Overcoming Failure of Imagination in Crisis Management: The Complex Adaptive System

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Abstract

This article explores the potential of the complex adaptive system as an emerging theoretical approach in crisis management, where practitioners and scholars are becoming increasingly reluctant to rely on traditional management techniques in situations involving ambiguity, uncertainty, and loss of control. While incremental management approaches are arguably useful in static situations, recent investigations into the events of September 11, 2001 and Hurricane Katrina indicate that over-reliance on them can result in "decisional paralysis," dangerously hindering the information sharing and horizontal communication needed in major crises. Conversely, the complex adaptive system provides a conceptual framework for enabling many diverse actors to interact locally in discontinuous, asymmetrical situations where unpredictable, shifting variables can quickly alter entire environments. Hence, this model may facilitate the rapid, adaptive and imaginative delivery of supplies, services, personnel and other resources to persons in peril.

KEY WORDS: Crisis management, complexity, chaos theory, complex systems science, complex adaptive systems, innovative decision-making, non-linear sense-making

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Introduction

Using asymptomatic cardiovascular disease as a metaphor, Kettl (2006) expresses his growing concern about the dangers threatening America's national security. Wondering if the "worst is yet to come," he asserts that if the federal government's response to the events of September 11, 2001 and Hurricane Katrina foreshadow what can be expected in the future, the dangers threatening homeland security will resemble stress tests conducted in a physician's office: without warning the patient collapses (275). He somberly concludes that if not treated correctly, the next cardiac event could be so devastating the patient may not recover (274). The September 11, 2001 attacks on the World Trade Center and Hurricane Katrina are viewed as examples of the extent to which decision-makers relied on inflexible, backward-looking approaches to problem-solving in the midst of mercurial, life-threatening events of catastrophic proportion. In sounding an alarm that future disasters may be unprecedented in their level of death and destruction, Kettl (2006: 276) uses "learning pathology" to describe the instinct to look backward instead of forward when asymmetric events erupt.

A particularly disturbing example is the scant number of progressive and potentially helpful after-crisis recommendations produced by the National Commission on Terrorist Attacks (Kean and Hamilton, 2006) which were actually adopted by the federal government. A clearly predictable consequence of this learning pathology is the certainty that future efforts to overcome what has been called a large scale governmental "failure of imagination" are doomed from the outset if they continue to be driven by managerial policies that breed decisional paralysis.

An overarching criticism of governmental actions in both the September 11 and Katrina disasters is that unheeded warnings of potential risks abounded (e.g., activities of Al Queda in the former, and weak levee protection in the latter), and that adequate preventive measures were not taken before these deadly events occurred. As these mega-disasters erupted, managerial confusion seriously delayed delivery of services, personnel, and other resources to people in need, exacerbating losses of life, injury, and property damage. Americans quickly viewed governmental responses as inept and lost confidence in the ability of responsible leaders to protect them.

In responding to these rapidly-developing situations, it appears that many managers inappropriately relied on slow, deliberative, incremental responses to events on the ground. Incremental administrative changes are adequate in addressing organizational problems and improving effectiveness during periods of stability and equilibrium. They are ineffective, however, when "wicked" problems alter the decision-making environment because there is little time to react to changing conditions. These problems are wicked because they are poorly formulated and fall outside normal boundaries of decision-making. Furthermore, they often involve many hopelessly bewildered individuals and decision makers, thereby risking and endangering entire systems.

What appears to be more interesting is how government and non-governmental organizations (NGOs) behave during and immediately after periods of turbulence. As the speed of change and

complexity increases, organizations turn their attention away from efforts to incrementally improve their "fit," and instead try to quickly establish new configurations. Organizational analysts refer to this type of adjustment as "discontinuous," because rapidly developing events force major reconstructions of *all* elements of the organization, including its procedures, policies, and culture itself (Burke and Litwin, 1992). Leaders need to set aside venerated hierarchical and jurisdictional boundaries and forge networks of *horizontal* partnerships for the new changes to work. If recent past is prologue, analyses of September 11 and Katrina suggest that while the need for discontinuous change in the future is glaring, incremental change will unfortunately remain as the formulaic bureaucratic response without a radical toggling of the current governmental perspective.

