that are relatively unique such that their implications cannot be (at least fully) anticipated. Such events, Leonard and Howitt (2007) state, produce outcomes for, and demands on, individuals, organizations, and society that generally *cannot* be fully understood until they occur. Those ideas led to following research propositions:

Proposition: A major information-processing requirement for organizational knowledge systems relative to catastrophe is to diagnose the probabilities for, and likely demands from, routine versus non-routine catastrophes.
Proposition: Routine catastrophes can be planned for and responded to with relatively formulaic analysis of past events that lead to pre-determined, relatively formulaic action. For non-routine catastrophes, on the other hand, networks, organizations, and leaders will be most effective when they primarily focus on broad catastrophe scenario development and network, organizational, and employee, creativity.
Proposition: Non-routine catastrophes require flexible plans that outline general strategies and are then flexibly deployed; dealing with them also requires relatively high-levels of decision-making.

DOI: 10.1002/job

Proposition: For routine catastrophes, networks, organizations, leaders, and members can focus primarily on developing and executing non-creative goals and behavioral plans. For non-routine catastrophes, on the other hand, networks, organizations, and leaders will be most effective when they primarily focus on broad catastrophe scenarios and development creative-performance goals for individuals, teams, organizations, and networks.

Leonard and Howitt (2007) also argue that routine disasters generate relatively low levels of stress on organizational systems and processes, and among organization members; while non-routine catastrophes generate relatively high levels of stress. That difference occurs, they argue, because of the differences in predictability and advance preparation that the two categories of catastrophe allow. Thus, the following research proposition:

Proposition: The less routine a catastrophe is, the more important will be advance development of organizational (e.g., stockpiling of critical resources; backup of key systems) and individual (e.g., social capital; efficacy) resiliency.

Stages of catastrophe

Time (event stage) is also a key construct in understanding organizations and catastrophe. The bottom-most center box in Figure 1, therefore, indicates that it is also important to consider differences in how catastrophe preparation, experiences, and recovery may occur—i.e., how catastrophe event *stages* create different implications and demands for organizations, networks of organizations, and individuals (Bruning, 1964; Christianson, Farkas, Sutcliffe, & Weick, 2009; Leonard & Howitt, 2007). Effective *planning* for and effective *recovery* from catastrophe may be influenced by a somewhat different set of factors than is effective *response* during catastrophe.

Leonard and Howitt (2007) and Bruning (1964) propose two stages of catastrophe: advance preparation and response as an event unfolds. Bruning (1964) uses case analysis to support the argument that leaders need to be *participative* before catastrophic events—in, for example, soliciting information about threats, generating potential mitigation and response strategies and tactics, and developing systems and plans. Bruning goes on to argue, though, that when a catastrophic event is underway, organizational leaders should function as ''dictators'' (a less emotionally charged label such as ''commander'' or ''general'' seems more appropriate to Bruning's intent). His analysis generally fits with the (non-catastrophe specific) Normative Decision Theory (Vroom & Jago, 1988). Bruning argues that pre-disaster, organization members widely expect to have input, but there is no urgent time pressure on leaders to make decisions; these are among the conditions under which Vroom and Jago (1988) recommend that highly participative leadership be used.

Bruning also indicated that when a catastrophic event is actually underway, organization members not only largely do not expect decision-input, they actually see it as dysfunctional and their confidence is raised and felt-stress decreased by a decisive, commanding leader. The latter is also in line with the work of Fleming and Waguespark (2007), who stress the importance of the physical presence of a leader during disaster response. Their study indicated that the physical presence of a strong, formal leader led to greater group effectiveness in crisis situations characterized by high level of uncertainty, even among members who had not interacted with each other previously. I propose, therefore, that:

Proposition: All other things being equal, *during* a catastrophic event, a physically present, strong (e.g., charismatic), directive leader will promote network, organizational, team, and individual resilience, efficacy, and goal-performance effectiveness; for the planning and recovery phases, however, participative leadership will be most effective.

Some observations I have made of the U.S. Federal Government, as well as other organizations, indicates, though, that sometimes a deadline for developing plans for addressing catastrophe is given to an agency, organization, or

DOI: 10.1002/job

organization unit from above. Therefore, the planning stage is not necessarily always without either time pressures, or bureaucratic-structuring that limits flexibility and participation. I propose, therefore, that:

Proposition: The extent to which time deadlines and other structural or procedural constraints on catastrophe-planning come from higher organizational or organization-network levels will partially determine the extent to which participation by teams and employees can occur and be effective during the planning stage.

Leonard and Howitt (2007) and Laporte (2007) add that within the *response* phase, some features of the nature of the event also help determine how leaders need to operate. This indicates, therefore, interaction between the Event Characteristics (e.g., predictability), and the Stage (i.e., time relative to event) elements of Figure 1. Leonard and Howitt (2007) argue that during recovery from *routine* catastrophes, rote and highly directive (i.e., commanding) leadership may be practical because creative organizational adaptation is less necessary. Laporte (2007) argues that where a catastrophe falls in the range of extremity influences the same outcomes, with relatively low-extremity events roughly corresponding to Leonard and Howitt's routine ones, and relatively extreme ones roughly to non-routine ones. Consequences of routine catastrophe can be anticipated relatively easily, plans for recovery developed in advance, and implemented in a relatively formulaic way. Non-routine disasters, on the other hand, do *not* have predictable implications and demands and, so, require very flexible plans that outline general strategies and allow for flexible implementation. Thus:

Proposition: ''Directive'' leadership may work best for preparing for, effectively operating through, and recovering from ''routine'' or low-extremity catastrophes; participative leadership may, though, be most effective for the planning, operating, and recovery stages of non-routine or extreme catastrophes.

