Chapter 21

Design Principles for Crisis Information Management Systems:
From Closed Local Systems to the Web and Beyond

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ABSTRACT

Since Hurricane Katrina, a lot of research has gone into improving disaster management through the use of crisis information management systems (CIMS). There has been much interest in how to design dynamic CIMS, particularly with respect to web-based emergency management systems. In the authors' research, they set out to design and develop a distributed web-based training and research tool for emergency managers and scholars. In order to develop their training system, they needed to simulate the CIMS that emergency managers use during a crisis and with which they could run training and research simulations. This raised the question: What exactly is a CIMS, and how does one design one? In order to answer this question, the authors engaged in nine months of field research at the Miami-Dade Emergency Operations Center in Miami-Dade County, FL. Through their field research and the emergency management experience of one of the authors, they identified several additional design principles for CIMS in today's technological and communication landscape. This paper outlines the resulting recommendations.

INTRODUCTION

A crisis is defined as "any event that threatens to, or actually does, inflict damage to property or people." (IS -1, n.d.). Crises can be small or large in scale. In large-scale crises, there usually is a significant probability of extreme danger and highly unpredictable outcomes (Leadership in Crisis, 2010). Small- or large-scale crises can occur at any time, and the consequences can be enormous. At the height of the H1N1 influenza outbreak between 2009 and 2010, 61 million people became infected with this virus. In addition, H1N1 caused approximately 274,000 hospitalizations and 12,500 deaths (CDC, n.d.). In 2004, the Indian Ocean earthquake and tsunami affected approximately 5 million people in Indonesia, Sri Lanka, India, and the surrounding areas. Over 280,000 people died, and more than 1 million people were displaced (World Health Organization, n.d.). In the US, Hurricane Katrina was one of the most expensive and devastating natural disasters in American history (Rabkin, 2005). Over half a million people were affected by the hurricane, and the US energy infrastructure was severely damaged (Rabkin, 2005). In 2012, Hurricane Sandy swept through the Northeastern United States. Seventy-two people died and 8.5 million people lost power. More than 650,000 houses were damaged or destroyed (Blake et al., 2013). Hurricanes Katrina, Sandy and other crises clearly show the importance of disaster preparedness. Indeed, much can be improved, especially with respect to training and collaboration among federal, state, and local governments (Agrait et al., 2004; Auf der Heide, 1989; Dorasamy & Raman, 2011; Holguín-Veras et al., 2007; Rabkin, 2005; Waugh & Streib, 2006). Specifically, one area that can be improved is the design of crisis information management systems (CIMS) (Catarci et al., 2011; Grant, 2008; Gryszkie-wicz, 2012; Gryszkiewicz & Chen, 2012; Onorati et al., 2011; Turoff et al., 2004).

The remainder of this paper is structured as follows. We begin by discussing differences between CIMS and general information systems. Next, we discuss how CIMS has grown with technology and co-evolved with the web. Following this, we review current theory on the design of crisis information management systems. After that we present our recommendations for CIMS. Finally, we conclude with implications and future directions of CIMS.

BACKGROUND

Evolution of CIMS: Similarity to and Differentiation from Information Systems

What is a crisis information management system? A CIMS is a vehicle that aids in storing, retrieving, analyzing, and organizing information; managing resources; maintaining situational awareness; supporting a common operating picture; establishing and maintaining command and control; facilitating decision-making; and collaborating with other emergency managers and agencies to aid in orchestrating response efforts. CIMS are computer-based software systems and they are, in effect, a specialized type of information system (IS).

IS grew out of the business and management domain (Hirschheim & Klein, 2012). IS historically has been based on designs to provide support for components of the organizations dealing with different types of decisions and processes requiring different types of information, such as transaction process-ing, accounting and finance, mid-level decision-making, operations management, and strategic planning (Davis & Olson, 1985; Keen & Scott Morton, 1978). Central to these types of systems, and similar to CIMS, was the ability to create and maintain a situational "image" of the firm's status, driving decisions

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