These phenomena raises an obvious critical question: How can leaders tasked with responsibility for public safety but accustomed to incremental management processes, make sense of their roles in unstable environments with countless shifting variables, some of which may be profoundly important, some inconsequential? One way is to explore possible theoretical perspectives that create a central place for uncertainty, particularly the accommodation of key stakeholders who can behave symmetrically in some situations and asymmetrically in others without exacerbating destabilizations. Some investigators familiar with crisis management (see Comfort 2002, Holland, 1995, Kauffman, 1993) have found that on a continuum of organizational performance, the complex adaptive system can be effective in linking order to flexibility by balancing mechanisms of control typically seen during incremental change situations, with those of rapidly changing, discontinuous environments. That is, where non-linear information processing requires rapid search, exchange, and feedback among many diverse public, private, and nonprofit agencies. This becomes possible in complex adaptive systems due to their capacity to adjust to large multiples of diverse participants who are dynamically involved in intricate webs of interaction that not only continually reshape their collective future, but also the permanent outcomes of the environment in which they are engaged that is struggling with a crisis (Axelrod and Cohen, 1999).

Agents, Agent-Managers, Nonlinearity, and Sense-Making in Major Crises

When crises occur, the ensuing panic and confusion generate tremendous amounts of incongruous and disjointed interaction among many individuals. These persons are referred to as leaders, managers, supervisors, administrators, policy makers, participants, players, actors, or characters. Less frequently we refer to them as "agents." Yet the term agent is better at capturing what they actually do. And in certain circumstances, "agent-manager" may even be more descriptive. In the nonlinear world of complexity, many kinds of people interact in spontaneous and sometimes irrational ways. This term also seems particularly suitable for describing the roles played by individuals in self-organizing systems. Meaningfully, Axelrod and Cohen (1999: 4) prefer the term because "An agent has the ability to interact with its environment, including other agents. An agent can respond to what happens around it and can do things more or less purposely." Further, in the context of disasters, Axelrod and Cohen (1999) assert that although we typically think of agents as people, <u>any</u> entity seeking to adapt, including public, private, nonprofit agencies, or even entire countries can qualify as agents.

To be effective in rapidly evolving situations then, agent-managers must realize that although in

the linear world any shift or change is basically proportional, depending on the strength of intervention, this clearly is *not* the case in the discontinuous, fast-breaking non-linear world of crises management, where no relationship exists between the strength of interventions and subsequent effects. Comfort (2002) argues that while organized hierarchy is central to sustaining incrementally governed linear environments, the self-organizing, complex adaptive system is better suited for rapidly changing, nonlinear environments. First responders to crises, for example, are keenly aware that as these events are occurring, even small variances and infinitesimal changes in seemingly not-so-crucial variables can have enormous impact on lives being saved or lost. This explains, in part, why nonlinear models of sense-making are better for discerning permeable, relational, and messy differences in pattern changes, which underlie all complex adaptive systems.

Equally important to this argument is the idea that most systems in chaos and complexity retain their ability to self-organize. The physical sciences describe chaos as the last stage a system enters before dissolving into randomness (Gleick, 1987). Perhaps even more crucial to our understanding of chaos are the recent advances in software and computational power which now permit scientists to study this phenomena in ways impossible before, allowing them to identify patterns of order within ostensible disorder , and to observe that although a system may change and take on a new shape, its parameters tend to stay intact; its basic identity does not fly apart, nor cascade out of control. Complex adaptive systems dealing with discontinuous, non-linear, and "extreme" change (Comfort, 2002: 102) also appear better suited to deal with the chaos and confusion created by crises than traditional hierarchical organizations.

In fact, the order and stability typically undergirding rapidly evolving asymmetrical environments may be explained in part by self-organizing behavior resulting from the adaptive actions of those local agents center stage in cataclysmic events, detecting, receiving, and processing information as changes occur (Comfort, 2002). It is through this process of learning and adaptation that a system responds, internally through its own energy, rather than simply reacting to external events (Murphy, 2000). Information sharing, in contrast to hierarchical authority, is the driving force behind the dynamics of real-time change in episodes of self-organizing behavior (Kauffman, 1993: 208). This asymmetrical dynamic thereby cushions varying degrees of shock to the organizational system. This outcome helps the complex adaptive system remain less susceptible to failure or collapse (Comfort, 2002, McDowall, 2002).