Next I present, a second, and more explicitly network-focused, model of organizations and catastrophe.

A Multilevel, Networked Theory of Organizations and Catastrophe

As with network theory, Figure 2 shows the importance of linkages among networks, organizations, and individuals. As with organizational systems theories and multilevel theories, it also focuses on constructs that bridge among levels within as organization, as well as the ties between organizational features and the thinking and behavior of individuals (and, implied in Figure 2, sub-groups within organizations).

At the center of Figure 2 is the construct *identity*, indicating a theoretical role for that construct as the linking mechanism among individuals, sub-groups, organizations, and networks. Identity deals with the questions of ''Who am I?'' and ''Who are We?'' The answers to both questions are necessarily comparative (Tajfel & Turner, 1979). In addition, all individuals seems capable of perceiving themselves and operating in the world on the basis of either ''I'' or ''We;'' the ''I'' and the ''we'' sometimes merge; and the ''We'' can take a range for forms from dyadic to small group (e.g., nuclear family) to large group (e.g., organization) to society or culture (Hogg & Terry, 2000; Kreiner & Ashforth, 2004; Triandis, 1995). Organizational identities influence motivation, goals, and resilience, and shape norms for thinking and behavior (Hogg & Terry, 2000; Kreiner & Ashforth, 2004; Riketta, 2005).

Note, too, that Figure 2 shows individuals as embedded in extra-organizational social networks (lower set of circles), as well as tied to their own organization, and the network for that organization (upper set of circles). Individuals and their identities, then, link their organizations and organizational networks to external individuals, groups, and networks. The double-headed arrows to/from identity are meant to indicate that such influences are bi-directional: from networks and organizations to individual thinking, behavior, and resources; as well as *from* individual identity (and the individual characteristics and outcomes it shapes) to organizational, organizational-network, and social network processes and outcomes (Riketta, 2005). The linking role for identity among networks,

DOI: 10.1002/job

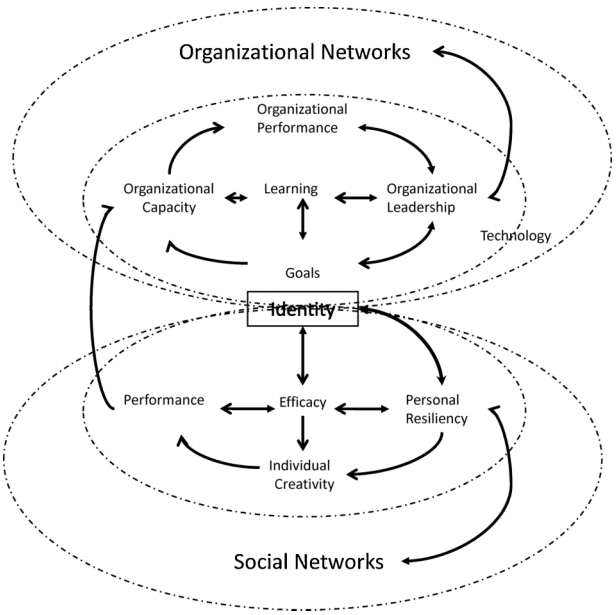

Figure 2. Organizational and individual capacity for catastrophe embedded in organizational and social networks

sub-groups, and individuals is described further by Ibarra, Kilduff, and Tsai (2005) and in Kilduff and Tsai (2003). Finally, recognize that leaders are also individuals such that, while their actions *qua* leaders are a key part of organizational influences on other workers (upper circles), they are also members of the organization and influenced by its forces and features; and members of organizational and extra-organizational networks such that they are both influenced by, and serve as links in and among, networks.

Networks of Organizations

Organizational networks appear at the top left of Figure 1 and as the outer circle of the top portion of Figure 2. No behavior can be understood independent of the system in which it exists. And, like individual human behavior, the actions of organizations do not occur in a social vacuum. Most catastrophes exert pressure on more than one organization at the same time. Organizations of the private sector, nonprofit organizations (and also ad hoc/informal ones), local authorities, and national governments tend to be conjointly impinged upon by catastrophes, and can only respond to them successfully if they plan and react collaboratively and effectively (Birnholtz & Finholt, 2008; CSTCT, 2002; Department of Homeland Security, 2009; Gupta & Sharma, 2006; James, 2008a; NCOTAUUS, 2004). Therefore, it is important for organizational science to consider, relative to catastrophes, the cross-currents and collaborative efforts and effects of organization networks.

