Safety Science xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Safety Science

journal homepage: www.elsevier.com/locate/ssci

Special Issue Article: Building Resilience

From linearity to complexity: Emergent characteristics of the 2006 Avian Influenza Response System in Turkey

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ARTICLE INFO

Article history:
Received 21 July 2015
Received in revised form 2 November 2015
Accepted 6 January 2016
Available online xxxx

Keywords:
Disaster management
Inter-organizational coordination
H5N1 Avian Influenza virus
Network analysis

ABSTRACT

This paper examines inter-organizational coordination to diminish local communities' vulnerability to the H5N1 Avian Influenza virus. Avian Influenza caused an important health crisis in Turkey in early 2006. It was a significant threat to both human and animal health for Turkey and the rest of the world. The present study analyzed the 2006 Turkish disaster response to the H5N1 Avian Influenza virus.

The study utilized data from content analyses of news reports from the Turkish daily newspapers *Cumhuriyet* and *Sabah*. The network analysis, conducted with the UCINET 6.0 social network analysis software program, revealed that existing bureaucratic organizational structure, following a linear policy approach, inhibited the effective implementation of public policies. The formal structure and policies failed to anticipate the informal interactions and circumstances that occurred during the emergency operations. There were problems of coordination and integration between public agencies and other sector organizations from different jurisdictions in responding to the Avian Influenza crisis. According to the findings, a complex organizational design based on organizational flexibility is needed to harness drastic change and contribute to resiliency in local communities.

1. Introduction

The Avian Influenza (H5N1 virus), like other infectious diseases, threatens the lives of humans and poultry worldwide. When Avian Influenza appears in the form of a pandemic, it becomes a great risk with the potential to kill millions of people. The H5N1 virus first appeared in China in 1996 and turned into an outbreak in 2005 by spreading to various countries in Asia, Europe and Africa, essentially through migrating birds. The virus was first identified in a flock of domesticated birds in Manyas, Turkey and caused a health crisis by 2006, spreading to 254 different local communities in 54 provinces (World Health Organization, 2006). The Avian Influenza crisis as a process can be divided into two phases. The first phase included the appearance of animal cases and was dominated by the efforts of The Ministry of Food, Agriculture and Livestock (MFAL) to bring the disease under control. The period between October 8, 2005, when the H5N1 virus first appeared in Manyas, and January 1, 2006, the date that the first patient from Dogubeyazit died, is the first phase. The second phase of the crisis began on January 1, 2006, the point at which the disease became a health crisis, and extended to the time when outbreaks of the disease were extinguished, by the end of March 2006. During the first phase, MFAL did not sufficiently inform local public authorities and tended to isolate its efforts from the public. During the second phase, along with the MFAL, the Ministry of Health and the Ministry of Agriculture and Rural Affairs were intensely involved at the central and local levels. Moreover, the analysis of two Turkish newspapers, *Cumhuriyet* and *Sabah*, indicated that 482 organizations participated in response operations between December 28, 2005 and January 17, 2006. During this period of time, at which the crisis peaked, four children died and more than two million domesticated birds were culled (World Health Organization, 2006; Arslan, 2007). The linearly designed Turkish disaster management, based on the principles of command and control, was caught insufficiently prepared, especially at the local level, for the crisis (World Health Organization, 2006). The system was unable to effectively coordinate organizations and resources during the first seven to ten days. However, the risk to human and animal life could have been much higher in the case of an Avian Influenza pandemic.

Avian influenza outbreaks require an effective disaster management system in order to minimize harm to human and animal

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http://dx.doi.org/10.1016/j.ssci.2016.01.006
0925-7535/

lives. A linearly designed organizational structure is insufficient to achieve this goal. The linear organizational design, based on a machine metaphor, is the reflection of Newtonian physics in organization theory (Prigogine, 1997; Koçel, 2003). A linear organizational system requires organizational action based on predetermined structures and flow of information characterized by fixed distribution of tasks, hierarchical supervision, and detailed rules and regulations (Travers, 2007; Eryilmaz, 2010; Morgan, 1997; Swedberg and Agevall, 2005). This organizational approach assumes that an organization or inter-organizational system achieves its goals and effectively responds to a disaster when and if decision makers follow pre-determined rules, procedures, and orders from their superiors. Thus, standard job procedure, rules and information flowing through a hierarchical ladder, is critical for facilitating coordination in and between organizations (Tompkins, 2005). This model assumes a command and control oriented management and a relatively stable environment. However, if the environment involves complexity and uncertainty, and requires timely information rather than predefined procedures, a command and control oriented management system becomes one of the weakest points of the system (Osborne and Gabler, 1992; Senge, 1994; Lewin and Sanger, 1994; Uri, 1995; Axelrod and Cohen, 1999).

