An Exploration of Organizational Capabilities for Emergency Response

Research-in-Progress

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ABSTRACT (REQUIRED)

In this paper, we examine emergency response through the theoretical lens of organizational capability literature. Specifically, we theorize the crucial roles of dynamic capability and improvisational capability in improving functional competence of emergency management, which in turn determines main response outcomes such as response effectiveness and stakeholder satisfaction. We also discuss the likely value of IT leveraging capability in cultivating organizational dynamic capability and improvisational capability in emergency response. Based on emergency literature, we identify four imperative information technologies that are likely to cultivate IT leveraging capability in emergency management. Finally, we theorize the potential relationships between dynamic and improvisational capabilities. Expected findings of the paper will make contributions to the studies of emergency management and inform practitioners such as emergency technology developer and first responders.

Keywords (Required)

Emergency management, organizational capabilities, theorization, research-in-progress

INTRODUCTION

Emergency management is the process of gathering and deploying resources to reduce loss of life and property when an incident strikes (Shen and Shaw 2005). Despite its tremendous importance to the society, emergency management is an understudied research area. A majority of the existing literature explored technical designs of emergency technologies. Little is known about managerial strategies in emergency response and the strategic use of cutting-edge information technologies to assist response efforts.

This research-in-progress concerns research questions of (1) "What organizational capabilities (both IT and non-IT) are imperative to emergency management?" and (2) "How do they interact to jointly influence emergency management?" This article attempts to make several contributions to the literature. First, we theorize the crucial roles of dynamic capability and improvisational capability in improving functional competence of emergency management. We contend that these organizational capabilities jointly influence functional competency of emergency management, which in turn determines main response outcomes such as response effectiveness and stakeholder satisfaction. Prior emergency studies have seldom applied relevant, established theoretical foundations to explain the phenomenon of emergency response (Chen et al. 2010). Second, we discuss the likely value of IT leveraging capability for organizations that function under extreme challenges. We argue that IT leveraging capability directly cultivates dynamic capability and improvisational capability. Third, we discuss four imperative information technologies that are likely to cultivate IT leveraging capability in emergency response. Key emergency response technologies are such as communication system, resource management system, knowledge management system, and coordinative work system. Fourth, we theorize the potential relationships between dynamic and improvisational capabilities. Specifically, we expect that dynamic capability fosters improvisational capability.

The rest of the paper is organized as follows: the subsequent section briefly reviews the literature as well as the theoretical underpinning of the current study. Next we present the research model and propositions. We conclude the paper by presenting the proposed research methodology.

THEORETICAL BACKGROUND

Theoretical Background

In this paper, we study emergency response management through organizational capability literature. Organizational capability is defined as "a set of differentiated skills, complementary assets, and routines that provide the basis for a firm's

competitive capacities and sustainable advantage in a particular business" (Teece et al. 1990). Capabilities subsume the notion of organizational competencies and transform inputs into outputs of greater value (Capron and Hulland 1999; Christensen and Overdorf 2000). Organizational capability literature is applicable to the research in emergency response. In the United States, emergency response is a well-organized management practice following the principles of incident command systems defined by U.S. Department of Homeland Security.

Capability literature underscores IT capability as an enabler of superb organizational processes within challenging task environment (Bharadwaj et al. 1999). The advancements of information systems have made emergency response information technologies readily available for first responders. Commercial off-the shelf systems such as DisasterLAN, E-Team, and WebEOC have been widely adopted by response professionals at Federal, state, and municipal levels across the United States. The deployment and utilization of these technologies foster IT leveraging capability that is of great interest to emergency practitioners (Auf der Heide 1989; Housel et al. 1986). Within the current research context, we define IT leveraging capability as the ability of emergency organizations to effectively use IT functionalities to support emergency management activities. Bharadwaj suggested that technology capabilities combine or co-presents with other organizational capabilities (Bharadwaj 2000). And thus, we consider other important organizational capabilities that may benefit from IT leveraging capability.

Emergency management operates within a challenging environment as response tasks are mostly non-routine and incident scenarios often change during the course of mitigation. It is therefore imperative that response organizations stay flexible, responsible, and innovative while attacking an ongoing incident. In the current study, we focus on two organizational capabilities that are important to organizations that operate in turbulent task environment. Dynamic capability is defined as "the ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" (Teece et al. 1997). It assumes sufficient time for organizations to conduct planning in response to anticipated environment events. Meanwhile, improvisational capability refers to the organizational ability "to spontaneously reconfigure existing resources to build new operational capabilities to address urgent, unpredictable, and novel environmental situations" (Pavlou and El Sawy 2010). In opposite to dynamic capability that functions well when an environment is characterized by predictable patterns of changes, improvisational capability is best suited for organizations to perform in an environment with high velocity of unanticipated changes (Pavlou and El Sawy 2010).

