Chapter 1
Building Resilience Through Effective Disaster Management:
An Information Ecology Perspective

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ABSTRACT

Existing literature argues that taking a holistic approach to disaster management is important for organizations in building resilience. Theoretical underpinnings to achieve a holistic understanding, however, is lacking. This article applies the notion of an ecosystem as a holistic lens to understand complex disaster management. The paper reports two case studies from Japan and Nepal to illustrate how an ecosystem works during a disaster. The theoretical framework of information ecology is used in analyzing the cases. Based on the findings, the study shows three interconnected mechanisms that can build resilience of an ecosystem in a disaster management context, namely (1) coevolution, (2) collaboration, and (3) embeddedness of local knowledge. The authors argue that coevolution is a key to respond to constantly changing situations during a disaster. To accomplish ecosystem coevolution, creating a collaboration system with governments and local communities and embedding local knowledge into the system are essential. Furthermore, digital tools can play a critical role in the coevolution process.

INTRODUCTION

Sometimes, a series of earthquakes and their effects may last for several months. Recently, numerous large earthquakes hit central Italy in August and October 2016 and January 2017. Similarly, in 2010, a 7.0 magnitude earthquake hit Haiti, which caused economic damage of around USD 13.9 billion and up to 250,000 casualties. Because of the intensity of the earthquake, it was difficult for relief organizations to meet basic needs in the field (Starbird & Palen, 2011). After Typhoon Haiyan hit the Philippines in 2013, the port of Tacloban and neighboring areas were destroyed, and some buildings were carried

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away by the storm which required more than several years to recover from the devastation. These events show that we need to consider how to deal with the consequences of disaster events, not only during the aftermath but also by protecting against and preventing long-term consequences before events occur. Disaster management demands more personnel to handle new problems that arise in the field (Post & Diltz, 1986). Different types of demands and responses should emerge in such an environment, and disaster management requires different levels of capacity in the system (Comfort, Ko, & Zagorecki, 2004). The lessons we can extract from previous studies (when we consider effective disaster management) suggest that examining each organization in isolation is not enough; a holistic approach (Ritchie, 2004) is important (Baharmand, Boersma, Meesters, Mulder, & Wolbers, 2016; Soden, Budhathoki, & Palen, 2014). During a disaster, we should consider organizations not as stable states (Holling, 2004) but as entities that coevolve to adapt to a particular situation.

In this regard, resilience, which refers to the capability to absorb disturbances (Holling, 1973), is a purpose that disaster relief organizations should achieve in disaster management. Studies show that disasters are naturally complex phenomena, involving international and national organizations and individuals from local communities, and most disaster cases are unpredictable (Perrow, 1983, 1984). The core idea of resilience is to see disturbances as opportunities for a recombination of structures and processes; further, resilience provides adaptive capacity (Smit & Wandel, 2006). Resilience identifies the capacity for collective action in the face of unexpected extreme events that shatter infrastructure and disrupt normal operating conditions (Comfort, Siciliano, & Okada, 2011) and the capacity of a community to mobilize action in response to the threat, once it has occurred (Comfort, Sungu, Johnson, & Dunn, 2001). Although the literature reflects different views of resilience, this paper regards resilience as a set of adaptive capacities (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008) to reorganize the functions of a community while a situation changes all the time during a disaster. The goal in emergency management should not be set as returning to an equilibrium state; instead, we should create an ecosystem to support gaining these capabilities in the field. Then, the question arises, how can we create such an effective and efficient ecosystem?

There is a growing body of literature that uses the ecosystem and socio-ecological perspectives (Adger, Hughes, Folke, Carpenter, & Rockström, 2005; Berkes, Colding, & Folke, 2003; Gunderson, 2000, 2001) as means to understand the nature of resilience in a societal context. Resilience also refers to ecological systems which are recognized as a measure of a system's persistence and the ability to absorb disturbances while maintaining the existing relationships between system entities (Holling, 1973). Based on this understanding, resilience theory envisions ecosystems as constantly changing and reorganizing processes (Berkes, 2007) which indicates that adaptive capacity can affect its ecosystem shapes. Agder et al. (2005) suggest that resilient socio-ecological systems reduce vulnerability to the impacts of a disaster and enhance a positive response which must last for a long time after the event. They also argue that resilient socio-ecological systems incorporate diverse mechanisms for living with, and learning from, change and unexpected shocks. In this sense, resilient socio-ecological systems work as a driving force for a community's reorganization process.

Existing studies advocate the importance of resilience as a strategy that each disaster relief organization should possess, and the usefulness of an ecosystem point of view as a holistic approach to resilience. However, we lack theoretical underpinnings to explore ecosystem activities during a disaster situation. To contribute to a similar research strand, this paper applied the information ecology framework to describe how an ecosystem works during a disaster situation and what roles digital tools can play in such a situation. The information ecology is considered a complex system of parts and relationships. It exhibits