One potential advantage to networks of organizations is that they have a larger pool of information, materials, people, and other resource to draw on than does any single organization (Birnholtz & Finholt, 2008; James, 2008a; Scaffidi, Myers, & Shaw, 2008; Torrey et al., 2008). Burt (1997) and Putnam (2007; see also Borgatti & Foster, 2003; Seifert, 2007) review evidence that effective organizational networks provide social capital to individuals and groups. Nahapiet and Ghosal (1998) defined social capital as ''networks of relationships (that) constitute a valuable resource (to organizations and their members).'' Social capital promotes individual and organizational resilience in

DOI: 10.1002/job

the face of catastrophe (Cameron & Lavine, 2006; Dieleman, 2010; James, 2008a; Peterson & Zimmerman, 2004). Thus, systems and practices that support the development of social capital within and outside of an organization should, as is shown in Figure 2, be valuable to supporting both organizations and their workers in possessing the resilience and capacity to cope with catastrophic events. This suggests that:

Proposition: Relative to catastrophe, networks will be effective to the extent that they are able to provide organizations with relevant information, resources, and action inputs. And
Proposition: Relative to catastrophe, networks will be effective to the extent that they strengthen members' resilience, goals, and efficacy for coping and performing relative to catastrophe.

Network vision also seems key for effectiveness relative to catastrophe. Leaders can help to create a vision that not only applies to their own organization, but also to other organizations networked together to address issues such as terrorism prevention (James, 2008a). The goal is to inspire commitment to and confidence in the network and its plans. Peus (2011), for instance, discusses the importance of organization humanitarianism (which seems similar to what is often called organizational social responsibility) *both* for its potential positive implications for workers, organizations, and society when catastrophes happen, and as a generally under-researched category of outcome constructs for organizational science.

Proposition: An inspiring network vision for dealing with catastrophe or helping society respond will strengthen employee identity, efficacy, resiliency, and creativity relative to catastrophe.

Moreover, there is some evidence that effective links among organizations and workers' social networks can yield positive benefits for both employees and for organizational success. For instance, Seifert (2007) argued that creation and publicizing of organizational systems (such as mechanisms for sheltering or evacuating employees' families) designed to aid employees' and family sustenance in the face of disaster helps to alleviate crisis-driven stress among workers and, by doing so, improves organizational performance. Carmeli, Waldman, and Halevi's (2011) results imply to a similar conclusion, though from the opposite direction: organizational structures, norms, and procedures that *hinder* providing support to victims of catastrophe may undermine well-being and adaptability.

Yet, the Kastenmueller et al. paper in this special issue shows that the relationship of social and organizational networking by workers in responses to catastrophes may also include some potential negative implications for both worker and for organizational effectiveness. It seems possible, however, that development and implementing the type of organizational support systems for buffering employees' social networks from catastrophes that Seifert (2007) advocates might help counter the types of withdrawal from organizational networking that Kastenmueller et al. (2011) provide evidence for. Out of those ideas, I offer these research propositions:

Proposition: Organizational and social networks can—relative to organizational and individual functioning regarding catastrophe—be either congruent with each other, or in conflict with each other, depending on environmental (e.g., catastrophe-type), organizational, and individual-difference characteristics.
Proposition: (Perceived) network congruence will influence employees' identity and goal congruence, their resilience, catastrophe efficacy, and creativity.
Proposition: Network congruence will improve organizational outcomes in catastrophe by way of positive impacts on the employee-level variables just outlined.
Proposition: Catastrophes that threaten social networks (or both organizational and social networks) will be more likely to yield conflict (relative to organizational and individual functioning) than will catastrophes that threaten only organizations or organizational networks. And
Proposition: Organization (or organizational-network) systems that provide structured supports for employees' social-networks relative to catastrophe will yield greater congruence between the two types of networks than will systems that lack such structured supports.

DOI: 10.1002/job

Catastrophic events create a high degree of uncertainty. Individuals who trust each other tend to work together more effectively, and networks where trust has developed should be more successful in buffering uncertainty and eliciting collaborative efforts to address catastrophes (e.g., Birnholtz & Finholt, 2008; Cameron & Lavine, 2006; Scaffidi et al., 2008; Torrey et al., 2008). I propose, therefore, the following proposition for research:

Proposition: Organizational and network climates high in trust will promote motivation, efficacy, resilience, creativity, and collaboration relative to catastrophe.

Organizational Attributes and Processes

In the Center left of Figure 1 is a box for ''Organizational Features.'' As is noted in the figure, a number of constructs fall under that label, including such things as organizational leadership and an organization's internal resources. It also includes broad organizational *types*, though.

Different major types of organizations need to prepare and operate differently if each is to be fully effective in the face of a catastrophic event. Three major categories of organizations are public-sector, private-sector (for-profit), and non-profit (aka, NGO's). The three types of organizations typically have different missions, which lead to variations in demands during *preparation* to address disaster or terrorism, as well as different patterns of action *during* such events (Gupta & Sharma, 2006; Jackson et al., 2004; Scaffidi et al., 2008). Little systematic work has been done to this point, though, to explicate the similarities and differences among private, public, and non-profit organizations in what affects their success at planning for and responding to disaster or terrorism (Gupta & Sharma, 2006; James, 2008b). James (2008b) found that both the public- and private-sector leaders tended to view *technological upgrades* as being more valuable for preparing for and responding to catastrophe than did leaders of non-profit organizations. On the other hand, the latter tended to endorse the value of *human-system* development for catastrophe preparation and response more so than did the leaders of either private- or public-sector organizations. The available evidence did not bear on the source of such differences. A research proposition for future study, therefore follows:

Proposition: Performance-goal and resource-availability differences relative to catastrophe across organizations in the three sectors will significantly predict differences in their technical versus human-system needs and readiness for catastrophe.

