Creativity in Emergency Response to the World Trade Center Disaster

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Introduction

Creativity is an important element of successful disaster response. While advance planning and preparedness serve as the backbone of disaster response efforts, creativity enhances the ability to adapt to the demands imposed upon individuals and organizations during crises and bolsters capacities to improvise in new physical and social environments. The focus of this paper is on creativity not merely as a talent or characteristic, but as a process undertaken by the organizations and emerging collectives that respond to new or changing situations. Disaster researchers and practitioners need to think about creativity much more explicitly, not just as something that "is needed" or "that happens." An enormous body of academic and popular literature focuses on creativity in business settings, where it is expected that managers will need to meet changing competitive or economic environments. Borrowing from the literature on entrepreneurial creativity, we apply Amabile's (1997) framework for categorizing creativity in private sector firms to the activities of responders to the September 11, 2001, disaster at the World Trade Center. We first introduce Amabile's framework and briefly discuss other relevant perspectives on creativity. We choose Amabile's conceptualization of entrepreneurial creativity because the dimensions of creativity that she identifies are analogous to the broad classes of creative

activities that we observed, and that, though treated differently, have been relevant to other researchers (e.g., Ross, 1978; Forrest, 1978). In particular, we focus on the development of new emergency response activities or systems; new kinds of products; new or unusual sources of supplies and expertise; and new constituencies for disaster-related services.

At the same time, Amabile's definition of creativity is expansive enough to include solutions that are novel to *those involved*: the solution doesn't have to be one that has never been seen before. Similarly, Ross (1978, p. 216) also considered innovations that were "new to the organizations in question." Creativity within the context of their experience is what is important when looking at how people respond to new events, not whether they have the fortunate inspiration to create something that never existed anywhere.

We relate creativity to such well-recognized features of disaster response as emergence and improvisation. Emergence, as presented in the disaster literature, is fundamentally a creative sequence of actions (see Forrest, 1978; Stallings and Quarantelli, 1985). It is the development of new relationships, new processes, or new ways of getting materials, often while simultaneously locating new constituencies. Emergent groups are creative organizations: they form to be creative. Yet thus far disaster research has not looked at them as such, and this has slowed making connections to other bodies of literature that address creativity more directly. Improvisation certainly requires creativity, understood as the skill, quality, or capacity for generating new ideas. Entrepreneurial creativity, as understood by Amabile and adapted by us, and improvisation as used in the disaster literature (Kreps and Bosworth, 1993; Kreps et al., 1994; Webb, 1998; Mendonca, 2001), are interactive, and may exist as subroutines of each other in different spheres of activity. Multiple improvisations may yield something entirely new, even if that was not the explicit goal at the outset, which may require smaller-scale improvisations in the process of implementing a novel solution.

After a discussion of some of the contradictions of creativity, we describe a number of instances of creative action by both established and emergent organizations. We also identify certain challenges created by the exercise of creativity and suggest preliminary strategies that might be useful in mitigating them. We conclude by suggesting that there are important differences between organizations usually studied in the research on creativity and those that are typically involved in disasters.

Creativity

The literature on creativity is vast, spread among the arts, psychology, business and management, and philosophy. In a summary, Clemen (1996, p. 188) describes creativity as

> . . . new alternatives with elements that achieve fundamental objectives in
> ways previously unseen. Thus, a creative alternative has both elements of
> novelty and effectiveness, where effectiveness is thought of in terms of
> satisfying objectives of a decision maker, a group of individuals, or even the
> diverse objectives held by different stakeholders in a negotiation.

He observes that "[a]ll definitions include some aspect of novelty. But there is
also an element of effectiveness that must be met" (1996, p. 188). In looking
at **entrepreneurial creativity**, Amabile (1997, p. 18) defines creativity "as
the production of novel and appropriate solutions to open-ended problems in
any domain of human activity; we have defined innovation as the
implementation of those novel, appropriate ideas." In other words, this
conception of creativity involves both success as well as newness: it is both
positive and adaptive.

Amabile (1997, p. 20) further specifies four dimensions of entrepreneurial
creativity: "(a) the products or services themselves, (b) identifying a market
for the products or services, (c) ways of producing or delivering the products
or services, or (d) ways of obtaining resources to produce or deliver the
products or services." These dimensions, though derived with respect to
business enterprises, provide a useful way of conceptualizing the kinds of
creativity that responders often exhibit in disaster situations. In addition, they
allow us to make connections with other well-developed literatures on
creativity that will both enrich our understanding of creativity in disasters and,
through further research, help us to use disaster experiences to advance
understanding of creativity more generally.

Similarly, Woodman et al. (1993, p. 293) have defined **organizational
creativity** as "the creation of a valuable, useful new product, service, idea,
procedure, or process by individuals working together in a complex social
system," which they further characterize as a common understanding of
creativity "placed within an organizational context." Amabile (1997, p. 20) is
also careful to distinguish between what is and what is not entrepreneurial
creativity:

> It is not limited to the establishment of new businesses, because it can be
> found when new enterprises are established within existing businesses.
> Moreover, it is not necessarily present in the creation of any new business;
> some significant degree of novelty must be involved, at some stage of the
> process. . . . Entrepreneurial creativity is not present in many of the
> incremental product or service improvements within established systems or
> paradigms, unless some significant novelty is required. . . . Moreover, even
> when a truly novel product or service idea is present, or when there is a
> novel insight about a market opportunity, entrepreneurial creativity does not
> exist unless the ideas are implemented in the creation of a new business or
> enterprise.