In this regard, one instructive caveat about nonlinearity and the adaptivity of agents remains: they are not rational in the sense of projecting long-term strategies and goals; the urgency of what they have before them does not require the talents of calculating thinkers but instead requires them to be "myopic pragmatists" (Murphy, 2000: 455) who are able to respond symmetrically, asymmetrically, and *decisively,* depending on the situation on the ground. Unlike agents accustomed to implementing incremental changes, adaptive agents, frequently distracted by unpredictable occurrences, tend to react nonrationally and inconsistently. Over short intervals, they build patterns of workable relationships with other agents, who build relationships with other agents and so on. To summarize the advantages of the complex adaptive system: its shape is not static but fluid, its interventions depend on relentlessly shifting variables being impacted by quickly formed relationships of disparate agents; and, these agents are drawn into spontaneous interactions often by limitlessly open-ended crises (Murphy 2000: 454). Table #1 provides an outline of distinctions between traditional crisis management models and those of

complex adaptive models.

Table #1 Conceptualizing Distinctions between Traditional Crisis Management and Complex Adaptive Models

Traditional Crisis Management Models (17th-20th Century)	Complex Adaptive Models (21st Century)
Organizational Approach: Methods, Planning and Assessments: Inherently Linear (Management, analysis and evaluation are incremental, mechanical, straight line, static processes)	Organizational Approach: Methods, Planning and Assessments: Inherently Nonlinear (Management, analysis, and evaluation are dynamic processes defined by periods of stops, starts, regressions and evaluated and measured poorly, if at all)
Emphasis is on Structure (Organized, mechanistic approach to delivery of services, personnel, resources, and materials)	"Messiness" and Occasional Chaos Normal (Delivery of services, personnel and resources dependent on analysis of systems, trends, patterns, especially agent relationships)
Design (Lower level agent as subordinate observer and implementer in leader's design; hence, emphasis on objective goal attainment)	Openness to Randomness (Lower level agent as participant in leader's design; hence, some planning needed but openness to spontaneity and unpredictability critical to facilitating success)
Quantitative (Situation is best explained objectively, often numerically with equations, graphs, charts, tables)	Qualitative _and_ Quantitative (Heuristic. Quantitative important, but qualitative is equally valuable in analyses, because value-laden scientific data weakly explains interconnections among systems/subsystems by quantitative procedures alone)
Empirical (Positivism, objectivity, and precision critical to the proper observation of phenomena)	Intuitive/Creative _and_ Empirical (Subjectivity present when observing all phenomena; hence, detecting underlying patterns requires logical _and_ creative, qualitative approaches)
Prediction (Clearly defined constructs and use of appropriate research methods will result in dependable predications)	Uncertainty (Models for predicting human behavior and rapidly changing social and natural environments highly unreliable. Focus should be on understanding social phenomena; human behavior too complex to predict)
Truth Seeking (Even in major disasters, verifiable facts and major truths "out there" awaiting discovery and/or validation)	Truth as Relative/Dynamical (Discovering and interpreting ever-changing webs of relationships and interconnections are better at revealing the

	dynamic nature of the event itself)

Crises and the Failure of Imagination in Dissipative Structures

Chemist Ilya Prigogine (1980: 201) was awarded the Nobel Prize for his work on physical systems called "dissipative structures." He described these structures as dissipative because they have the ability to capture and make productive use of energy that otherwise would be dispersed, destroyed or lost, thus turning chaos into complex order. The truth is dissipation doesn't lead to death of the system, but a new order out of disorder. Similarly, self-organizing social systems can survive and retain their identities in disasters - manmade or natural - when adaptive agent-managers apply various strategies (or even tricks) for transforming the forces of disorder into forms better suited to the needs of the changing environment. This illustrates one of the paradoxes of complexity: disorder not only can be a source of new order, but in many instances it spawns growth and improvement in systems. Zaleznik (1977) argues that progressive leaders, are women and men who often have more in common with artists, scientists, and other creative thinkers. These visionary individuals often use their imaginations and creative powers to drive creative organizational growth resulting from disorder. He or she is also more likely to resist the urge to come to premature closure before understanding changing events more fully. While Zaleznik (1977) describes the control-style agent as taking measured steps in implementing incremental change, the imaginative agent-manager is transformative, and vibrantly engaged in exploring possibilities for coping with discontinuous change.