Sector-differences also influence network responsibility. For instance, public-sector organizations generally take the lead on coordinating catastrophe planning, response and recovery efforts by networks of multiple organizations (Council on Foreign Relations, 2002; Gupta & Sharma, 2006; James, 2008a; Leonard & Howitt, 2007; Taras, 2006). Private-sector organizations, non-profits, and communities also substantially rely primarily on public-sector organizations for aid after a catastrophe (Jackson et al., 2004; see also Carmeli et al., 2011). According to Jackson et al. (2004), NCOTAUUS (2004) and the Department of Homeland Security (2009) public-sector organizations must especially plan for and communicate about the safety of their workers' family members. Otherwise, Jackson et al. (2004) argue, public sector organizations' workers will not remain focused on catastrophe-performance goals, and the organizations' capacity to perform effectively will be reduced (see also NCOTAUUS, 2004). Thus, the following proposition for research:

Proposition: While *all* organizations need to consider employees' families when designing systems for terrorism/disaster events, managing a response effort, and recovering from a terrorism/disaster event, that will be especially critical for the effectiveness of public-sector, the sub-set of catastrophe-focused non-profit, and the sub-set of catastrophe-product or service focused for-profit organizations.

DOI: 10.1002/job

On the other hand, with Katrina, responsible public-sector organizations failed to adequately prepare for, respond to, or facilitate inter-organizational coordination; while some for-profit organizations (e.g., the parcel-delivery company UPS) *did* effectively do so (Taras, 2006). Experiences such as those suggest that private-sector capabilities for disaster prevention and response have been underutilized (CSTCT, 2002; Flynn & Prieto, 2006; James, 2008a). Those results and findings led to the following research idea:

Proposition: For-profit organizations will aid networked organizations and/or society cope with catastrophe to the extent that they possess both excess capacity beyond that needed to secure their own personnel/operations, *and* a vision of providing aid to outside parties.

There are at least two other types of organizations that should also be considered relative to catastrophe: Those that focus substantially on catastrophe preparation, response, and recovery as a business product; and *informal* catastrophe-focused organizations. Regarding the former, physical security and cyber security companies, companies that produce anti-terrorism technologies and providers of disaster-preparation and disaster-recovery products and services all seem to be growing in number, scope, economic impact, and influence (on, for instance, public policy as well as on how organizations interact with their customers). Therefore, organizational *opportunities* (including entrepreneurial opportunity) can come from catastrophes, just as does organizational risk. The latter has, though, gotten most of the attention that organizational science has directed to catastrophes. Opportunity-finding is a key cognitive skill for creativity (James & Drown, 2008; Osche, 1990).

Proposition: Organizations/entrepreneurs will find economic opportunities in catastrophe (or potential catastrophe) to the extent that they have learning systems focused on analysis of environmental risks combined with a goal of catastrophe-related intra-/entrepreneurship.

A final type of organization (or, possibly, network) that operates in catastrophe but that is also under-examined relative to them is an *informal* organization (Fleming & Waguespark, 2007; James, 2008a; Scaffidi et al., 2008; Torrey et al., 2008). An example is an ''open innovation community,'' defined by Fleming and Waguespark (2007) as a group of individuals who voluntarily and informally work together to address outcomes from catastrophes. Torrey et al. (2008) did a case study of internet communities that appeared during hurricane Kartina. They found that *small*, internet-organized disaster-action groups tended to coalesce around one person who initiated a particular action (e.g., collecting donations for hurricane victims). They tended to develop relatively high levels of trust, participation, and cohesiveness. However, member interaction and disaster-action also tended to fade, and eventually disappeared, if the initiating individual became less active. On the other hand, *larger* internet-based disaster-action groups tended to develop out of an existing group that had a different initial focus. Such large informal groups tended to have more diffuse leadership and show a lower level of cohesiveness but, ultimately, persisted in their disaster-related actions for a longer period of time.

Proposition: Visionary, charismatic individuals tend to create and lead relatively small, highly active, but short duration informal catastrophe-focused organizations/networks. Leadership teams, on the other hand, tend to create and lead informal catastrophe-focused organizations/networks that are relatively large, low to moderate in activity, but relatively persistent over time.

Structure and systems

Balancing the need for *a priori* schemes, roles, and intentions with the flexibility to respond to fluid conditions is at the heart of much the difficulty of managing disaster planning and response (CSTCT, 2002; Gupta & Sharma, 2006; NCOTAUUS, 2004; Schneier, 2000; Shai, 2005). As Shai (2005) and Carmeli et al. (2011) discuss, organizational structure and the rigidity of organizational norms can both influence the ability of employees to effectively respond

DOI: 10.1002/job

to unexpected events (see also Birnholtz & Finholt, 2008; Hazy, 2006). Research shows that routines and long-established beliefs are not easy to shed and are, therefore, counterproductive to adaptability (Leonard & Howitt, 2007). A flat, less hierarchical structure makes flexibility of strategy and action easier, as employees are given responsibility over their tasks and empowered to make decisions on their own within a guiding framework (Birnholtz & Finholt, 2008; Seifert, 2007). Individuals from organizations with less rigid strategies and structures may also find it easier to work with members of other organizations—to, i.e., network across organizational boundaries (Birnholtz & Finholt, 2008; Kapucu, 2006).

