ABSTRACT

In complex emergency/disaster scenarios, persons from teams from various emergency-response organizations collaborate to achieve a common goal. In these scenarios, the use of smart mobile devices and applications can improve the collaboration dynamically. The lack of basic interaction principles can be dangerous, as it could increase the level of disaster or can make the efforts ineffective. This paper examines the main results of the project WORKPAD finished in December 2009. WORKPAD worked on a two-level architecture to support rescue operators during emergency management. The use of a user-centered design methodology during the entire development cycle has guaranteed that the architecture and resulting system meet end-user requirements. The feasibility of its use in real emergencies is also proven by a demonstration showcased with real operators. The paper includes qualitative and quantitative results and presents guidelines that can be useful in developing emergency-management systems.

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INTRODUCTION

Due to the recent increase of safety threats like environmental disasters or terrorist attacks, Crisis Response has become a relevant application field for the development of new information technologies. In this context, team members need to collaborate in order to reach a common goal. The use of mobile devices and applications is valuable for the improvement of collaboration, coordination and communication amongst members of team(s) to achieve the desired goals. But there are also risks in the usage of mobile applications, e.g., decrease of performance. In emergency/disaster scenarios most of the tasks are highly critical and time demanding; for instance, in such scenarios the saving of minutes can result in saving people’s lives. Therefore it is unacceptable to use systems that lack proper interaction principles.

The European project WORKPAD (www.workpad-project.eu) achieved to provide an architecture that intends to improve the collaboration in emergency management. According to the initial user requirements collection (de Leoni et al., 2007), and by the analysis of how Emergency Management is faced in the different European countries, the consortium learned that the most suitable architecture is two-level: a first level is deployed on the spot and a second level involves the servers of the different rescue organizations. There are several front-end teams on the field, each composed of several rescue operators. Rescue operators are equipped with PDAs and their work is orchestrated by a Process Management System (PMS) which is located on the team leader’s PDA. In fact, based on several studies of emergency plans and end-user interviews, emergency plans can be seen as special cases of business processes (de Leoni et al., 2010). The Process Management System manages the execution of emergency-management processes by orchestrating the human operators with their software applications and some automatic services to access the external data sources and sensors. The use of a PMS aims at improving the efficiency and effectiveness in dealing with the emergency’s aftermath, thus reducing the event’s consequence. At the back-end side data sources from several servers are integrated and the result is a single virtual data source that front-end devices can query, thus obtaining information aggregated from several sources.

The development of WORKPAD followed a methodology focused on user-centered design principles (Dix et al., 2003). This methodology relies on continuous involvement of users during the whole development cycle which guarantees that the final system meets user expectations. The section “Overview of the usability evaluation methodology” will provide detailed information about the different types of user tests performed within the scope of the project.

The feasibility of the WORKPAD system is demonstrated by a drill that the project consortium showcased on 18th June 2009 in the village of Pentidattilo (Calabria, Italy). In particular we simulated the occurrence of an earthquake and asked real users from different rescue organizations to deal with the situation by using WORKPAD. A video that illustrates the successful showcase is available at http://www.youtube.com/watch?v=48Hs5Qwg0ho. The section “Workpad Showcase” gives more details on a showcase storyboard and illustrates the interaction among the WORKPAD components. The section “Showcase Results” summarizes the showcase results and provides information on the user evaluation, whereas the section “Lessons Learned” mentions some guidelines which were established based on the evaluation results.

The existence of two levels in the architecture and the strong focus on user evaluation is a novelty compared with other relevant research projects in the area of emergency management, such as SHARE (http://www.share-project.org), FORMIDABLE, EGERIS (http://www.egeris.org) and ORCHESTRA (http://www.eu-orchestra.org).