A Participatory Approach to Designing Decision Support Systems in Emergency Management

Pietro Baroni, Department of Information Engineering, University of Brescia, Brescia, Italy
Daniela Fogli, Department of Information Engineering, University of Brescia, Brescia, Italy
Massimiliano Giacomin, Department of Information Engineering, University of Brescia, Brescia, Italy
Giovanni Guida, Department of Information Engineering, University of Brescia, Brescia, Italy
Loredana Parasiliti Provenza, Department of Information Engineering, University of Brescia, Brescia, Italy
Michele Rossi, Department of Information Engineering, University of Brescia, Brescia, Italy
Marko Bohanec, Jožef Stefan Institute, Ljubljana, Slovenia
Martin Žnidaršič, Jožef Stefan Institute, Ljubljana, Slovenia

ABSTRACT

This article presents a participatory design approach to Decision Support Systems, which is specifically built to face the socio-technical gap that often impedes DSS acceptability by end-users in real work environments. The approach has been experimented in two case studies in the field of health-related emergencies, namely earthquake and pandemic flu. The application of the approach and the results obtained are described with specific focus on the phases of requirement analysis and system evaluation.

Keywords: Decision Support Systems, Emergency Management, Evaluation, Participatory Design, Requirement Analysis, Socio-Technical Gap

DOI: 10.4018/ijdsst.2014010104
1. INTRODUCTION

Health threats are events that may have serious adverse effects on human health such as epidemic or pandemic infections, biological or radiological terrorist attacks, earthquakes and other hazardous natural events. In such situations, formalizing well-defined emergency plans and establishing emergency management teams are crucial for assuring a coordinated and effective response to what could be a catastrophic event (Haddow & Bullock, 2003). Members of emergency teams usually include several experts and operators from different fields and work contexts, from medical communities to public health and public safety agencies, organized at national, regional, and local levels. They have different roles and responsibilities in managing an emergency, as well as different perspectives on the emergency event itself and its possible effects.

In particular, in emergency management teams, crisis managers play an important role for effectively responding to emergency situations. They are not involved in operative tasks but are in charge of all the decisions necessary to select, prepare and carry out operative actions. They are typically active 24 hours a day even for rather long periods of time, and operate under pressure, stress, and responsibility overload. In their job, they have to apply stated emergency plans, comply with formal regulations, and promptly respond to several inputs arriving from the upper management at local, regional or national level. Their tasks are typically knowledge-intensive and require all their competence and experience in the field.

To face the complexity of this scenario, a decision support system (DSS) that can match the practical and social expectations of an emergency team can be of a great value. A DSS can proactively help crisis managers in making crucial decisions, and assist the whole emergency team in its work (French & Turoff, 2007).

However, in order to make a DSS a useful tool for decision makers, a socio-technical gap must be bridged. Emergency management teams, indeed, include high-level professionals who are generally not willing to be supported or driven by an artificial system. Four main issues impede DSS acceptance:

- **Lack of Trust**: DSS users know that their actions, if wrong, will have a severe social impact: why should they trust a system they only partially know and that can be even perceived as intrusive and foreign?
- **Lack of Motivation**: decision makers are expert professionals who know their job and have a wide experience in managing critical situations: why should they adopt the DSS, what benefits should they expect from its use?
- **Fear to be Diminished**: decision makers may suspect that adopting a DSS might play down their role and make their job trivial.
- **Fear to be Replaced**: decision makers may suspect that, in the long run, the DSS might even make them useless.

User acceptance is therefore a key issue in DSS design. To this purpose, we have developed a participatory DSS design approach specifically built to face the socio-technical gap that often impedes a good project to be effectively applied in the real work environment for which it has been conceived. This approach – preliminarily presented in (Baroni et al., 2010) – has been experimented in two real-size case studies concerning emergency management: (1) an Italian project related to the management of emergency situations that arise after an earthquake event (Earthquake, 2004-2005); (2) EU project HEALTHREATS (2007-2010), whose goal was to enhance the capability of European health institutions to respond efficiently and in a coordinated manner to health threats caused by pandemic flu. The proposed approach is focused on two phases of the whole DSS life cycle that play a key role for user acceptance, namely requirement analysis and system evaluation; the former is aimed at identifying DSS requirements and the latter at assessing the usefulness and usability of the implemented system. Putting the users in the
Checking the Consistency of Solutions in Decision-Making Problems with Multiple Weighted Agents

Decision Making and Support Tools for Design of Machining Systems
[www.igi-global.com/chapter/decision-making-support-tools-design/11251?camid=4v1a](www.igi-global.com/chapter/decision-making-support-tools-design/11251?camid=4v1a)

Case Study Applications in Software Environments
(2016). *Decision Support for Construction Cost Control in Developing Countries* (pp. 292-306).
[www.igi-global.com/chapter/case-study-applications-in-software-environments/147437?camid=4v1a](www.igi-global.com/chapter/case-study-applications-in-software-environments/147437?camid=4v1a)