Needless to say, organizational and personal stress impacts agents in myriad ways. Psychiatrist George Vaillant (1977) studied the lives of successful and relatively unsuccessful Harvard graduates for about thirty years (Csikszentmihalyi, 1990: 199). He found that relatively successful graduates who were able to fashion what he called "mature defenses" to stress, were also more adept at "transformational coping." One distinguishing characteristic of the transformative person is that she stays vigilant and analytical, constantly reassessing priorities and conditions that change discontinuously. This is in sharp contrast to persons who rely on "regressive coping" mechanisms by shutting down - like the incremental-type agent-manager and who denies rapidly emerging facts, and seldom looks inward to probe inner resources to solve problems. Csikszentmihalyi, (1990: 200) asserts that when others faced with crises have given up and scaled down the complexity of their lives, those who have mastered transformational coping skills earn our admiration for their willingness to adapt and to grow.

Confronting the dangers and traumas of crises can threaten and immobilize agent-managers of average ability. Transformative agent-managers, however, stay focused, minimize distractions, and often persevere because they do not allow external events to undermine their identities or belief in their abilities. While others are weakened by tragedy, they engage their imaginations to transform seemingly hopeless situations into positive ones. These transformations are possible in the complex adaptive system when the agent-manager is responding to changes in the environment, and has confidence in the ability to control her or his own destiny (Logan, 1985).

To arrive at this level of confidence the agent-manager understands that a different set of rules will be required in order to succeed and help others survive. In this new, amorphous role then, he or she becomes an indispensable link and catalyst for matching available resources with developing

conditions. With their attention on full alert, constantly processing information from the environment and a multitude of formal and informal sources, the agent-manager is then better positioned to gain a sense of the evolving environment and discern its emerging properties in order to find better ways to deal with threatening situations, and even perceive unexpected opportunities to defuse them (Csikszentmihalyi 1990). In fact, studies of past behavior of managers in chaotic circumstances indicate that even in the midst of turbulent, chaotic circumstances they can make congruent decisions to further reinforce the underlying order within ostensible disorder .

Failure of Imagination: Misgivings of Agents in Complex Adaptive Systems

Agent-managers can be put off if decision options created by complex adaptive systems are not clear. Agent-managers operating in uncertain environments under volatile "real world" conditions are justified in being skeptical of theoretical approaches that resemble "fuzzy" new age management models that lack rigor.   In particular, nonlinear models may be viewed skeptically because they may be perceived as lacking the intellectual heft to help agent-managers arrive at street-level decisions. In this vein, it is interesting to note that on-going advances in computer simulations suggest that complexity studies have moved well beyond elusive theoretical modeling and metaphor (Murphy 2000: 457) to the more practical application of sound scientific principles.

Researchers may be able to conceptualize, for example, how various agents self-organize around important events and key pieces of information by extrapolating information from previous studies that have applied logistic regression to time series data to model nonlinear changes in social behavior. In short, advances in agent-based modeling premised on complexity theory, may serve to illustrate how disparate agents - individuals, government leaders, volunteers, profit and nonprofit organizations - form local alliances during crises, which then form large-scale patterns with important strategical and social implications.

Appropriately conducted simulations may be instructive in helping tease out how *ad hoc* alliances affect disaster outcomes. Nowhere are these simulations more important than in the frenetic and sometimes haphazardly informed media coverage of destabilizing events (Murphy 2000: 456). For example, in New Orleans during Katrina some media exaggerated portrayals of minority group members as lawless thugs, disproportionately engaged in violence and looting, when later investigation revealed this simply was not the case. These portrayals clearly contributed to the reluctance of outsiders to help, as well as fueling police preoccupation with law and order activities instead of focusing on search and rescue operations. Hence, computer simulations showing possible differences between outcomes of accurate versus unsubstantiated or partially substantiated information may assist policy makers and media executives develop strategies and procedures to reduce shoddy, irresponsible reporting during the next crisis.