Flexibility and creativity relative to catastrophe may be more likely in private-sector (and, perhaps, non-profit) organizations that in public-sector ones, which tend to be more bureaucratic and static in their approaches (see Carmeli et al., 2011; James, 2008a; Seifert, 2007). Systems theory (e.g., Kast & Rosenzweig, 1972), on the other hand makes the distinction between (relatively) open- (to environmental conditions) and closed systems (or organizations). Both open- and closed-system organizations exist in each sector—public, private, and non-profit. Christianson et al. (2009) similarly concluded that catastrophes can actually improve the learning of some organizations by strengthening and deepening existing and effective organization ''routines'' (strategies, techniques, systems) for gathering, integrating, and developing insight from information. This leads to the following propositions for research:

Proposition: Organizational routines (rules; norms) for *decision-making or performance* will *hinder* creative responses to catastrophe; routines for *learning* from environmental conditions and experiences will, on the other hand, *aid* creative responses to catastrophe.

Proposition: Individual and team efficacy and creativity, as well as organizational capacity, in the face of catastrophe will be generally greater as the following conditions hold: organizational (and organizational network) hierarchies are flatter; there are relatively few rules structuring workers' thinking and behavior; and technical, role, and other systems allow flexibility.

Proposition: Individuals from organizations with flat hierarchies, flexible structures, systems, and roles, and stronger network ties will have greater personal resiliency to withstand the stresses of experienced (or threatened) catastrophe and will, therefore, perform better for the organization, increasing its capacity (see Figure 2).

Note, however, that all of the preceding may also be qualified by catastrophe ''event type,'' as was outlined previously as in:

Proposition: Worker, organizational, and network creativity will have a stronger relationship to positive outcomes as catastrophes become more non-routine and extreme.

Leaders and leadership

Organizational leaders desirous of promoting collaboration to overcome problems must create a climate that encourages high employee investment with each other and the organization (Lord, Brown, & Freiberg, 1999; Nahapiet & Ghosal, 1998). A sense of identity with other (individual or organization) yields investment, and leadership substantially consists of promoting the organizational conditions that promote identification, and bridging between organizational identity and subordinates' goals (Lord et al., 1999; Kreiner & Ashforth, 2004; Riketta, 2005).

As has already been noted, various authors (e.g., Dieleman, 2010; Hazy, 2006; Shai, 2005) argue that organizations require a balance of consistency to strategy and action, and flexibility if they are to succeed in changeable environments. Leaders' vision may be a key element in achieving both organizational success in the present, and capacity to adapt to major environmental change (James & Lahti, 2011; O'Connell, Hickerson, & Pillutla, 2011; Zaccaro & Banks, 2001). Leaders need to develop and communicate an effective strategy for organizational success in current conditions while, at the same time, promoting the flexibility and creativity crucial

DOI: 10.1002/job

for adaptation to catastrophe (9/11 Public Discourse Project, 2005; Jackson et al., 2004; Kapucu, 2006; Seifert, 2007). An inspiring vision yields high motivation to set vision-related goals, and to strive to achieve them, increased creativity among workers and, ultimately, greater organizational success (James & Lahti, 2011; O'Connell et al., 2011). From those ideas, I derived the following research propositions:

Proposition: An organizational vision theme of adapting to environmental catastrophes should yield an increased sense of efficacy for problem-solving relative to catastrophe, as well as a focus on opportunity-finding. And
Proposition: Leader actions to activate or deactivate structural routines will, by way of employee creativity, increase organizational capacity to handle catastrophe and organizational success in the face of catastrophe.

In addition, Choi, Anderson, and Veillette (2011) provide evidence that rigid routines have the greatest negative effect on the creativity of employees who are by nature relatively more creative. Thus, bureaucratic rigidity may have the greatest negative impact on those employees most likely to provide creative inputs that organizations need in order to survive a catastrophe.

Proposition: Leader creative visions and actions to activate or deactivate structural routines will have the greatest effect on individuals already personally invested in (identified with) creative performance goals.

Systems theory, though, makes a distinction, relative to vision (and in other ways), between the duties and effects of executive leaders, and those of leaders at lower levels. Zaccaro and Banks (2001) indicate that executive leaders formulate and promulgate organizational visions, while lower level leaders primarily transmit and reinforce them. Supporting that idea, James and Lahti (2011) provided data indicating that executive leaders vision-related communications and behaviors have significantly greater influence on employees' internalization of and motivation by a vision than do the communications and behaviors of lower-level leaders. That leads me to the following researchable propositions:

Proposition: Top-level organizational leaders are primarly responsible for articulating and implementing a vision that incorporates both goals for ongoing, normal performance by the organization and its members, and goals for preparing for and adapting to catastrophe if the latter is to be achieved. And
Proposition: Top-level organizational leaders are primarily responsible for signaling the need for, along with taking action to, ''punctuate the equilibrium'' of normal routines (structural bureaucracy; goals for routine performance) in order to activate worker creativity toward preparing for or responding for catastrophe.