An important difference between the disaster and the business environment is, of course, the overall urgency of the creative decisions to be made; nevertheless, the types of creativity are analogous. Some or all of them are apparent in various instances of creative action that occurred in New York City. Comfort (1999, p. 29) argues that creativity is also strongly related to the capacity for "sensemaking" that Weick (1993) describes: the ability to comprehend aspects of the environment and to make decisions. She draws on Luhmann's (1989) conception of "autopoiesis," noting that it is "a powerful, driving force for creative self-expression . . . in individuals that, if extended to social groups and organizations through articulated communications processes, serves as a vital source of creativity, renewal, and regeneration in social systems undergoing change." Comfort (1999, p. 59) observes that "[a]utopoiesis necessarily involves interaction with the environment."

Woodman et al. (1993, p. 294) draw upon Woodman and Schoenfeldt's (1989, 1990) interactionist model of "creativity [as] the complex product of a person's behavior in a given situation." They further argue (1993, p. 296) that "group creativity is a function of individual creative behavior 'inputs.'" Creativity thus is a kind of human-environment interaction, by which we mean part of an evolving ecology of local demands, existing resources, individual skills, and organizational dynamics. What emerges from these different research approaches is a view of collective creative action rooted in gathering environmental information, considering the implications of that information with respect to ambient challenges, and then generating, identifying, and selecting actions that are anticipated to meet those challenges.

Creativity and Emergence

These concepts of creativity correspond with those of emergence. In his analysis of emergent groups, Forrest (1978, p.110), relied upon similar concepts of environmental interaction: "[S]ocial systems interpret cues from the environment so that necessary adaptations or corrections can be made to achieve systematic objectives." Much of the adaptive response that occurred in New York took place through processes of emergence, a phenomenon that is well established in the literature on disasters. Emergence is, at its heart, the development of processes that did not exist before. Entrepreneurial creativity is the foundation of emergence, as an example drawn from that literature demonstrates. Forrest (1972, pp. 30–33) described the evolution of a group of volunteers who assisted in registering evacuees and providing support services to firefighters during a 1970 southern California fire. Civil authorities were burdened by proliferating demands and, unable to cope with the challenges of evacuee processing, "turned to the local community for assistance." An officer of a women's club and her husband volunteered to help. They soon organized a system for tracking donations, offers of

assistance, and assigning tasks to incoming volunteers. A friend was recruited to divide supervisory responsibilities and to help manage the storage and disbursement of supplies, the establishment of a medical treatment area, and other relevant tasks. When firefighters needing rest began to arrive, the nature of the operations shifted to meet those needs: furnishing cots and providing personal-care products, food, and laundry service:

> Five basic activities crystallized: general support and assistance, providing food and clean clothing for firefighters; a medical department staffed by two nurses who administered first aid; a stockroom to receive, record and dispense all material resources; a food and coffee relay system, which operated between CDHQ and the firefighters; and lastly, a communications department which received, sent and recorded all incoming and outgoing telephone calls.
>
> (Forrest, 1972, pp. 32–33)

As this example shows, emergence is a significant coping response in times of crisis, augmenting the capacity of established organizations to meet shifting demands. Emergence is also rooted in various kinds of creativity. In this paradigmatic example, none of the participants was really engaged in any particularly new activity. If one considers their tasks solely as segmented entities, making lists, answering phones, unloading a truck, and stacking boxes are, in fact, everyday tasks, familiar to everyone. But they were organized into a **production process** that had not existed before, either in that place or for that group, and that involved new kinds of relationships.

Creativity and Improvisation

A disaster is an event that is defined, in large part, by the improvisational aspects of the response (Tierney, 2002). Since disasters disrupt the patterns of what can be governed or absorbed by routine procedures, an event that does not demand the exercise of improvisation does not, by definition, constitute a disaster. Indeed, Kreps and Bosworth (1993) argue that the pioneers of disaster research intended that the field would place a theoretically based focus on organizational stability and change in the crisis context. This research is well represented by a large body of literature examining emergent groups (Stallings and Quarantelli, 1985); organizations that form new or altered organizational structures and perform non-routine tasks in a disaster (Dynes, 1970); organizational adaptation in disaster (Stallings, 1970); improvisation in organizational domains, human and material resources, tasks, and activities (Kreps et al., 1994); role improvisation (Webb, 1998); and enhancing improvisation through decision support tools (Mendonca et al., 2001).

We distinguish between our uses of creativity and improvisation in two ways. First, within the literature on disasters and emergency response, improvisation refers to unplanned-for activities that take place after a crisis. In contrast, creativity, including in the specialized entrepreneurial sense, is important across the entire spectrum of emergency work, from planning, implementing, and responding, to post-event learning. Second, there is a more theoretically significant distinction to be made between creativity and improvisation. Improvisation refers to the aligning of individual organizational components which, acting separately, nevertheless maintain a mutually shared vision of desirable outcomes. For example, Weick, Mendonca, and others use jazz as a context in which to examine the organizational aspects of improvisation. Weick's introductory essay in the 1998 special issue of *Organization Science*, which focused on jazz improvisation, draws on a number of perspectives on improvisation, in particular those that liken it to conversation (Weick, 1998, p. 548). Weick also argues:

> Considered as a noun, an improvisation is a transformation of some original model. Considered as a verb, improvisation is composing in real time that begins with embellishments of a simple model, but increasingly feeds on these embellishments themselves to move farther from the original melody and closer to a new composition. Whether treated as a noun or a verb, improvisation is guided activity whose guidance comes from elapsed patterns discovered retrospectively.

