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# Social Networks and Information Systems to Handle Emergency and Reconstruction in Natural Disasters: the L'Aquila Earthquake Case Study

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## Abstract

After the earthquake of 6 April 2009, the citizens of L'Aquila and the near provinces suffer many discomforts due to difficulties of collecting information they need to come back to a normal life. Most buildings in municipality and province have been damaged or fell down so it's difficult to collect information from this structures. In this paper we discuss about the social and organizational needs of the L'Aquila citizens after the earthquake. We describe how an information system can help population to have an active part in reconstruction process supporting the development of a innovative social network. Furthermore this system acting at a social level can help the population to recover the shock caused by the loss of civil infrastructures and productive fabric, and to retie the broken social and productive links according with the sensemaking approach.

**Keywords:** Disaster Management Systems, Sensemaking Process, e-participation, Mobile Computing

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# Social networks and information systems to handle emergency and reconstruction in natural disasters: the L'Aquila earthquake case study

*Alessandro Banzato, Francesco Barbini, Alessandro D'Atri, Edoardo D'Atri, Stefano Za*

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**Abstract.** After the earthquake of 6 April 2009, the citizens of L'Aquila and the near provinces suffer many discomforts due to difficulties of collecting information they need to come back to a normal life. Most buildings in municipality and province have been damaged or fell down so it's difficult to collect information from this structures. In this paper we discuss about the social and organizational needs of the L'Aquila citizens after the earthquake. We describe how an information system can help population to have an active part in reconstruction process supporting the development of a innovative social network. Furthermore this system acting at a social level can help the population to recover the shock caused by the loss of civil infrastructures and productive fabric, and to retie the broken social and productive links according with the sensemaking approach [7].

**Keywords:** Disaster Management Systems, Sensemaking Process, E-participation, Mobile Computing

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## Introduction

In case of large disastrous events, such as the recent earthquake in central Italy, the citizens are mainly considered as victims and people to be rescued, while their active participation is generally kept marginal. But the experience shows that citizen are actually "living sensors" capable of seizing a large number of information and signals, extremely useful both in the prevention phase and, when a disaster happens, in the rescue and humanitarian interventions.

Three phases can be identified when a natural disaster (such an earthquake) happens [5]: (i) people try to face the emergency in an isolated and unregulated way (e.g. fire department and population works for the extraction of the citizen from the rubble straight after the earthquake); (ii) unexpected resources come to the disaster location and the need of additional resources is identified; (iii) command centres are organized to manage and coordinate people and resources to support cooperative actions for rescue (e.g. the installation of control structures by Italian Civil Defence).

Citizens' active participation can be effective only if an efficient communication and

cooperation environment is available. If we consider the ICT we have to take into account that in the early phases of the emergency, the main communication way is based on mobile devices and cellular networks, since the wired communication may be unavailable.

We will discuss in the following how a suitable cooperation environment can be useful for the social reconstruction after a disaster starting from the sensemaking theory.

## Disasters and the social construction of reality

When a disastrous (natural or human-made) event strikes a population, it obviously provokes large material and human losses: many people are directly or indirectly killed and wounded; houses, infrastructures, commercial activities are damaged and primary services are inhibited and suspended [4]. Lots of people are forced to leave their homes and are displaced in various locations. In a very short time, the fundamental connections upon which the social life is based are broken [2]. Material damages are usually massive, however the most relevant and subtle damages are impacting on the psychological and social conditions of the disaster-prone people.

As proposed by Weick [6] a disaster is a cosmology episode, i.e. an episode that “occurs when people suddenly and deeply feel that the universe is no longer a rational, orderly system. What makes such an episode so shattering is that both the sense of what is occurring and the means to rebuild the sense collapse together” [6]. In other words, the people impacted by a disaster lose their personal and social framework of meanings and they need to rebuild them by enacting a new sensemaking process. Sensemaking is a continuous process knitting together beliefs, implicit assumptions, experience, cause-effect relationships, hypothesis about what will happen. It is a social process of construction of a shared reality. By means of sensemaking, people create and recreate conceptions of themselves and of all around them that seem sensible and stable enough to be manageable [7].

Hence, starting from the immediate aftermath of a disaster (cosmology episode) people enact a complex process of sensemaking to rationalize both the disastrous event and the actual chaotic situation. This process should benefit of social interaction patterns able to stabilize meanings by creating shared interpretative schemes. However, in the disaster-prone area, social ties are difficult, and people may find social interaction very difficult.

For these reasons, it appears very important to develop strategies and techniques for allowing social interaction, thus enabling a shared sensemaking process.

Basing on such premises, the EagleVox project is aimed at providing on-line services and a multimodal forum able to support social interaction of people during chaotic post-emergency situations.

EagleVox allows people affected by a tragic event to act as active agents in the redefinition of their social connections. By means of EagleVox, such people will first of all establish a virtual social network and then will develop a social sensemaking process based on semantic analysis of exchanged information. It is worth highlighting that this process is driven by people, in a pure bottom-up approach.

In the following, the main characteristics of the EagleVox and other similar project will be presented.

## Social objectives and examples of disaster management systems

Over years many ICT-enhanced support tools in case of natural disasters or crisis situations have been developed: these systems are categorized as Disaster Management Systems (DMS)[6]. There are systems focused on the management and the coordination of resources for the rescue organizations; alternative systems try to offer the citizen the possibility for participating in reconstruction phase by sharing information.

Two of the most relevant examples for this specific topic are described in the following.

