DSS for Health Emergency Response:
A Contextual, User-Centred Approach

Dimitris Oikonomou, University of the Aegean, Greece
Vassilis Moulianitis, University of the Aegean, Greece
Dimitris Lekkas, University of the Aegean, Greece
Panayiotis Koutsabasis, University of the Aegean, Greece

ABSTRACT

This paper presents the design approach and architecture of a Decision Support System (DSS) for the Hellenic Centre for Emergency Health Care (EKAB, http://www.ekab.gr). The DSS supports the cooperation and decision-making processes at the EKAB call centre concerning the effective activation and allocation of appropriate resources mainly: ambulances, healthcare personnel and other public emergency resources like fire fighting and police. The DSS is a geographic web-based mash-up that builds on top of existing information systems and databases, and collects, aggregates, records, and presents various types of dynamic information about medical incidents in real time, promoting evidence-based medicine. The system provides a number of user interfaces (web-based and mobile) for call centre operators, radio centre operators, ambulance personnel, and administration. A contextual approach was necessary for the design of the system based on various related methods. Field observation of the current ways of work at EKAB sites, design, and development of data resources and user interfaces were conducted.

Keywords: Contextual Design, DSS, Health Emergency Response, Mash-Up, User-Centred Approach, Web-Based

1. INTRODUCTION

Medical decision-making is influenced by numerous factors that can be classified according to Haynes et al (2002) into: (a) research evidence relevant to a clinical problem or decision; (b) physiological rationale; (c) individual experience. In addition, the context of decision-making severely affects the choice and mix of decision criteria: decisions tend to rely solely on human judgment when the timeframes are short, the situation is stressing, the available information is incomplete, and when there is a lack of recorded evidence about similar past situations. Health emergency response is a perfect example of such a stressing environment: it requires the intense and continuous cooperation and decision-making of various people and roles.

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involved in life-critical situations of providing urgent medical care.

Health emergency response systems have been studied from a number of perspectives. A large stream of research has focused on service optimisation issues (Derekenaris et al., 2001; Yoo et al., 2005; Haghani & Yang, 2007); other systems emphasise on technology related to network and information technology integration (Kyriacou et al., 2003); while other approaches focus on remote medical intervention through telemedicine (Chu & Ganz, 2004). Regardless of the focus of each approach, it is widely admitted that any approach for health emergency response should build upon current norms, practices and knowledge of people and organisations involved. According to Carver and Turoff (2007, p. 38) “a user-centred systemic approach is required with a major emphasis on user requirements driving technological developments (for the design of emergency response systems)”.

The proposed DSS is a geographic, web-based mash-up application that integrates and represents various types of dynamic information about health emergency response (like location of incident on city maps, dynamic indication about road traffic, progress status about the incident, etc.) in a similar way to other web-based dynamic mash-ups like the open-access system of marine traffic (http://www.marinetraffic.com) (Lekkas et al., 2008). The DSS delivers useful information at the coordinating centre and the points of care and records incident management data like calls, transportations, hospitals’ treatment, patients’ health problems and response times. This provides the necessary data and network infrastructure for evidence-based decision making. Evidence-based decisions do not rely on human judgement and previous clinical experiences alone, but take into account a wide range of data about the situation at hand including recorded past similar cases.

The paper is structured as follows: Section 2 presents related work in terms of a review of approaches and systems supporting health emergency response and background in terms of the user-centred methods used for this work. Section 3 presents the contextual analysis which took place at the sites of EKAB and identified the particular ways of work highlighting breakdowns and requirements for the proposed DSS. Section 4 presents the design of the DSS for health emergency response focusing on its functional architecture and the user interfaces; in addition, the first positive evaluation results are outlined. Finally, Section 5 presents the discussion and conclusions of this work.

2. RELATED WORK AND BACKGROUND

A. A Review of Relevant Systems for the Support of Health Emergency Response

The area of health emergency response has been studied extensively in scientific literature. A large stream of this work deals with addressing technical and optimisation issues to minimise
Medical Robotics: State-of-the-Art Applications and Research Challenges
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