(Weick, 1998, pp. 546–547)

At the same time, creativity is an aspect of improvisation. The catastrophic collapse of the World Trade Center after the September 11th terrorist attacks and the magnitude of the impact on New York City necessitated a wide range of improvised activities (Wachtendorf and Kendra, 2002) which themselves were, in turn, creative processes in the entrepreneurial sense elaborated by Amabile (1997). Hundreds of thousands of people were evacuated by boat from lower Manhattan; telephone communication was, in large part, temporarily disabled in parts of the city due to the destruction of telephone lines and cellular phone towers; the city's Emergency Operations Center (EOC) at 7 World Trade Center was evacuated and eventually collapsed, necessitating the establishment of interim and then semi-permanent EOC facilities; and the damage to the World Trade Center area necessitated complex site management, security, safety, and clean-up processes (while response and recovery activities overlapped) in ways that had not previously been implemented by any of the organizations involved. Organizations and individuals improvised, some more successfully than others, to meet the demands generated by these and other emerging challenges, often with very new and innovative results.

Planning and creativity work in concert to produce effective improvisation. The new social arrangements that emerge after a disaster and in response to an evolving crisis situation cannot be divorced from previously existing arrangements (Kreps and Bosworth, 1993). Prior preparedness increases the ability to improvise (Kreps, 1991). This planning forms the basis for decision making in emergent environments, and informs decisions by anticipating possible challenges or pitfalls that could come as a consequence of improvised activities. Planning often provides some element of stability—whether of organizational structure, role, task responsibility, resources, or the physical environment—when other elements are in flux or demand unplanned-for action. At the same time, the very need for improvised action points to the inability of plans to take adequately into account one or more specific demands—sometimes quite understandably so, since it is not practical or feasible to fully plan for every possible scenario. Existing social arrangements are always subject to change (Kreps and Bosworth, 1993), particularly when coupled with the ambiguity and confusion that often accompanies large-scale disasters (Webb et al., 1999). For these reasons, creativity emerges as an instrumental contributor to successful improvisation.

The Contradiction of Creativity

Along with researchers, emergency management practitioners appreciate the creative aspects of their work. Creativity is a trait or characteristic often strongly associated with emergency managers and is often cited as a prime job-related skill, as the following passages indicate:

> The Texas Emergency Manager (TEM$^©$) certification is an indicator of experience, hard work, continuing education, dedication to integrity, and creativity.
>
> (Emergency Management Association of Texas, 2002)

> "A disaster is any event that overwhelms your ability to respond," [Judi Van Swieten] says. "You have to be prepared for the worst and work from there, often changing the plan as you progress. Flexibility, adaptability and creativity—those words guide my career."
>
> (Thomson, 2002)

One publication by The International Emergency Technical Rescue Institute notes that

> [t]he future belongs to those who can recognize the needs of an emergency situation and respond with speed, accuracy, creativity, innovation and calm leadership.
>
> (*USARAA News*, 1999, p. 1)

Creativity is an important quality for disaster managers even outside the environment of a disaster: it is important during hazard identification, plan development, and communication and outreach to the public, processes that often have strong entrepreneurial aspects as well. A disaster plan may have to be developed and "sold" to elected officials or corporate officers, for example. Yet even though creativity and flexibility are regarded as important qualities of emergency managers, and people involved closely with emergency response recognize that emergencies demand these qualities, exercising creativity during a response is, paradoxically, often regarded as dysfunctional for emergency personnel. It appears as an indication of failure to plan properly ahead of time. This is because emergency management plans, apart from their function as guides to action, serve rhetorical or political purposes (Clarke, 1999). Clarke argues that they are meant to attest to the competence of emergency planners to foresee events. Moreover, plans fulfill the symbolic function of converting the uncertainty that surrounds hazards or accidents into the kind of certainty that can then be managed. Sometimes the planning process can be stretched beyond credulity; at that point plans become "fantasy documents" (Clarke, 1999) that accept as possible that which is improbable. In other words, planning is such an important activity that plans must be written for situations in which the event will almost certainly differ from what is anticipated, and the anticipated response will be based on preconditions that are likely to be radically altered.

Given the emphasis on plans, even those that are impossible to execute, it is not surprising that departing from them can seem to be evidence of a failure. Disasters, however, break the rules that guide the ordinary conduct of business and government, at least for a period of time. Disasters create new environments that must be explored, assessed, and comprehended. They change the physical and social landscape, and therefore disasters require a period of exploration, learning, and the development of new approaches.

Method

The findings presented in this paper are based on qualitative, inductive analyses of data gathered during exploratory fieldwork commencing within two days after the terrorist attack on the World Trade Center and continuing for two months thereafter. Researchers from the Disaster Research Center conducted over 750 collective hours of systematic field observations. In particular, we closely observed key planning meetings at highly secured facilities, including New York City's EOC, incident command posts, and the federal Disaster Field Office. We also spent extensive periods observing operations at volunteer, supply, and food staging areas, the "Ground Zero" area, family assistance centers that were established for victims' families, and respite centers that were established for rescue workers. Additionally, we

observed activities at major security checkpoints in lower Manhattan and at locations central to the emergency response. In the course of our fieldwork, we generated a large volume of notes providing a rich description of observations and experiences, took over 500 photographs, and sketched and collected floor plans of various facilities to track the spatial and organizational changes over time.

In addition to direct observation in New York City, we collected a wide array of documents produced by local, state, and federal agencies as well as by individuals and organizations with less formal ties to response efforts. These documents included but were not limited to internal and public reports, requests for information or resources, informational handouts, internal memos, schedules, meeting minutes and agendas, maps, and internal directives.

To supplement observational and documentary data sources, the Disaster Research Center also compiled an extensive electronic database of articles and web-based information. Newspaper articles from major New York City papers were collected for six months after the attack. Articles from major periodicals, selected articles from newspapers from around the world, and information from the many government, charity, community-based, individual, and private internet sites that emerged after the disaster event were included in this database. The diverse subject matter was later coded according to relevance to the response and early recovery as well as to primary emergency response functions. The functional categories that formed the basis of the coding scheme were informed by the literature on disasters and based in large part on the activities observed during the fieldwork component of the research. The use of multiple methods and data sources—direct observation, informal interviews, reports and other documents produced internally by New York City responding agencies, documents produced by victims of the disaster and informal supporters of the official response, newspaper accounts, and internet-based data—allowed us to triangulate the data, comparing the information collected from one source with other sources as a means to check for accuracy and validity of the data (Denzin, 1998).