Not surprisingly, reputations of politicians and government officials can change overnight when disasters occur. Equally important, legitimate questions are often raised about the efficacy of governmental planning efforts to prevent a disaster or to minimize the potential for damage. Agent-managers in prominent leadership positions may wish to consider the value of modeling the influence of new information and their response to it on changes in public attitudes toward them personally (Goertzel and Goertzel, 1995).

These methodological approaches represent only a fraction of a growing number of germane complexity-based studies, but their relevance to crisis management should be clear. Moreover, thought should be given to the impact of change *within the agent* during and following a major crisis. While systems self-organize during periods of great stress, agents handling them also grow in complex ways. One important area of identifiable growth in the evolving self focuses on "differentiation," the other keys in on "integration." The former is essentially a movement toward uniqueness and separateness from others, and the latter a union with other people, and with ideas and entities beyond self. Csikszentmihalyi (1990: 41) extols these benefits because overcoming significant challenges, such as managing crises inevitably leaves the person feeling more capable, more skilled, and oddly enough "less predictable, and possessed of rarer skills." Growth occurs not only because the successful agent-manager's thoughts, intentions, feelings, and senses are focused on saving lives and preventing further harm, but also once the event is over one the agent-manager feels more competent than before, not only internally but also with respect to the other agents with whom he or she has interacted during the crisis.

Discussion

In this paper we have indicated our support for the opinions of scholars and practitioners who contend that catastrophic danger to homeland security predictably will increase as long as leaders resist exploring ingenious, and heretofore untried management approaches in preventing them. To get at the root of why this happens, one need only examine the historical efforts of traditional leaders who adhered to principles of organizational efficiency and centralized hierarchical lines of authority in cataclysmic situations (see Axelrod and Cohen, 1999). More recently, credible investigations of governmental responses to September 11, 2001 and Hurricane Katrina indicate that while there were instances of innovative action-based decision-making, what was more obvious were cases of poor planning, poor execution, excessive administrative rigidity, and faulty application of sound emergency management practices. These efforts, while arguably adequate in hierarchical incremental change situations, not only failed, they dangerously undermined rescue efforts by interfering with the collaboration and horizontal communication called for in fast-breaking crises. This further compounded the ensuing panic and delayed medical and other critical assistance to individuals needing it. Left uncorrected, intellectual inertia may continue as the most compelling issue crisis management will face in the remaining decades of the twenty-first century.

That said, we acknowledge that agent-managers acting in crisis settings may find themselves situated between a theoretical rock and conceptual hard place. As we have illustrated, previous conceptual models of public organizations and organizational behavior have not served public agent-managers well. Rigidity, bureaucratic "stove-piping," and a host of other organizational ills can quickly hamper an organization's efforts to provide an effective crisis management response.

Part of the challenge for agent-managers lie in this stark reality: the tax-paying public *expects* effective, results-oriented governmental performance during crises. Americans have little or no patience for excuses and reasons about why governmental agencies did not perform adequately. In particular, the failure to properly plan and prepare for potential disasters is the least excusable of organizational sins. Reviews of post-September 911 and Katrina literature point to how the public's shock and anger at government emanated from the belief that these agencies undeniably had sufficient

information about the potential threat of these disasters but *negligently failed* to prevent them. American citizens assumed that efforts were already in place to coordinate prevention activities, share timely and relevant information, and develop imaginative and strategic interventions to stop disasters or minimize resultant damage.

In this regard, Schon (1983: 345) reminds us that "the scope of technical expertise is limited by situations of uncertainty, instability, uniqueness, and conflict." In emerging crises, agent-managers need to be able to quickly develop and utilize emergent strategies that allow them to follow Schon's charge to "reflect in action" (345).

To this end, the field of Public Administration seems to be on the cusp of a paradigmatic change in how future crises will be managed. While the academy *en masse* has seemed reluctant to accept emergent changes, a growing number of practitioners and scholars have begun to question the dubious "virtue" of mechanistic efficiency and hierarchical authority during situations that clearly require rapid access to and sharing of crucial information (Axelrod and Cohen, 1999).

Perhaps what is concurrently changing is the belief in an ordered and measured method of societal change. Up to now, the incremental approach has been the *preferred* method of change in American society. Regardless, there is recognition among a growing number of practitioners, scholars, and ordinary citizens that fundamental changes in infrastructures can occur as the result of disasters. Technology has also dramatically changed the role of the agent-manager as the pivotal actor in emergency crisis management, which suggests that our methods for studying public organizational change need to include this new reality.

