Chapter 63
Enhancing Emergency Response Management using Emergency Description Information Technology (EDIT): A Design Science Approach

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ABSTRACT

This paper presents a novel approach toward facilitating the effective collection and communication of information during an emergency. Initially, this research examines current emergency response information workflows and emergency responder dispatch criteria. A process for the optimization of these workflows and criteria, along with a suggested method to improve data collection accuracy and emergency response time using a mobile device application, are suggested. Specifically, a design-science approach incorporating the development of an expert system designed to facilitate efficient and effective sharing of emergency information is applied. The resulting benefits could improve emergency communications during large-scale international gatherings, such as sporting events or festivals, as well as the sharing of industry-specific safety incidents. A process model for conducting analyses of additional emergency response processes is also presented. Finally, future research directions are discussed.

1. INTRODUCTION

Denver, Colorado, a city with a population of over 634,000 individuals, has an emergency-communications network with a failure rate of one-in-every-five emergency calls. Dispatchers failed to meet emergency response time standards more than 1,070 times. Additionally, addresses of incidents had been misreported, crucial emergency location information was never received, and dis-

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patcher mistakes have led to at least one wrongful death lawsuit due to a failure "to supervise and train its emergency-communications operators and police dispatchers" (Osher, 2013). Such communication failures are not unique to Denver and impact emergency call centers globally.

According to the National Emergency Number Association (NENA), there are over 6,000 public-safety answering points (PSAPs) in the United States alone (NENA, 2014). Public safety representatives suggest that a large number of emergency calls cannot be completed, as the current generation of wireless communication technology cannot adequately determine the position of a caller (Fung, 2014a). Additionally, of one thousand PSAPs, only 187 report a 'great deal' of confidence when receiving data from wireless carriers (Fung 2014a). Furthermore, it has been stated that only 2% of all PSAPs can receive and interpret short messaging service (SMS) data. Yet, over 70 percent of the 400 thousand individuals in the United States that call PSAPs each day connect via mobile devices. Most of these mobile devices likely had the capability to transmit SMS data. While the United States Federal Communications Commission (FCC) recently voted to mandate that all cellular service providers must support the capability of mobile devices to connect to PSAPs using SMS, it is still unclear how incident location information will be provided to dispatchers (Fung 2014b).

While PSAPs are challenged by technical constraints, they must also deal with human communication barriers, including excess background noise, language barriers, caller hysteria, or the inability to precisely describe the incident location. As these challenges exist during normal PSAP operation, large-scale public events further highlight the need for an improved process and technology. For instance, public events, such as the London Olympics, the Munich Oktoberfest and the Vienna Donauinselfest attract 680 thousand international visitors, 6.4 million total visitors and over 1 million international visits, respectively (Office for National Statistics, 2012; Oktoberfest, 2013; Die Presse, 2014). International visitors to such large-scale public events may not be familiar with local emergency telephone numbers, may not know the local language sufficiently to explain details of an emergency, and may not be familiar enough with a city to adequately describe the emergency location. Surprisingly, the information systems literature barely addresses such issues. One exception is Yang, Su, and Yuan (2012) who researched fire disasters at major public events, including the 2008 Beijing Olympics, and stated that a key to their design was to understand user requirements. Thus, this research project approaches the design of an improved communication technology from the perspective of emergency communications operators who rely on accurate and detailed emergency information to make life-saving decisions.

The purpose of this research is to conceptualize, design and develop a mobile expert system to optimize emergency reporting. The development of such a system aligns with the global initiative of modernizing government services to support contemporary technologies. Surprisingly, the information systems scholarship, and more specifically the e-government research area, has largely avoided addressing the reporting, collecting and disseminating emergency information. For example, between 2003 and 2013, the 'basket of eight' top information systems journals address this issue in only six relevant studies (Venkatesh, 2013). See Table 1 for more information on these studies.

This paper addresses this research gap by evaluating key requirements for a mobile application to optimize the sharing of emergency information with local emergency response resources, as well as developing a prototype of such an application. An understanding of how individuals can benefit from an intelligent system to ensure accurate collection and communication of emergency data provides a unique exploration opportunity for the information systems scholarship. For instance, while numerous systems designed to collect public

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