The discussions below are based on direct observation, informal discussion with participants and, where noted, secondary sources. They illustrate that response activities involved combinations of the dimensions of creativity identified by Amabile. We analyze (a) new products or services that responding agencies provided or used; (b) situations in which responders identified a particular constituency for products or services; (c) creativity in producing or delivering response-oriented products or services; and (d) the acquisition of resources for the disaster response. We emphasize that, in our use of this entrepreneurial model, we are not suggesting that responders were acting like business entrepreneurs. Rather, we use the model in a more strict analytical sense because of its usefulness in conceptualizing the different

manifestations of creativity and in characterizing an operational environment in which new ideas, strategies, and methods came to fruition under extreme conditions.

Creativity in New York City after the Attacks

Mapping and GIS

The emergency response in New York City after the attacks was created on virtually a daily basis as needs were identified, solutions considered, and actions implemented. In other work (Kendra and Wachtendorf, 2003) we describe how the New York City EOC was reconstituted after the destruction of its very advanced facility at 7 World Trade Center. After moving to a succession of intermediate facilities and making use of a mobile communications van, the Office of Emergency Management (OEM) finally moved to Pier 92, a cruise-ship pier that had been scheduled to be used for a bioterrorism exercise on September 12. OEM re-constructed the EOC within this space, bringing in or facilitating the delivery of computers, fax machines, printers, desks, chairs, and even carpet. Emergency managers, in many respects, faced a new operational environment consisting of many more agencies than previously dealt with and in a cityscape that was fundamentally altered, both by the destruction itself and by road closures, detours, and facilities that were put to new, unusual uses. A hotel and a university student center became respite areas for rescue workers, for example. Stated most generally, emergency managers had to explore and reclaim an altered environment. They had to develop a new "map" of a response that had not been previously envisioned and identify the important locations for staging and coordinating response activities, which themselves were changeable as the response evolved.

The term "mapping" can be used in a literal and not merely metaphorical sense for these activities. One noteworthy example of creativity was the development of a geographic information system (GIS) and map-distribution function, amounting virtually to a cartography factory. Ground Zero, itself a new term for a transformed area, was an entirely altered landscape, difficult even for New York residents to orient themselves with respect to the familiar features of the area. Command posts, respite centers, warehouses, and washdown stations were among the needed facilities for which space had to be found, locations mapped, and maps made available to responders. Apart from the reconstitution of the EOC as a whole, development of the mapping capability within the EOC shows creativity (see *ArcNews*, 2002 for an extensive narrative. See Thomas et al., 2002 for a discussion of use of GIS and other technologies) that exemplified all of Amabile's (1997) creative dimensions involving product and process. The original EOC at 7 World Trade Center had GIS equipment, but the scope of the operation at Pier 92

was much larger, providing a variety of map products for different users. Furthermore, a number of personnel from different organizations worked there: students and professors from local colleges; information technology and other specialists from New York City; and representatives from ESRI (the ArcInfo vendor) among others.

This operation evolved in sophistication over time, so that eventually there was even a customer service desk, at which a responder could place a request for a map and pick it up later. This activity and the burgeoning organization that supported it were not pre-planned; rather, they emerged in answer to developing needs. This capability involved not only bringing in people and hardware and software from a variety of sources, but also a process of learning, by spatial analysts and emergency managers, what spatial information was required for the response and what was possible to produce given the available information.

Forrest (1978, pp. 120–122) observed that "viable" groups must secure their legitimacy with respect to other groups, such as by advertising their existence in some way, and that they must further successfully process resources, information, and "demands" (requests for action). Interacting with the environment requires the establishment of a "boundary position" or "position of entry." Our observations of the GIS function are certainly congruent with Forrest's observation: some genuine marketing was involved—a process of reaching out to new users of spatial information—as GIS specialists displayed their products and kept potential map users informed about what might be available. The customer service desk/person was a boundary-spanning position, both organizationally and spatially: the desk was located at the entrance to the GIS area. At the same time, demonstrating the importance of entrepreneurial creativity to the formation of emergent groups, this function was supplemented by a deliberate creative undertaking: the map requests became so numerous that a tracking system was required.

> ESRI staff in Redlands worked with the New York City team to develop an online map request system that entered map requests into a database and provided a prioritized queue to the mapping staff. "We trained folks on how to use it and then wrote up a quick user manual," says [Mike] Tait. "It made it much easier to track the status of a map request with all the specifics, including contact information, right there."
>
> (*ArcNews*, 2002, p. 6)

The activities related to mapping and spatial analysis illustrate all four types of entrepreneurial creativity suggested by Amabile (1997). New products were produced in the form of maps and the online request-tracking system. The overall organization and the customer service system constituted new

processes (in turn supported by the online tracking system). New resources were seen in the GIS and remote sensing expertise brought in from public and private sources. Finally, complex and overlapping markets emerged, consisting of the various participants in the response who requested and supplied maps and other spatially referenced information. GIS specialists created new relationships to supplement those that already existed, and they used technologies in ways that had not been envisioned before September 11th (Tierney, 2002).