Leadership also seems critical for organizational and network learning (Bunderson & Sutcliffe, 2002; Kapucu, 2006; Woolley, 2011; Zellmer-Bruhn, 2003). Leaders, in information processing, must look for signs of developing catastrophes, of means of potentially dealing with them, and of weakness (in, e.g., skills or resources) that need to be dealt with for success during or after one. That, and the leader-behavior flexibility relative to catastrophe indicated above—in the propositions about their signaling and action roles for subordinates—means that leaders may also need have at least two sets of organizational learning strategies and goals. One set would be tied to ''normal'' environments, and one set to (potential or actual) catastrophic environments. That is not to say that the two sets of strategies/goals would not overlap—they likely would. But one set would be more strongly relevant to ''normal'' conditions, and one more relevant to catastrophic conditions. Leaders must also be capable of shifting emphasis between those two sets as circumstances indicate a shifting balance between the two types of environments. This leads to the following proposition:

Proposition: The goals of organizational leaders relative to catastrophe will influence them as performing organizational members.
Proposition: A major part of leaders' performance responsibility involving influencing the balance of learning systems between learning for effectiveness in ''normal'' conditions, and learning for effectiveness relative to catastrophe.

DOI: 10.1002/job

Proposition: Influencing leader ability to shift among goal sets and associated performance and learning outcomes will be the external influences (e.g., input from networked others), and the individual-level influences shown in Figure 2 (along with others not shown there or discussed in this paper because of space constraints) such as leader identity, leader resiliency, leader creativity.

As is shown in Figure 2, at least some leaders seem to serve as critical ''boundary spanners'' for organizational networks for catastrophe (Fleming & Waguespark, 2007; Kapucu, 2006). Top-level leaders seem to have more responsibility for managing network linkages (Gersick, 1991; Kapucu, 2006; Katz & Kahn, 1978; Leonard & Howitt, 2007). Middle managers, on the other hand, may tend to serve a particularly crucial role relative to integrating learning *within* organizations (Beck & Plowman, 2009). Beck and Plowman argue that middle managers, being exposed to information from both lower level employees, and from top leadership, serve the functions of both transferring information across (within-organization) levels (*cf*, James & Lahti, 2011), and pulling together information from multiple levels into coherent knowledge. I propose, therefore, the following hypothesis for future research:

Proposition: Top-level leaders information-processing will be more strongly related to deriving useful information about catastrophe or potential catastrophe from networks, and to communicating catastrophe-relevant insights from their own organizations to networks. Mid-level leaders in organizations information-processing will be more strongly related to both developing internal organizational knowledge relevant to catastrophe, and to communicating such insights to top-level organizational leaders.

Finally, the results of the Stein, Steinley, and Cropanzano (2011) study indicating more punitive decision-making by leaders (judges, in particular, in Stein et al.) in the aftermath of a catastrophe may illustrate that, in catastrophe, leaders may invest more in their social identity and associated social goals, values, and norms; and less in organizational identity, goals, values, and norms. For future research, I propose that:

Proposition: The balance between leaders' organizational identities, and their major social identities will significantly shape their goals, learning, dominant behavioral and decision norms, and creativity relative to catastrophe.

Catastrophe teams

More and more single organizations and networks of organizations are using groups and teams for planning, problem-solving, task-work, and leadership (Hackman, 2005; Paulus, Larey, & Dzindolet, 2001; Sundstrom, McIntyre, Halfhill, & Richards, 2000). It is not surprising, therefore, that the efforts of in-organization and inter-organizational teams seem to be critical to effective processing of catastrophe related information, to organizational effectiveness in catastrophe, and to coordination of networks and catastrophe efforts (Council on Foreign Relations, 2002; CSTCT, 2002; Defense Science Board Task Force, 2003; James, 2008a; Kapucu, 2006; Risen & Johnston, 2002; Schneier, 2000).

A body of scholarship relevant to teams and catastrophes is work on *action teams*, defined as groups made up of diverse specialists who have been trained to collaborate to cohesively adapt to shifting environmental demands (Kozlowski, Gully, Salas, & Cannon-Bowers, 1996; Sundstrom, De Meuse, & Futrell, 1990). For instance, during catastrophes, different types of emergency responders (i.e., police, firefighter, ambulance workers) form action teams in order to respond, in ways that go beyond their previous experience, to the novel and unpredictably events that are likely to occur go (Danlelsson & Ohlsson, 1999; Drown & James, 2010; Zolin & Hinds, 2004). Only limited work has been done, however, on how to design, implement, and effectively operate action teams (Danlelsson & Ohlsson, 1999).

Such evidence as exists indicates that optimal performance by action teams requires that they find an effective balance between *task-work* and *teamwork*. Task-work involves execution of individual and team operational tasks; while teamwork relates to skills involving coordinating activities, sharing information, and implementing

DOI: 10.1002/job

appropriate strategies (Caldwell & Evaerhart, 1996; Dunn, Lewandowsky, & Kirshner, 2002; Marks, Zaccaro, & Mathieu, 2000). Both quality and quantity of communication processes seem to be important determinants of action team performance; and many catastrophe-focused organizations acknowledge the need for improved communication and coordination during emergencies response (e.g., Department of Homeland Security, 2009; Jackson et al., 2004; Siegel, 2005; NCOTAUUS, 2004; Taras, 2006; Torrey et al., 2008). Moreover, Marks et al. (2000) showed that there is a stronger relationship between training in communication, and team performance in novel situations than in routine (to the team) situations.

