



Organizational Fragility Curves: Sensemaking under Stress

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Organizational Fragility under Stress

- ◆ Fragility as a measure of performance under stress
 - Fragility in the built environment
 - Point at which a building collapses under shock
 - Fragility in organizational context
 - Point at which the capacity for collective action collapses in the social environment



September 11, 2001

- ◆ World Trade Center attacks illustrate both types of fragility:
 - Structural collapse of buildings under intense heat of 2000 degrees
 - Steel structure of building lost its integrity
 - Organizational collapse of operational system of security systems, flight crews and passengers, rescue teams
 - Members faced unimaginable events, could not recognize risk, were unable to act to avert danger



Organizational Sensemaking



- ◆ Depends upon information processing
- ◆ “We can only create what we already know”:
H.A. Simon
- ◆ Drops under stress; problem solving capacity lessens: G. Miller
- ◆ Depends upon recognition of signals and symbols: M.Feldman & J. March



Disaster Environments



- ◆ Create the most difficult conditions that human managers face
- ◆ Involve the interaction of interdependent human and technical systems
- ◆ Failure in one subsystem triggers failure in a second, then a third, until system collapses
- ◆ Require a sociotechnical approach to problem solving in response operations



The Dynamics of Response

- ◆ Systems under threat seek mechanisms of coping and survival
- ◆ Coping mechanisms take varied forms
 - Denial
 - Resistance
 - Flight
 - Creation of a new system that includes the threat as an interacting component



Response Systems Under Threat

- ◆ Interact with the threat in repeated, recognizable patterns
- ◆ Seek new patterns of interaction through monitoring, assessment, learning and adaptation
- ◆ Evolve through self organizing behavior of component units into a complex adaptive system



Complex adaptive systems



- ◆ Operate on a continuum from chaos to order
- ◆ Move from either end of the continuum toward the center, the ‘edge of chaos’
- ◆ Represent flexible adaptation to new information over time
- ◆ Demonstrate the capacity to reallocate resources and action in response to new demands



Self organization occurs

- ◆ In the center region between chaos and order in an evolving system
- ◆ Where there is sufficient order to hold and exchange information, but ...
- ◆ Sufficient flexibility to adapt to a changing environment



Theoretical background



- ◆ Chaos theory: evolving groups show a sensitive dependence upon initial conditions
- ◆ Percolation theory: information flow may suddenly transform a collection of individuals into a unified group to carry out a shared goal
- ◆ Organizational learning: members draw inferences from previous events to inform actions to reduce risk or increase success in future events



Emerging systems represent



- ◆ Response to perceived threat
- ◆ Collective action to achieve a stated goal
- ◆ Innovative efforts to change their existing status vis a vis the threat



Initial conditions for emerging systems include:

- ◆ Articulation of commonly understood meanings between system and its members
- ◆ Sufficient trust among leaders, organizations, and citizens to enable members to accept direction
- ◆ Sufficient resonance between emerging system and its environment to gain support for action
- ◆ Sufficient resources to sustain collective action under varying conditions



Assessment indicators for emerging systems

- ◆ Technical structure: e.g., communications, transportation, electrical power infrastructure
- ◆ Organizational flexibility: e.g. adaptability to changing conditions, leadership
- ◆ Cultural openness: e.g. acceptance of new concepts, patterns of action



Four types of emerging systems:

- ◆ Non-adaptive:
 - Low on technical structure
 - Low on organizational flexibility
 - Low on cultural openness
 - Function under threat largely with outside assistance
 - Revert to previous status after threatening event



Emergent adaptive systems:



- ◆ Low on technical structure
- ◆ Medium on organizational flexibility
- ◆ Medium on cultural openness to new concepts of operation, organization
- ◆ Develop a mode of organization and action to cope with threat, but are unable to sustain collective action



Operative adaptive systems:



- ◆ Medium on technical structure
- ◆ Medium on organizational flexibility
- ◆ Medium on cultural openness
- ◆ Function well in response to threat, but prove unable to translate methods of response into new modes of sustained operation and threat reduction



Auto-adaptive systems:

- ◆ High on technical structure
- ◆ High on organizational flexibility
- ◆ High on cultural openness
- ◆ Rare achievement, but in practice, systems prove effective in response to threat and able to transfer lessons learned into sustained reduction of threat



Organizational fragility in events of 9.11.01

- ◆ Flights from Boston into WTC illustrate non-adaptive systems; collapse of sensemaking
- ◆ Flight 93 from Newark: illustrates an emergent adaptive system
- ◆ Federal response to attacks: illustrates an operative adaptive system



Continuing threat of terror

- ◆ Requires an auto-adaptive system
- ◆ Appropriate use of technical systems to monitor, process, disseminate information
- ◆ Rethinking organizational functions to achieve self organizing action to avert risk
- ◆ Creating new meaning from experience that enables effective action in dynamic conditions



Conclusions:



- ◆ Constructive approach to emerging systems:
 - Treat emerging systems as units of interaction with the wider environment and include them in a ‘new’ system of action
 - Invest in information infrastructure to monitor changing conditions
 - Design a scalable knowledge base, with access to information appropriate to each level of action
 - Avoid intermittency in risk assessment through a systematic program of monitoring risk conditions