In future crises the task of coordinating the operational responses of disparate agents will become even more vital to the delivery of effective governmental responses in discontinuous situations. The task of coordinating future actions of agents will depend primarily on access to timely information, as well as their ability use and adapt to it. For this reason, the complex adaptive system is a viable alternative to traditional management strategies because it provides a set of concepts, questions, and design issues that allow agent-managers to try previously untested ideas in unstable, discontinuous situations. Moreover, as novel approaches are employed during highly volatile events, the complex adaptive system also sets a context in which other agents may feel more comfortable adapting to previously untried approaches as well (Axelrod and Cohen, 1999).

Essentially, complex adaptive systems can supply the crucial conceptual "glue" to manage the process of effective self-organization, because complexity-based systems are permeable enough to allow a vital exchange with the environment (Murphy 2000: 456). In addition, complex adaptive systems provide a workable model for addressing the tendency of relentlessly shifting variables to cascade out of control, with agents adjusting to other agents in an unceasingly reflexive dialogue. As noted above, for the adhesion to remain strong, active multi-directional communication and collective learning are needed to prevent weakening of parameters, which otherwise would cause the system to fail catastrophically. To keep this from happening, Comfort (2002) stresses the importance of pre-planning among organizations and agencies involved to identify how crucial information will be accessed and shared, thereby guiding proactive interventions that may help us cope with future instability. When faced with asymmetric threats, public officials who have not pre-planned quickly become baffled about "who ought, could, and should do what," when those threats suddenly become real (Kettl, 2006: 280).

Two contrasting examples are instructive. During Hurricane Katrina, New Orleans Mayor Ray Nagin pointedly complained about the lack of collaboration and coordination of federal officials, asserting at one point "they don't have a clue what's going on down here" (Kettl, 2006: 278). Conversely, this was not the case with Pentagon officials who had made preparatory decisions of who would be in charge in the event of an attack, and indeed had been staging incident command scenarios with emergency management personnel in Arlington, Virginia well in advance of the actual attack on September 11. Undoubtedly, their efforts drastically reduced and helped minimize casualties and injuries on the day of the attack

Conclusion

This paper offers a far-from-exhaustive account of the complex adaptive system, its postulates, and its associated methods and applications, particularly as it relates to crisis management. Admittedly, its scope is limited. Nonetheless, herein we identify four future applications of principles of complex adaptive systems to crisis management as one way to encourage imaginative on-the-scene decision-making.

First, we believe that terminology used in describing traditional hierarchical management (e.g. "linear," "incremental," "structured," "symmetrical") should be modified as needed to include idiom more conducive to use with the complex adaptive system (e.g. "nonlinear," "dynamical," "discontinuous," "extreme"). Second, we argue that "agent," and in some instances "agent-manager" should become preferred terms to describe those pivotal individuals interacting and adapting to fluid, cataclysmic events. This is especially important as self-organization evolves and begins to affect operations in nonlinear dynamical systems. Third, we advocate for the increasing acceptance of complex adaptive systems not only in the physical and social sciences but in crisis management as well. We further contend that by applying the complexity-based social science lens, future studies of crisis management may reveal how the *field itself has come to behave as a complex system*, comprised of many related theories that coalesce to create coherent patterns. Finally, we suggest that because agents behave symmetrically in some situations yet asymmetrically in others, the complex adaptive system offers a theoretical approach that can be easily translated into practice.

Of significant importance, this approach also will permit agent-managers faced with uncertainty to depart from some traditional managerial practices, without forfeiting objectivity, sensemaking, and restraint. Having said all this, we note, however, that more graphical conceptualization is needed to ensure that complex adaptive models have adequate validity and reliability. This is necessary to meet the public's expectation of effective governmental performance during crises (validity), and to encourage replication and adaptation where appropriate (reliability). Because of its novel organizing principles the complex adaptive system appears to be especially relevant to this task. Especially when a crisis is imminent or occurring and individual agents, in collaboration with other agents, need the freedom and flexibility to depart from traditional hierarchical management practices, take risks, and draw upon their imaginations to rapidly improve operational efficiency and delivery of resources and personnel to persons in peril.

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