Waterborne Evacuation

The waterborne evacuation of lower Manhattan immediately after the attack provides an example of creativity along two dimensions identified by Amabile (1997): "ways of producing or delivering the products or services," and "ways of obtaining resources." Here the service is the evacuation itself, and the resources are the people and materials that contributed to it. It is also an example of emergence, in which responders departed from their normal and even their disaster-related roles and in which many responders took part on an unplanned basis. An evacuation of that magnitude was not planned; one Coast Guard officer referred to it as an "ad hoc" event, while another described it as an extension of the agency's existing catastrophic search and rescue plan (which had been designed for the thousands of people who might be, for example, involved in a ferry accident). The Coast Guard is now working to "memorialize" the procedures that emerged on September 11th, which demonstrated the importance of multiple, sequential improvisations to overall entrepreneurial creativity. Available vessels arrived to assist and were assigned by Coast Guard officers working aboard the Sandy Hook Pilots' pilot boat and then aboard a cutter (Sherwood and Schoenlank, 2001). According to Coast Guard officials, approximately 500,000 people left Manhattan by boat, whether by tour boat, military vessel, passenger ferry, or private craft. In another instance of people using existing skills and capabilities to perform new tasks the pilot boat *New York* fueled fire trucks and other vehicles (Sherwood and Schoenlank, 2001), which, for the firefighters, was a new way of acquiring resources. Refueling a truck was a new service provided by the pilots, with the firefighters constituting a new market for it. The waterborne operation was a creative exercise in which people rose to the occasion with all sorts of vessels, and it is also an instance, especially initially, of the kind of self-organization that is important in complex adaptive systems (Comfort, 1999). As one account noted:

> "We moved about 30,000 people on our six boats," says Peter Cavrell, senior vice president of sales and marketing for Circle Line. "It wasn't any kind of coordinated effort. We just started doing it." Continues Cavrell, "In its own

small way, Circle Line is a symbol of New York. We just wanted to do our part."

(Snyder, 2001)

Not every instance of creativity in New York City involved creating a new product or item; for example, some of the creativity involved "the means for creating or delivering the product—the identification of new market opportunities, or the organization and the systems that are established for bringing the product to market" (Amabile, 1997, p. 18). Although the Coast Guard and other vessels respond from time to time to smaller-scale emergencies, there had never been an evacuation of Manhattan by water; creativity was key to how they developed this response. In addition to developing new "products" or new systems, creativity can take the form of altered procedures, i.e., doing or not doing something that would be done ordinarily. With respect to the seagoing evacuation of Manhattan, Coast Guard inspectors at the point of embarkation were authorized to use their discretion to permit vessels to exceed their certificated passenger capacities. The Coast Guard example is just one of many where process was adjusted with respect to ambient conditions and authority devolved to personnel closer to the scene for greater flexibility. Working closely with Department of Health officials, New York State Department of Environmental Protection officers also relaxed the issuance of citations to truckers hauling debris from Ground Zero without tarpaulins, recognizing that it was impossible, because of the risk of fire, for them to comply with the regulations requiring that their cargoes be covered.

In their discussion of high reliability organizations, Weick et al. (1999, p. 103) noted that "[w]hat is distinctive about HROs is that they loosen the designation of who is the important decision maker in order to allow decision making to migrate along with the problem." It wasn't, however, merely the loosening of regulations that was significant in the waterborne evacuation; it was the capability of the inspectors to apply their experience and judgment. Weick et al. also stress the importance of circumventing hierarchy when greater expertise is located at lower levels. Their focus is on detection of error in complex, high-intensity operational environments: aircraft carriers or air-traffic control, for example. In Manhattan on September 11th, the challenge was avoiding two kinds of error: overloading boats, or not permitting as many people to evacuate as might be able to. In this instance the force of the Coast Guard hierarchy was crystallized in the Certificate of Inspection, which regulates the number of passengers and crew a vessel can carry. The simple act of empowering inspectors to act at their discretion placed expertise in deciding how many people was a safe number where and when it was needed.

Credentialing

Procedures that developed around security and credentialing constitute an additional instance of "creative ways of obtaining resources to produce or deliver products or services." Not only was the September 11th incident a high-impact disaster that produced numerous casualties, it was also a complex emergency with added ambiguous dimensions such as the ongoing terrorist threat, the criminal investigation, an ongoing process of remains recovery and identification that persisted more than six months after the attack, and a very dangerous collapse site situated within close range of an extremely densely populated urban area. Early in the response, it became clear that controlling access to various affected sites would prove a significant challenge. In addition, the standard OEM visitor badges had been lost in the destruction of the original EOC and, even if available, these badges would have been entirely inadequate for the hundreds of people who passed through the reconstituted EOC on a daily basis or who required access to other secured zones and facilities throughout the area.

One of the ways this complex emergency was dealt with was through the development of a credential system. This system, in the form it took after September 11th, was not a previously existing process. While based on other credentialing procedures, it evolved over the course of the response. Initially, government-issued identification sufficed for entry into the EOC. Beginning on September 15, and continuing over a few weeks, OEM developed a series of badges and progressed through several phases. At first, OEM used a relatively simplistic credentialing system where anyone given "clearance" received a blue and yellow badge featuring the OEM insignia. This computer-printed badge was essentially a piece of paper placed in a name-tag holder, could be easily duplicated, and had no identifying information. Eventually, OEM issued plastic badges with a white background and the label "WTC 2001." These badges displayed a digital color image of the individual, the person's title and organizational affiliation, and a variety of codes indicating particular areas to which the person could have access. At the same time the more sophisticated WTC 2001 badges were developed and distributed, temporary badges were developed for contractors and volunteers who needed short-term access to specific areas. These badges also evolved over time. The process involved in obtaining badges was at times very time-consuming for some individuals. Although it was important for the city to restrict the number of people with access, the city also had a real and legitimate need to move along with critical assessment and recovery tasks, including the inspection and repair of surrounding buildings. Some of the contracted workers used in these aspects of the response employed creativity to obtain resources—in this case, the resource was access badges—in order to deliver their response services and meet their responsibilities in an expedited fashion.