In the reminders of this article, we will explore the phenomenon of organizational management of emergency response through IT leveraging capability, dynamic capability, and improvisational capability.

CONCEPTUAL MODEL AND RESEARCH PROPOSITIONS

In this section, we present the conceptual research model which is shown in Figure 1.

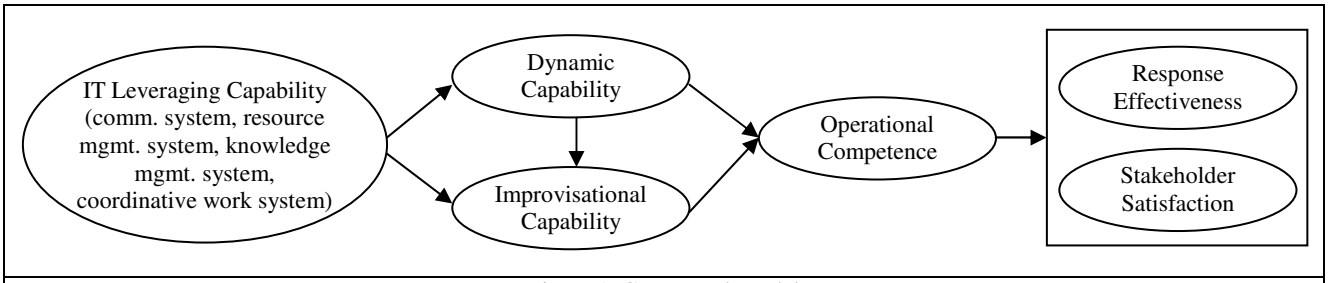

Figure 1. Conceptual Model

Findings of extant literature on emergency response suggest IT leveraging capability as a multi-dimensional construct: communication system, resource management system, knowledge management system, and coordinative work system. Communication systems are IT tools that allow incident responders to share information and intelligence (Manoj and Baker 2007). Incident responders have adopted communication systems such as wireless networks, 800M Hz radios, and satellite phones. These systems enable responders to stay connected, share task critical data, and foster situational awareness. Resource management systems grant responders with the ability to identify, mobilize, and deploy response resources. Resources are often limited in response districts due to a lack of financial resources. To this end, resource management systems are employed to manage personnel and organizational contacts, training, certification, and special skills; equipment inventory for organizations, departments, and facilities; and equipment description and specification. Knowledge management systems, such as knowledge coding, digital asset systems, expert directory, and retrieval features, support the acquisition and exploitation of response pertinent knowledge (Turoff et al. 2004). Through the access to public and private

knowledge repositories, responders obtain the stock of knowledge that is cumulated over time and consequently transfer and apply it to the current incident response (Murphy and Jennex 2006). Coordinative work systems, such as computer aided dispatch, status board, GIS support, and chat and conferencing, establish a global operational picture of an ongoing incident response and assist in task coordination and collaboration (Chen et al. 2008b). A global operational picture is pivotal to ensure that responders are on the same page in terms of collective response operations that involve all response task forces.

Organizations exercise dynamic capability in response to predictable and anticipated task environmental changes (Pavlou and El Sawy 2006). A good portion of task environment turbulence is more or less predictable to experienced responders. For example, a growing household fire within a crowded neighborhood is very likely to spread; mitigation of this anticipated fire escalation will require the mobilization of extra fire engines and evacuation of local residents, which can be completed by consulting the protocols and involved stakeholders within a reasonable amount of time. In the context of emergency response, recent studies have suggested several processes that are relevant to dynamic capability: reconfiguring response resources to better match an ongoing emergency incident; accessing to response knowledge; management of task critical information; sensing, understanding, and projecting the threats that originate from an incident; coordinating response operations, and integrating multi-agency for co-evolving taskforces (Bharosa and Janssen 2009; Chen et al. 2010; Oakley 2012). Given its rich, matching supports to the many dynamic capability processes in emergency management, we expect that IT leveraging capability will positively contribute to dynamic capability. Hence, we expect:

Proposition 1: IT leveraging capability will positively associate to dynamic capability.

Improvisational capability is vital to organizations when they face unanticipated events that have to be attended to instinctively. Improvisation during emergency response is challenging because each incident is unique. Standard operating procedures of incident response will not be able to address the entire contingency, as a consequence, first responders have to design and implement novel response tactics on the fly. To improvise, responders need to assess the current situation and determine what is unplanned for, to what extent planned-for procedures do not apply to the present situation, when to improvise, and how to improve during incident response. Emergency response literature has highlighted several mechanisms that help improvisation: referring to standard operating procedures, basic guidelines, and frameworks; and enacting strategies based on recognizing characteristics of past response problems in current response situation (Mendonca 2007). IT leveraging capability contributes to improvisational capability as it offers situational awareness and assessment through communication, supplies knowledge of fundamental response tactics and past experience, and enables quick implementation through resource management and coordinative work supports. Hence, we expect:

Proposition 2: IT leveraging capability will positively associate to improvisational capability.