The goal of the Sahana<sup>1</sup> system is to coordinate and manage activities after natural disasters in order to obtain more efficiency and effectiveness in rescue activities (e.g. tent camp management, resources logistics and coordination of first rescue activities). Sahana project highlights the importance of integrating information and for the management of different organizations to have an accurate intervention on the disaster area.

Ushahidi<sup>2</sup> project aims to develop a communication method for citizens to give the possibility to advise through SMS and e-mail about real time events showing this information on a portal. Through Ushahidi citizens and organizations collect and visualize real-time geo-referenced information after events or critical situations.

Since our research work will be firstly focused on mobility, FixMyStreet<sup>3</sup> could also be considered as appropriate reference, even if is not exactly a DMS. This platform allows to inform, retrieve and discuss about problems related to route and traffic conditions. Once a problem is highlighted it will be signalled directly to the appropriate authority and to other citizens. This system not support mobile communication but only web based one.

<sup>1</sup> www.sahana.lk : Sahana is been used for the first time for the emergency due to south-est Asian Tsunami (2005), for the north pakistan earthquake, for Philippine Islands (2005), for the Guinsaugon landslide (2006) and for Yogyakarta earthquake in Indonesia

<sup>2</sup> www.ushahidi.com: when Ushahidi, that means “witness” in Swahili, borns it was a website for localize violence episodes in Kenia due to 2008 electoral crisis.

<sup>3</sup> www.fixmystreet.com: this system was developed and is now running in England from 2007.

Although these systems aim to manage crises and disasters they don't allow citizens to exchange personal feelings to support the reconstruction of a social community.

## The EagleVox project

In critical situations due to natural or man-made disasters, the common information channels between institutions and population could fail due to two main reasons: (i) the communication infrastructures collapse; (ii) people cannot reach their usual communication access point (e.g. Internet at home). Mobile communications became increasingly important in such situations [3]. The EagleVox architecture combine mobile ICT technologies (mobile computing), social web (e.g., Web 2.0) and semantic technologies (ontologies, semantic annotation, natural language computing).

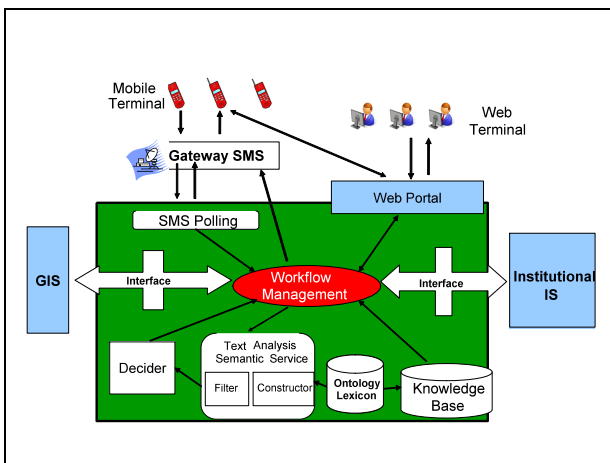


Figure 1. EagleVox Architecture

A detailed description of EagleVox architecture can be found on [1].

The main objectives of EagleVox are twofold: (i) to allow citizens to actively participate in the monitoring of the territory and contribute in all the phases of the disastrous event: from the prevention to the immediate intervention, to the reconstruction; (ii) to act at a social level to help the population recovering the shock caused by the loss of public and private infrastructure, and to retie the broken social and business links.

EagleVox will give to citizens two kinds of access: mobile (sending/receiving SMS) and web terminal.

The system, by semantic analysis use, sends periodically received information to the appropriate institutions supporting top-down

and bottom-up communication (citizen-to-citizen, citizen-to-institution, institution-to-citizen, institution-to-institution). In this way it's possible monitoring main community events supporting the reconstruction of the social connective tissue.

EagleVox can voice citizens collecting their real needs, expectations or fears during the reconstruction phases. This can be a way to support the social monitoring of community and to provide a unique listening point where citizens can send a SMS for their wishes, worries or advises.

## Conclusions

After the testing of EagleVox prototype, the development of the system go ahead as follow: (i) building a bidirectional communication channel (both bottom-up and top-down);

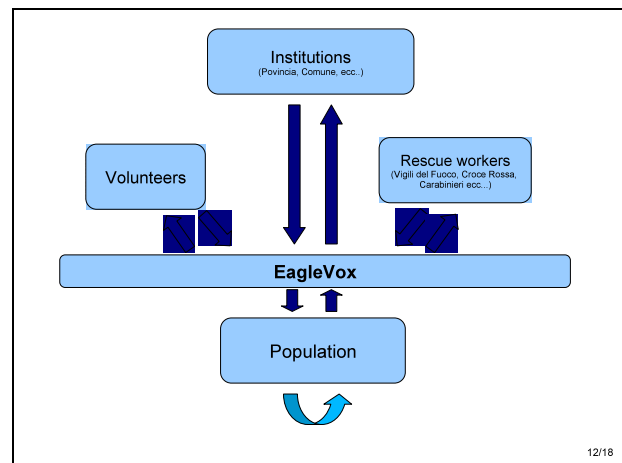


Figure 2. EagleVox long term communication objectives

(ii) controlling and collecting subtle data for the reconstruction management; (iii) giving the possibility to be active subject in the reconstruction process allowing citizens to show their real needs, expectations or fears. In this way EagleVox can support the sensemaking process giving population a unique listening point where send information about their feelings, sensations or needs.

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