

Work and reflection in crisis informatics

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Abstract. Our research focus is on the design of systems that can be used to support reflection on action in the context of crisis management. In particular, we are interested in discussing issues at the intersection between cooperative work and cooperative learning in crisis situations. Our contribution is based on initial user studies we have conducted with Italian emergency organizations and the development of a Mobile Augmented Reality browser that we have developed for supporting crowd management.

Introduction

Our perspective on crisis management stems from our research on support for reflection. More specifically, we are interested in learning that is based on experience and that is highly situated in specific social and physical contexts.

Learning is recognized as an important aspect of dealing with crisis. This might include training of emergency personnel, training of volunteers, training of citizens for preparedness and, more recently, to make them more active participant in crisis management, especially considering the growing space of possibilities offered by social media [1].

In our research we focus on learning, and more specifically on reflection on action [2], based on revisiting experiences with the goal of learning. We believe that this is an important complement to traditional training because crises are rare events

and it is important to learn from each single occurrence. Despite protocols are carefully designed, each event is highly situated and might lead to unexpected situations; individuals might react differently than expected; teams might interact differently than planned; ...

Reflection can help workers, and their organizations, to improve their crisis preparedness and learn how to perform better in the future. Debriefing sessions with emergency workers gathering together are often the venue to do collaborative reflection, but they need to

be fed with information useful to trigger reflection. This is challenging because crisis work is highly distributed (in time, space, competencies, roles, ...) and it is therefore difficult to capture the relevant data, accounting for multiple perspectives. Focus is often on organizational level, neglecting citizens and workers on the field, while giving them voice might lead to important lessons learned.

To support debriefing and reflection we have developed CroMAR [3], an App running on iPad2 for supporting reflection by allowing exploration and cooperation around information generated during a large event. Interaction is based on mobile augmented reality (see attached figures).

CroMAR: Supporting reflection on crisis

In CroMAR, information is organized around the geographical location(s) where an event has taken place. Mobile Augmented Reality is then used to visualize the information *after* the event to reflect on it. Mobile Augmented Reality represents an interesting alternative to other types of information visualization, e.g. timelines or tag clouds, because it can be used to promote reflection in the specific location of the event by augmenting it with relevant information. In this way, we can expect the reflection process to be naturally grounded in a context that helps to make sense of the information and reflect on alternative paths of action. Though the system has functionalities that might be relevant for reflecting on any working experience with a strong physical nature, the system has been specifically developed for reflection on emergency work, in particular in relation to crowd management.

Crowd management involves a number of actors with different roles. Since discrepancies are important triggers for reflection, information visible in CroMAR comes from different sources in order to highlight different points of views of an episode, e.g. textual and multimedia tweets from citizens, data from supporting applications, sensors (attach.- Fig. I). In our perspective, the creation of the

information necessary to promote meaningful reflection and learning is a highly collective process.

We also look at reflection on the event as necessarily cooperative. To promote cooperation and reflection, CroMAR provides different modalities of navigation (attach.- Fig. II); the possibility to tag available information, to start video calls, to share specific views with other workers via email (attach.- Fig. III). We are also currently implementing collaborative editing of lessons learned during a reflection session.

Food for thoughts

At the workshop we are interested in discussing the relation between reflection and work, and on how participative reflection can lead to an improvement of practice.

What is the role of reflective learning in crisis work? How do we promote reflective practices? How can we assure that reflection leads to improved practices? This requires going beyond the predominant approach that looks at reflection mainly in terms of debriefing sessions and with an organizational perspective

Fully acknowledging the highly situated and distributed nature of crisis work, reflection must be also situated and must seek for the participation of multiple actors. We need to understand better which are the actors that under different circumstances can bring in relevant perspectives. How can they be motivated to join the process? How can they share their experiences considering their different perspectives? How do the necessary sense-making processes unfold and can be supported? Which forms of cooperation can support participation and knowledge construction?

Reflection can be supported with data that help recalling the experience in more details than one remembers. For multiple reasons, collecting this data might be challenging. For example, an ethnographic study among Swedish fire and rescue service workers has shown, as reported in [4], a limited use of formal documentation. The study also reports that much documentation is generated outside the official systems and on different media (computer, blackboard, pen and paper). In general, fragments of information come from actors operating in different contexts to achieve different goals. They are pieces of a puzzle that must come with an embedded context that allow setting them together in time and space to be compared, clustered, layered, shared and re-used across multiple representations. Pieces of information should not be seen in isolation, but as part

of a *Common Information Space* that supports reflection on the practice. In this perspective, the system should be able to support sense-making processes to allow meaningful action. This is relevant not only for reflection, but more in general for supporting work.

Citizens are an important, often neglected, source of information. As pointed out in [1, 5, 6], citizens not only report general information on what is happening during a certain situation, but they also actively provide information that is relevant for the operations. Citizens' contributions are also important for reflection because they bring in different perspectives, grounded in the territory, and provide input on how action has been perceived. How can citizens be motivated to provide information? How can they be trained to provide relevant information? Again, these issues are relevant for both work and reflection.

Reflective learning is often associated with creativity because it increases the capability of workers to think critically to their work and act differently in the future. What is the role of creativity in crisis management when people have to work under rigid protocols and the limited knowledge of each worker might make any unconventional decision dangerous?

Finally, crises are strongly situated in physical spaces where different organizations such as ER units, firefighters and the like, co-habit and co-operate. Multiple places can be associated with these spaces, shaped by the ongoing practices, often crossing organizational boundaries. The leading assumption behind the design of CroMAR is that these places are critical in supporting work and reflection. Crisis informatics can benefit from the understanding of places gained in CSCW, while enriching the current conceptualization.

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