Proposition: Communication-goal and skill training will improve the effectiveness of catastrophe action teams. And

Proposition: Organizational leadership, vision, and social-capital supports all influence catastrophe teams' ability to effectively balance team-work goals and task-work goals.

Upward communication of information also seems critical to ongoing adaptability in catastrophic conditions (Drown & James, 2010). Organization members must both have the means and be willing to communicate upward critical information and creative ideas that come out of their on-the-ground experiences. Therefore:

Proposition: Organizational norms, goals, and communication systems can either facilitate or hinder upward communications from action teams. Conditions that facilitate upward communication will enhance the effectiveness of action teams in achieving their roles in promoting organizational adaptability to catastrophe. Conditions that hinder upward communication will hinder the effectiveness of action teams.

Various authors (summarized by Nahapiet & Ghosal, 1998) have found that the extent to which a team perceives itself as capable to perform a task (collective-efficacy) is the best predictor for performance when dealing with an unfamiliar task. Other research (summarized by James (2008a) and Nahapiet & Ghosal (1998)) has also indicated that the extent to which team perceive themselves as capable of performing unfamiliar task (have, i.e., good collective-efficacy for creative tasks) is the best predictor for team performance. See James (2008a) for an application of creative efficacy to organizational networks and anti-terrorism planning.

Proposition: Team efficacy for catastrophe-related learning and performance will be significantly related to the success of a team at accomplishing those tasks.

Organizational technical systems

In Figure 2, technology is shown as overlapping the boundary of an organization and its network. Technological systems can provide substantial aid to organizations in preparing for (e.g., gathering intelligence; coordinating planning; protecting resources) and acting during (e.g., communicating needs and commands) disaster or terrorism events (CSTCT, 2002; James, 2008a; Rogalski & Samurcay, 1993); but can also create problems during each phase (9/11 Public Discourse Project, 2005; Jackson et al., 2004; Kapucu & Van Wart, 2006; NCOTAUUS, 2004; Schneier, 2000).

It seems that organizations sometimes rely too heavily on technology as a means of preventing disasters or terrorism, or for buffering against their potential effects. For instance, Bruce Schneier, a computer software and network security expert argued in 1996 (Schneier, 1996), that cyberencryption advances would eventually solve hacking and other information-technology system security issues. By 2000, however, Schneier (2000) acknowledged that purely technological solutions to IT system security would never succeed in guarding against most major realistic threats. From this comes the following research proposition:

DOI: 10.1002/job

Proposition: Organizational networks or organizations that focus primarily on technical approaches to catastrophe will be less effective in dealing with them than will those that focus primarily on human-system or interactive human-technical approaches.

Technical systems structured for ''normal'' conditions can be inadequate to information volumes or types of performance demands present during catastrophes (Dalhber, 2001; Jackson et al., 2004; NCOTAUUS, 2004). So, we need study of how to design and implement organizational technical systems such that they will be functional for both ''normal'' operations, and for the demands created by catastrophic conditions.

Proposition: Organizational and network processes (e.g., leadership; rewards) need to incorporate mechanisms for ''punctuating the equilibrium'' of ''normal'' technical systems/processes and unit boundaries to produce adaptability to circumstances that demand sudden change.

Interactions of human and technological systems

Effectively coordinating interaction of the human and technology systems of organizations seems to be a key to preparing for and responding to catastrophes. Two National Academies of Science committees (the Committee on Prospering in the Global Economy of the 21st Century—CPGE—2005; the Committee on Workforce Needs in Information Technology—CWNIT—2000), the U.S. Department of Commerce's Office of Technology Policy (Office of Technology Policy, 1999) and Schneier (2000) have all recently targeted the intersection of human systems and information systems as a critical area generally (i.e., across topics, not just relative to disaster-terrorism) requiring new research (see also Wolley's commentary on Kastenmueller et al., 2011).

Levy (2007) and Garnett and Kouzmin (2007) argue that technical systems and organizational cultures modify and moderate each other such that information processing and knowledge management become a subjective product of their interaction (see also Bunderson & Sutcliffe, 2002; Vaughan, 1996). Birnholtz and Finholt (2008), Caldwell and Evaerhart (1996), Fleming and Waguespark (2007), Hazy (2006), Leonard and Howitt (2007), and Torrey et al. (2008) make the case for the interaction of organizational leadership and technical systems as influences on organizational performance in catastrophic situations. Vaughan (1996) documents how the organizational cultural influences that shaped decision making in the Space Shuttle program prior to the Challenger disaster came from an interaction of professional (engineering, in particular) culture, experience over time with technology, and evolving socio-cultural thinking and interaction norms.

Proposition: Network, organizational and professional cultures shape processing of information about and from technologies, as well as plans for use of technology to address catastrophe.

James (2006), Shirley (1998), CSTCT (2002), Gupta and Sharma (2006) and NCOTAUUS (2004) make the case that organizational and network politics also crossing with technical systems to shape outcomes.