Complexity theory argues that nature has both linear and nonlinear characteristics. Along with prediction and order, there is a nonlinear, coincidental, uncertain, unpredictable, and disordered world (Gleick, 1987; Waldrop, 1992; Uri, 1995; Marion, 1999; Lewin, 1992). Complexity, uncertainty, and constant change require a complex organizational model for flexibility, speed, and adaptation for adapting to complex environments as well as continuously learning and improving the operational system of a disaster management (Zhou et al., 2010; Jones et al., 2013).

The learning and adaptation is especially critical for local resiliency. Aaron Wildavsky defines resiliency as "capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back" (Bruneau et al., 2003). Comfort argues that local resiliency is about the capacity of local communities to adapt existing resources and skills to altered situations and operating conditions (1999). Mileti's words, it refers to the "capability of complex systems...to cope with changing conditions, to permanently adapt and, nevertheless, satisfy present needs" (Possekel, 1999, p.56). From this point of view, local resiliency represents a system where "a locality can tolerate and overcome damage, diminished productivity, and reduced quality of life from an extreme event without significant outside assistance" (Mileti, 1999, p.4).

Turkish disaster response system of the time reflects a linearly designed, centralized structure that basically involves central organizations and ministries at the central level and their local branches at the local level. The formal response system is designed by the disaster law and related regulations and assumed to work effectively in local communities. In case of a disaster, central organizations coordinate personnel and resources. While the municipalities have secondary roles, public organizations supervised by the provincial and district directorates have limited capacities to cope with the negative effects or bounce back in most local communities. The formal Turkish disaster response system is linear in the sense that it is assumed to adapt to and operate effectively in the altered conditions created by each and every disaster.

This study analyzes the inter-organizational network structure of the Turkish Disaster Management response to the 2006 Avian Influenza crisis. Based on a theoretical framework in complex adaptive systems, this research uses social network analysis to understand to what extent the formal disaster response system was sufficient to provide inter-organizational coordination in local communities. The main question of the study is *to what extent did the inter-governmental response network represent the linearly designed formal Turkish Disaster Management System?*

The study also addresses two sub-questions to reveal the complex adaptive capacity of the whole disaster response system:

- *To what extent did the local disaster organizations show sufficient capacity to support community resilience?*
- *To what extent did the disaster management system allow/facilitate multi-sector organizational response system/operations?*

2. Theory

Centralization versus localization is a critical policy problem in organizing disaster response systems. The preparedness of local communities on an optimal scale against disasters is critical for minimizing the risk to people and their properties. Building resilient local communities goes beyond the centrally organized command-control systems that put relatively less emphasis on improving the local capacity for resilience (Mileti, 1999). To accomplish sustainable resiliency, local governments and local residents should have more power and should take more responsibility in evaluating and allocating resources and designing policies to reduce the impacts of disasters (Platt, 1999; Mileti, 1999; Wang et al., 2014). Although the capacity of local communities is critical, their integration with each other and with the central organizations plays a key role in creating a resilient disaster system.

The complex adaptive system model provides important insights for creating an integrated and resilient disaster system that can self-organize for dynamic conditions. Complex adaptive systems are not in a state of equilibrium; they exist between chaos and order (Kauffman, 1993). Organizations or units that operate at "the edge of chaos" are neither tightly nor loosely coupled. The actors of the system have sufficient flexibility to exchange information and constantly rearrange themselves to adapt to new conditions (Marion, 1999; Battram, 1999). At the local level, there are many actors who collaborate based on information and general principles (Stacey, 2003; Cilliers, 1998). This micro level interaction and adaptation determines the system level of behavior (Marion, 1999, p.87).

A complex response system can be achieved through developing an emergent network, which is defined as set of organizations spontaneously acting at least in certain domains as a single coordinating unit and adapting to altered conditions (Topper and Carley, 1999). The emergent character is due to their spontaneous in response to environmental demands and also by design (Baker, in Topper and Carley, 1999). The network can create flexible and redundant modes of connectivity to distribute the information congestion and minimize the possibility of failure. Emergent network structures can find alternative ways to reach each other to overcome the problem of any failed node (Kapucu, 2005). The relationships among sub-systems and actors are very different from the relationships in the linear model of organization. Through accurate, valid and timely information supported by sufficient information technology, actors interact with other sub-units to enhance coordination (Comfort, 2002; Sappanen et al., 2013). These interactions lead to the emergence of a flexible organizational network as opposed to a rigid, pre-structured disaster management system (Celik and Corbacioglu, 2010, 2012). In such an organizational design, horizontal coordination and teamwork comes to the forefront, while management based on a central hierarchical authority, strict regulations, and control is avoided (Morcol, 2001).

In contrast, the linearly designed fixed structure is based on command and control and assumed to work like a machine; however, when symmetry breaking events such as disasters occur, the linear structure easily breaks down and cannot easily bounce back

Please cite this article in press as: Celik, S., Corbacioglu, S. From linearity to complexity: Emergent characteristics of the 2006 Avian Influenza Response System in Turkey. Safety Sci. (2016), http://dx.doi.org/10.1016/j.ssci.2016.01.006