Chapter 76
Identifying First Responders Information Needs:
Supporting Search and Rescue Operations for Fire Emergency Response

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ABSTRACT

At the onset of an indoor fire emergency, the availability of the information becomes critical due to the chaotic situation at the emergency site. Moreover, if information is lacking, not shared, or responders are too overloaded to acknowledge it, lives can be lost and property can be harmed. Therefore, the goal of this paper is to identify information items that are needed for first responders during search and rescue operations. The authors use an educational building fire emergency as a case and show how first responders can be supported by getting access to information that are stored in different information systems. The research methodology used was a combination of literature review, fire drills participation, and semi-structured interviews with first responders from different emergency organizations. The results presented are identified information items and an information model.

INTRODUCTION

Fire is one of the most frequently occurring emergencies that causes loss of lives and infrastructure destruction (Alamdar, Kalantari, & Rajabifard, 2016; Li, Yang, Ghahramani et al., 2014). In Norway, the fire statistics for the year 2014 shows that fire emergencies caused 54 deaths (BrannVernforeningen, 2014a) and almost 4 billion NOK economic damage (BrannVernforeningen, 2014b). In case of fire emer-

gencies, rescuing people from areas filled with smoke and fire might get decreased due to unavailability of needed information. Therefore, it is important for first responders to improve their search and rescue operations by reducing the time spent on information search and more on rescuing people.

The purpose of the Search and Rescue operation is to "prevent loss of life and injury through search, locate and rescue persons in distress by alerting, responding, and aiding activities using public and private resources" (Abi-Zeid & Frost, 2005). As a case study, we consider fire emergency in the university building. An important factor that affects the effectiveness of the search and rescue operations is the availability of information related to the topography of the building and its occupants. The baseline information which is needed for first responders is stored in different university systems and may not be accessible by the first responders at the emergency location due to security, privacy and legal issues. Hence, first responders usually collect information from questioning the security personnel at the campus or the victims and by investigating the location visually (Gursans Guven, 2011).

Victims may be under shock and gathering information from them is very time consuming and the collected information may be incomplete. Consequently, first responders have to spend a lot of time for collecting information. Moreover, the collected incomplete information prevents responders from developing situational awareness and may result in harm to people or property.

Situational Awareness (SA) can be described as the state of understanding that a responder has of an emergency situation, that means the dynamic understanding of 'what is happening', especially with respect to the needs of command and control operations (Vieweg Sarah, 2010) (Endsley, 2000). Sarter and Woods defined SA as "all knowledge that is accessible and can be integrated into a coherent picture, when required, to assess and cope with a situation" (Sarter, 1991; Vieweg, 2010).

The research question that we address in this paper is: "Which information items are needed by the first responders for an effective fire emergency response?" We address this research question through a combination of literature review, fire drill participation, and semi-structured interviews conducted with first responders from different crisis response organizations and civil protection authorities. The objective of addressing this question is that first responders' search and rescue operations can be improved by providing access to the immediately needed or relevant information at the emergency site before or during the search and rescue operation. On the basis of the collected, a UML information model is developed and validated with first responders' feedback.

The rest of the paper is organized as follows. First we describe an indoor fire emergency scenario which was used to know the information list that is needed by the different emergency responders as well as to collect from the literature review and then the research methodology which was used to identify the information needs of first responders is explained. Later, literature review on recent studies on needed or relevant information items during fire emergency management is presented and then the results are presented. Finally, the discussion and conclusion part summarizes the lessons learned from this research and discusses directions for future research.

EMERGENCY SCENARIO

Emergencies can vary greatly. For each kind of emergency, responders require different information and procedures to handle them. In this paper, we concentrate on one specific case to illustrate how to identify information needs of first responders to manage search and rescue operations efficiently.

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