Proposition: Politics among individuals, units, or organizations will hinder capacity to address catastrophe to the extent that they promote conflict and reduce cooperation.

Finally, CSTCT (2002), James (2008a), James and Drown (2008), and Seifert (2007) also make the case for technical systems influencing organization members' creativity, as well as members' creativity affecting the effectiveness of technical systems. This leads to the following research proposition:

Proposition: Existing technologies will tend to channel (individual and collective) creativity regarding catastrophe but; higher levels of creative use of technology will improve individual, team, organizational, and network effectiveness relative to catastrophe.

DOI: 10.1002/job

Individual Differences

At the bottom left of Figure 1 is a box for individual differences. As stated and implied in earlier sections of this paper, it important—relative to catastrophe as to every organizational event and task—to identify individual (and team) knowledge, skills, characteristic, and experience demands of positions and to make sure that incumbents possess them. This is the topic of individual differences.

Kastenmueller et al.'s (2011) study indicates that individual differences in reactions to terrorism (threats, in this particular case) impact on both individual (e.g., coping with stress) and organizational (e.g., recruitment of resources from out-of-organization individuals and groups) outcomes. That led to the following proposition:

> *Proposition*: Existing individual differences in personal resilience (including social capital) will partially predict whether individual workers respond to catastrophe (real and potential) with negative emotions (e.g., stress) and behaviors (e.g., withdrawal into familial networks) or with positive emotion (e.g., positive feelings about task goals) and behavior (e.g., increased job effort).

Other examinations of dispositional (cognitive, emotional, personality) influences on reactions and performance relative to catastrophe would be valuable. It may even be the case that some types of workers would find the prospect of catastrophe exciting and inspiring—rather than stressful and difficult—i.e., evocative of opportunities to help their organizations (and the general public) respond to disaster or terrorism. Some individuals, fatigued and jaded by the day-to-day everyday of work, are likely to find it pulse-quickening and soul-lifting to wrestle with crisis and do things that clearly immediately impact people. I propose, therefore, the following:

> *Proposition*: Existing individual differences in the Big-5 personality characteristic of Openness to Experience will partially predict whether individual workers respond to catastrophe (real and potential) with negative emotions (e.g., stress) and behaviors (e.g., withdrawal into familial networks) or with positive emotion (e.g., positive feelings about task goals) and behavior (e.g., increased job effort).

Network characteristics and network position also influence individuals' beliefs about supports they can expect, as well as their beliefs about what is expected of, and possible for, them (Ho, Rousseau, & Levesque, 2006; Kilduff & Tsai, 2003). That is represented in Figure 2 by the positioning of individuals between organizational and non-organizational networks. Network-analysis research to examine the following proposition is needed, therefore:

> *Proposition*: Differences across individuals in network positioning will shape their cognitions about catastrophe (or potential catastrophe), their sense of identity, their felt efficacy for tasks, and their creativity. By way of those influences, individual differences in network position will shape contributions to organizational capacity and the ability of organizations (and networks) to address catastrophe.

Conclusions

I have argued that organizational scientists with interests in every topic in the discipline, and with all levels of focus, need to attend more to organizations and disaster/terrorism. In doing so, I attempted to support the importance of that issue to organizations of all sorts, as well as to document that many important aspects of it are either under- or un-researched. By reviewing key categories of constructs that seem relevant to the topic and incorporating them into tentative theoretical frameworks, I tried to both make the case for the importance of theory development, and initiate it.

DOI: 10.1002/job

It seems to me, too, that by studying how organizations can prepare for and attempt to cope with disaster or terrorism, and integrating knowledge about it into theory, we could potentially gain valuable insights into a number of aspects of organizational, individual, and societal processes and outcomes in more ''mundane'' circumstances. Extending that even further, we need to not lose sight of the fact that disaster and terrorism, while destructive and dangerous, also bring some opportunities. I referred briefly in the section on Types of Organizations to entrepreneurship focused on products or services to prevent, plan for, or respond to disaster and terrorism. Scholars of entrepreneurship and new product development by existing businesses should study influences on success at tapping the market niches created by disaster/terrorism concerns and actualities. Moreover, transforming an organization or a network to develop resiliency from disaster/terrorism could also be integrated with or provide leverage for transforming organizations in other ways. For instance, employee and family support systems designed to meet the drastic conditions of a catastrophe might also be useful for supporting employees and their families in less drastic circumstances. Similarly, leadership strategies designed to promote organizational adaptability in the face of disaster or terrorism might also promote adaptability and innovation toward general economic success by a company.

Before ending, however, I do want to point out the potential dark side of the emphases I have argued for throughout this paper. For science, there is always the danger that any topic or current societal concern can be used as simply a symbolic hook on which to hang any pet theory or construct. Relative to organizational *applications* of the priorities, ideas, strategies, and techniques argued for in this paper, a risk exists similar to that just outlined for research: disaster and terrorism threats and demands can potentially be use as a shield for many types of bureaucratic authoritarianism or individual or collective hidden agendas.

It is early days for our knowledge of organizations and disaster/terrorism. That means that there is much work for organizational scientists to do on this topic. It is a broad but exciting test for our discipline. The model and discussion here are offered as platforms from which we might begin to meet that challenge.

Author biography

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