Based on the extant literature, Chen et al. recognized emergency management as consisting of "mini-second" response and "many-second" response (Chen et al. 2008a). In mini-second response, onsite first responders mitigate the immediate threats that originate from a hazard. This response is reactive in nature; responders operate within a short time window and with a local picture stemming from the local scenario. Given the fact that each incident is unique, first responders improvise a lot during mini-second response. In many-second response, secondary responders provide support functions to assist those who fight at the front line. Actions of these responders are based upon a more reflective and proactive posture; they operate with a global operating picture and a large time window. Specifically, secondary responders closely assess the ongoing response efforts (e.g., success or failure in prior actions) and monitor the surrounding task environment (e.g., forecasted wind direction) so as to calculate the likely changes in incident scenario. They act upon these anticipated changes to seize opportunities in refining mini-second response operations by supplying the to-be-needed resources and knowledge and offering suggestions for alternative response strategies. To this end, improvisational capability contributes to the success of mini-second response process where unexpected contingency has to be addressed spontaneously. Meanwhile, dynamic capability helps many-second response process by reconfiguring response resources to handle the predictable changes that may take place during the course of incident mitigation. As discussed, dynamic and improvisational capabilities help organizations to leverage their resources and create new routines to complete response processes under trying condition. We therefore expect that they will contribute to emergency response functional competency, which is defined as the ability to effectively execute operational emergency response processes:

Proposition 3: Dynamic capability will positively associate to functional competence.

Proposition 4: Improvisational capability will positively associate to functional competence.

Dynamic capability functions following the logic of "planned opportunity" (Pavlou and El Sawy 2010). Given necessary time between planning and execution, organizations undertake planning process to address anticipated contingencies. By strengthening dynamic capability, an organization enriches its repository of preplans and improves its preparedness in response to any future events in the task environment. While improvisational capability may act outside of existing formal

plans, it often benefits from preparedness within an organization. Kreps pointed out that "improvisation and preparedness go hand in hand. One needs not worry that preparedness will decrease the ability to improvise. On the contrary, even a modest effort to prepare enhances the ability to improvise" (Kreps 1991). Capability literature also echoed that skillful and fruitful improvisation is a result of existing organizational capabilities (Brown and Eisenhardt 1995; Miner et al. 2001; Weick 1993). Therefore we expect that improvisational capability may be cultivated by an accumulation of dynamic capability. When response organizations are versed in responding to incidents with agility and flexibility, they are more comfortable in responding to non-routine tasks and are more likely to succeed in leveraging known strategies and plans in a novel manner to address unexpected and unplanned for task scenarios. Hence, we expect:

Proposition 5: Dynamic capability will positively associate to improvisational capability.

Next, we expect that a higher functional competency of emergency response organizations will lead to positive emergency response outcomes. When a response organization is equipped with greater competency to execute operational emergency response processes (e.g., firefighting and rescue), they are more likely to reduce the loss of human lives and properties and to satisfy the affected community.

Proposition 6: Functional competency will positively relate to response effectiveness.

Proposition 7: Functional competency will positively relate to stakeholder satisfaction.

CONCLUSION

To validate the research model, we will use survey methodology to solicit data from chiefs of emergency response organizations. Chiefs are the key informants as they are knowledgeable about the daily operations at own organizations. We will test the research model using structural equation modeling analysis tools such as partial least squares (PLS) which employs a component-based approach for estimation and places minimal restrictions on sample size and residual distributions. PLS is suited for testing models that contain both reflective and formative constructs (Chin 1998). In our model, IT leveraging capability will be modeled as a formative construct due to its multi-facet nature. PLS also supports exploratory research. Our paper studies an important yet understudied research topic that is IT assisted emergency response; PLS is therefore appropriate. We will test the measurement model for construct validity, reliability, and common method bias. In addition, we will test the structural model for path significance.

The current paper attempts to make several contributions to the literature of emergency response and organizational capabilities. First, we theorize the potential values of dynamic capability and improvisational capability in improving functional competence of emergency management. Second, we discuss the likely importance of IT leveraging capability for organizations that function under extreme challenges. Third, we explore four major, supportive information technologies that cultivate IT leveraging capability in emergency response. Fourth, we theorize the intricate relationships between dynamic and improvisational capabilities. Expected findings will inform practice. First, the results will validate the value of IT leveraging capability. Commercial vendors who design emergency response technologies may prioritize their development efforts by focusing on the identified supportive emergency technologies and keep refining the levels of system support to incident mitigation. Meanwhile, emergency response community may use the findings to justify their investments in IT systems and prioritize their investments on the various emergency systems. Also, emergency responders may look for strategies that improve their dynamic and improvisational capabilities, in an attempt to strengthen their operational competency for better response outcome.

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