Due to safety and security considerations, supervisors of construction workers were only allowed a certain number of contractor badges. At the same time, demands were placed on the supervisors to carry out their responsibilities in an expedited manner. The number of badges allocated to them occasionally fell short of the number of contractors needed to undertake or promptly complete these tasks. The supervisor would then contend with a certain competing tensions that needed to be resolved. On the one hand, the contract workers needed to do a task and on the other hand they did not have the resources—access badges—that would allow them to complete the task. This tension resulted in some supervisors engaging in creative strategies in order to achieve their ultimate response goal.

This scenario recounted by one supervisor of contract workers illustrates their employment of creativity. The supervisor received approximately 20 badges needed for access to complete the inspection or repair of a building. More workers were needed, however, to finish the task at hand. As a solution, 20 workers would go in, one worker would take their badges, and then this worker would give separate groups of 19 workers the same badges for access to the building. Temporary badges for contract workers did not have identifying information, but instead expired after a certain time period. Supervisors retained control over the badges and a contract worker could not enter or exit that building or area without a badge. Still this solution enabled responders in charge of inspection and repair to "make do" with the badges they were allocated by implementing a creative approach for accessing resources needed to achieve their ultimate goal.

The credentialing system represents an instance of creativity of process. Emergency managers classified sensitive areas, such as Ground Zero, and ascertained who required access. They instituted a system for issuing and tracking badges, and they improved the system over time. Others within this system, such as the contractors, viewed these badges as resources and undertook creative means to acquire them in order to do their work.

Challenges of Creativity

Although creativity is accepted by researchers and practitioners as significant in managing emergencies, and although feats of creativity were significant in New York City's response on September 11th, exercises of creativity during the pressure of a response to an emergency may give rise to future complications. We can anticipate that, the greater the magnitude, scope, and/or duration of a disaster, the greater or more frequent the complications might be. Plans promise coherence in a dynamic situation, and the ability to comprehend and respond to a disaster as a total unit. They attempt to bring many possible contingencies within the ambit of predictability. Response strategies that involve creativity, however, approach disasters as more

disaggregated entities, comprised of micro-events that require separate management. Detailed plans developed in advance of an emergency are intended to provide coherence and predictability to the response; a plan with which everyone is familiar should be a source for re-establishing an orderly, predictable response in the uncertain and dynamic post-event environment.

The prime difficulty with the exercise of creativity is that, by necessity, it occurs outside of a framework of control. Sometimes individuals exercise creativity; other times groups or organizations do so. Creativity is a function of inspiration and artistry (Kendra and Wachtendorf, 2003). It does not emerge on schedule, and as a consequence creative and innovating steps can occur out of sequence with other actions being undertaken by responding organizations and groups. Creativity can introduce a random and unpredictable element into the response milieu. One person's or group's creative insight can become another's challenge, and creative activities also become a new part of the operational environment about which people must learn and to which they must adjust, precisely at the time when they prefer stability and predictability. The spatial analysis, waterborne evacuation, and credentialing activities described above had successful outcomes but also had challenges associated with them. The examples outlined below highlight other types of creative activity, but here we discuss in more detail the challenges that can accompany creative action in the disaster context.

One example of challenges associated with creativity was tension that developed within the formal disaster response organizations regarding the nature and scope of creative efforts, in particular over what timeframe to consider emergent needs. The time horizon is an important consideration when planning courses of action; some officials have jobs that compel them to look at different spans of time when contemplating actions. Creativity within the response milieu developed as an iterative process among various officials and, as in any work setting, there were clashes over the direction of the creative endeavor.

One of the needs identified early in the response was washing down debris and vehicles, especially trucks and heavy equipment that would be leaving the Ground Zero area. Much of the debris was dangerously hot after having been extracted from the rubble pile (hot enough in some instances to ignite the tarpaulins on the trucks), and in addition, the dust and ash posed a health hazard. Emergency managers needed new washdown equipment and procedures to deal with the hazard, i.e., new products and new processes. Officials from the New York City Department of Health (DOH) and the New York City Department of Design and Construction (DDC) quarreled over whether it was better to have washdown apparatus in place as quickly as possible, or whether some time should be taken to design a more carefully engineered structure that would be heated ("winterized"), in anticipation of the cold weather that would arrive in December. The official from DDC

argued that building winterized facilities required a "substantial planning process," and that responders should plan how to develop that plan. The official from DOH was perplexed by what he saw as unreasonable delay in meeting immediately pressing needs as opposed to problems that could develop a couple of months later. Ultimately the sophisticated equipment was built, custom-designed for this application.

The quarrel over the washdown apparatus illustrates an aspect of conflict that is apparent in other settings. The argument between DOH and DDC reveals a "core-overlay" structure, a term used by Burgess and Burgess (1995, p. 107) to characterize the dynamics of environmental controversies. In that pattern, a fundamental moral or philosophical "core" issue is "overlain" by "confused interests . . . disagreements over technical facts, [and] questions of procedural fairness." Although the core issue (development versus conservation) is the real source of the conflict, it is manifested as a sequence of overlying disputes that propel the controversy. Burgess and Burgess (1995) distinguish between conflict, the fundamental divisive issue, and dispute, the overlying opposing contentions. Their goal in a controversy is to identify the core-overlay structure and to treat the overlying disputes. The core, representing well-developed moral views, may be intractable, though some progress may be possible; then the strategy is to mitigate the rancorousness. The core-overlay structure can be seen in the washdown argument: the core issues were the fundamental organizational missions of DDC and DOH and the respective professional imperatives sensed by the participants, made more complex by the different time horizons for planning. The overlying issues were clustered around operational challenges or linguistic details, such as what the word "shall" meant in regulations involving transport of potentially hazardous materials.

Another instance shows the challenges of adopting new methods, tools, or procedures. The introduction of emergency management software, although not precisely an example of entrepreneurial creativity, had analogous effects on the EOC organization since it was new to many of those involved. Before September 11th, OEM had decided to adopt E-Team, a web-based application that allows for tracking of resource requests and deliveries. The decision had only recently been made, but OEM decided to make use of the software in this emergency and to institutionalize new organizational routines, even though most of the agency representatives staffing the EOC had little or no experience with it. OEM brought in E-Team personnel, as well as other emergency management specialists familiar with its use, to install the software at Pier 92. Because few workers in the EOC had any experience with E-Team, it was necessary to run training sessions to acquaint people with its use. This introduction of a new product and a new way of delivering services associated with the distribution of resources was a highly effective tool to reduce duplicate allocation of resources and for accounting for resource requests and

fulfillment. Still, the timing of its introduction drew some criticism from those responders who were required to use the program; although OEM was familiar with the software, it was a new product to most of those who worked with it and required a period of learning and adaptation. One logistics officer said that the middle of an emergency was a bad time to bring in new software. Yet this is also an example of the importance of the timescale over which creativity operates; the early introduction of E-Team, a new process for the EOC organization, allowed it to be used during nearly the entire course of the response. When American Airlines Flight 587 crashed in November shortly after leaving John F. Kennedy airport, New York City EOC staff were experienced with E-Team and able to use it to manage the response.

   Creativity is not the sole province of official emergency responders. Just as important as the creativity exhibited by emergency managers in the official response structure is that exhibited by the convergers. As noted earlier, the subtext of emergence is creativity: while people may not always be creating something that has never been seen before, the essence of creativity is that the actions undertaken are new to them. As Amabile (1997, p. 18) observed, "[N]ovelty may appear in the means for creating or delivering the product . . ." and in reaching new markets, not just in creating something new. Emergent groups and convergers often display considerable imagination and ingenuity in meeting their objectives. In many instances it was a matter of adapting their existing talents to the new post-event environment (for example, boat operators). We encountered, for example, bicycle couriers who delivered food along the secured perimeter when they weren't permitted to help in other ways (Kendra and Wachtendorf, forthcoming). Some of the volunteers exhibited skills that were quite entrepreneurial, not in a business or financial sense, but there was a kind of volunteer "market" in place; many people were competing for an opportunity to help, not in a direct sense but certainly implicitly. Those with particular skills sought to identify, or to create, markets for them. We observed chiropractors who, by skillfully allying themselves with Red Cross workers, gained access to the staging sites surrounding Ground Zero and eventually the EOC and worked on a stack of pallets with a pad thrown across. The imagination and resourcefulness of such well-meaning volunteers, to say nothing of the creativity shown by exploiters and the disaster opportunists who also converged, were sometimes an irritant to emergency managers. Convergers can often be a source of additional assistance to emergency managers, bringing skills that may not exist when and where they are required, but they can also present challenges, since they are another potentially uncontrollable element in the response milieu whose appearance can create complications for security and site safety.

Conclusions and Implications for Planning

New York City's OEM had conducted many drills and exercises that addressed responses to different kinds of emergency events. Included at these drills were representatives from a broad range of local departments and agencies. When responding to the September 11th disaster, these agencies essentially recreated their ongoing and planned relationships on a daily basis, accounting for changes in the social and physical context but also using sets of skills and capabilities that were developed in earlier training and practice. At the same time, other individuals and organizations (that had not been involved in any of the city's exercises) played important roles in the response. These individuals and organizations, however, were able to draw upon their experiences, informational resources, and existing networks and to augment those established resources with creative ideas. For all of these groups, the requirement in this disaster was to deploy these skills and capabilities in new ways that were adapted to the emerging situation. Although creativity is generally regarded as emerging from flashes of inspiration or insight, it is also founded on broadly applicable abilities. Bruner, for example (1983, p. 183, cited in Weick, 1993), argues that creativity is "figuring out how to use what you already know in order to go beyond what you currently think."

In other work (Kendra and Wachtendorf, 2003) we considered the tension between anticipation and resilience, especially as articulated by Wildavsky (1991), who argued that the likelihood of experiencing events that could not be planned for was such that a strategy of developing resilience to stressors would be better than trying to anticipate and plan for every type of event. Since it is not possible to anticipate everything, such an effort would lead to failures in many cases. In our view, however, anticipation and resilience are not in opposition. Instead, the sought-after quality of resilience can be achieved only by the prior fostering of sets of capabilities that can be applied in a variety of disaster situations. Indeed, we argue that the World Trade Center disaster response shows that creativity is such a significant feature of response to an extreme event that planning and training should move explicitly toward enhancing creativity and the resultant improvisation at all levels of responding organizations. Given that creativity undergirds improvisation, and is an important dimension of resilience (Weick, 1993), such a widely recognized and vital component of emergency response should not be left for emergency managers to acquire by chance, nor should it rely on emergency managers fortuitously bringing these skills to the job or developing them on their own.

With this objective in mind, Mendonca (2001) is building a decision support system with a training mode that features improvisation, and he notes that there are other techniques that can be used within organizations to promote creativity, such as brainstorming. Clemen (1996) summarizes some

methods that are used in corporate settings to develop creativity skills; these might be applied in the emergency management field as well. He first distinguishes between "fluent" and "flexible" thinking. "Fluency is the ability to come up with many new ideas quickly. Flexibility . . . stimulates variety among these new ideas" (Clemen, 1996, p. 203). Relevant exercises that Clemen mentions include thinking of new uses for familiar objects, using "idea checklists," and using or generating lists of questions such as Osborn's "Idea-Spurring Questions" (Clemen, 1996, p. 204, citing Osborn, 1963).* Emergency managers should investigate other techniques that might be useful in their particular circumstances. They should also consider aspects of their work environment that can be conducive to creativity. Given the environmental-interaction aspect of creativity, a well-designed EOC that facilitates information exchange (both with personnel in the field and among those staffing the EOC) is essential (see Perry, 1991).

In our discussion, we have considered creativity in a disaster response setting by using concepts developed to describe entrepreneurial creativity in business settings. Future research should examine whether or not the same organizational factors that impede or facilitate creativity in business settings have an impact in the disaster response environment, but it seems that, at a minimum, emergency managers should try to identify and mitigate the features inside and outside their organizations that might suppress or impede creativity, such as deleterious reward structures and other maladaptive motivational influences (see Amabile, 1997 and Woodman et al., 1993 for a discussion of some of these barriers). Emergency managers should also consider the meta-organization that forms to deal with disaster. It is not just the agencies that are usually thought of as the "emergency management" agencies that respond to community-wide disaster. Such a response will include agencies that had never worked together before, and between whom there may be vast differences in organizational culture. The longer a crisis lasts, the more tension there is likely be among officials whose jobs and whose professional imperatives involve different timeframes for action. That tension may work against the development of adaptive, creative solutions. The exchange concerning the washdown stations occurred several weeks after the initial impact when these tensions had increasingly begun to develop in the New York City response environment, and it was extremely contentious. We don't suggest that emergency managers turn themselves into mediators or alternative dispute resolution specialists. Nevertheless, it might be useful to develop an alertness for the core-overlay structure, especially in response

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* For example: "*Substitute?* Who else instead? What else instead? Other ingredient? Other material? Other process? Other power? Other place? Other approach? Other tone of voice?"

activities that will be carried out over a period of time and that will require the participation of multiple agencies, including agencies not normally involved in disaster response and for whom the entire environment is new. Such alertness may help an emergency manager forestall potentially divisive quarrels.

We have noted that creative action, though both a sign of and a requirement for intelligent responses to disaster, can create other challenges, inconveniences, or discord within and between organizations. These pitfalls are not really those of creativity; rather, they are the inevitable consequence of fundamental inabilities to foresee every contingency. These inabilities will be considerable when confronting surprise disasters (Mitchell, 1996) such as the World Trade Center disaster. People have to act creatively in such situations, by definition. The challenge is in mitigating any drawbacks. Comfort (1999) holds out hope that communications and information technology can help organizations align their actions more coherently. E-Team, with its capacity for displaying information simultaneously to many users, is such a technology, and our observations suggest it was useful at keeping emergency managers "on the same [web] page."

But as Quarantelli (1982) pointed out, what is communicated is as important as the effectiveness of the medium. The medium is not always the message. In order to have an awareness of what must be communicated, emergency managers must have at least a working knowledge of how creative processes unfold in organizations. We argue that the entrepreneurial creativity model provides a useful way of conceptualizing the creative processes involved in emergency response. We suggest, however, that this research need not stop with the application of existing theory; instead, we see a number of possible research directions that might be taken to advance theories of creativity more generally. For example, the rapid tempo of disaster response may provide an opportunity to examine a creative process from inception to fruition in compressed time, which may throw into relief the most critical aspects.

This paper attempts to connect phenomena observed in disasters with those observed in other settings. In so doing, we hope to begin a more thorough exploration of creativity in disasters than has previously existed, while at the same time setting the stage for transfer of findings to wider literatures. Much of the literature on creativity is concerned with organizational aspects that foster or diminish creativity, such as reward systems and the critical reception of new ideas. This literature works within an entirely different temporal spectrum from that considered in this research, although even in disasters some decision making is carried out over weeks and months. This, of course, was particularly so over the protracted World Trade Center response. We believe that this line of research can lead to advances in the understanding of organizational creativity more generally,

such as by developing a better understanding of the temporal scale in the exercise of creativity.

Furthermore, research on creativity as it affects the emerging self-organization of the group would add a significant dimension to understanding of creativity—for example, how it can affect the structure and composition of a group. Looking at the creative aspect of emergence, our concern in this paper has been with individuals and organizations that do not routinely work together on the activities under examination. Most of the research on creativity focuses on organizations in which the participants have some familiarity with each other and with the dynamics of their organizations. The motivational factors that are examined in such research can only be a factor when people have an expectation of a particular unfolding of events and distribution of rewards within their organizations. But emergent groups are often composed of strangers, or people who have not worked with each other before in cooperative/collaborative activities. Interactions within the group are developing simultaneously with the creative process of meeting disaster-related needs. In these situations, creativity is exercised at the same time that group participants negotiate their evolving relationships with the group and with newcomers. An examination of the exercise of creativity with respect to the emerging division of labor, self-identification of appropriate skills and talents (what Forrest (1978, p. 116) refers to as "usable human attributes"), and group-level validation of individual participation can lead to an enhanced understanding of creativity as an agent or catalyst during group formation and change. Similar research might also illuminate aspects of interorganizational coordination, particularly among organizations that ordinarily have little contact with each other.

The World Trade Center disaster plainly showed the significance of creativity in disaster response; many instances of creativity were featured in the news media and may have been valuable in fostering within the public an appreciation for the unplanned aspect of some disaster response activities. We noted earlier a fundamental contradiction: that creativity is important but simultaneously perceived as an indication of failure, if not by emergency managers then by their constituencies, such as the public they serve and the elected and appointed officials to whom they answer. We suggest that it is important to recast creativity, not as a dysfunctional feature, but as a highly necessary and adaptive response. Examining well-established post-event behaviors, such as emergence, as acts of simultaneous, self-reinforcing individual and collective creativity highlights both the importance of improved understanding of creativity and the need to relax the tension, noted earlier, that often surrounds unplanned-for yet highly adaptive creative solutions. Some treatment of creativity in the research literature on disasters might give practicing emergency managers more leverage to feature creativity in their planning and response activities.

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