

# Crowdtasking: Field Study on a Crowdsourcing Solution for Practitioners in Crisis Management

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## ABSTRACT

In this paper we elaborate on the concept of *crowdtasking* as a form of *crowdsourcing*. The paper describes the setup and boundaries of a first controlled live field test of a prototypical implementation of a possible crowdtasking workflow. The implemented workflow allows crisis managers rapid intelligence gathering due to direct and tailored task distribution. Practitioners of Crisis and Disaster Management and volunteer managers who were present during the field test made favourable comments on the approach and its implementation. The analysis of the records and the conducted interviews give new insights and ideas for further development.

## Keywords

Crowdtasking, volunteers, community management, field study, crisis informatics.

## INTRODUCTION AND PREVIOUS WORK

When disastrous events occur, we often hear of innumerable people who are willing to help, though they are not formally involved in disaster relief organisations. The coordination of these volunteers can vary between two extremes: on one side volunteers organise themselves in a grassroots approach while on the other side a formal organisation leads them tightly.

Both approaches have their assets and drawbacks: The grassroots approach allows volunteers to establish a decentralised organisation structure that is able to adapt to unforeseen incidents. At the same time a decentralised organisational structure can be ineffective as its separate units (volunteers) are not necessarily coordinated. Consequently, it is likely that tasks are carried out repeatedly and redundantly by different units while other, maybe crucial tasks, are left untreated. The presence of social media platforms offers a way to improve the organisation of help, the resilience and mitigation of disaster events (Palen, Vieweg, Liu and Hughes, 2009; Soden, 2014; Starbird and Palen, 2013; Vieweg, Hughes, Starbird and Palen, 2010). Professional organisations for disaster relief, on the other hand, have a high degree of formalised procedures. Under normal circumstances, this allows for efficient and effective help. However, the workforce of such entities is often limited, which in turn restricts the assistance they can provide.

Thus, official disaster relief organisations try to incorporate volunteers in various ways. A loose form of informal incorporation is established by monitoring and analysing social media streams (Hiltz and Plotnick, 2013; Hughes, 2014; Verma et al., 2011). There are also approaches that aim to mediate between formal relief organisations and volunteers to integrate them in relief efforts (Cobb et al., 2014; Hofmann, Betke and Sackmann, 2014; Lanfranchi, Wrigley, Ireson, Ciravegna and Wehn, 2014). A tighter form of incorporating

volunteers is practiced by the Austrian Red Cross (ARC) through their disaster management initiative “Team Österreich” (“Team Austria”, TÖ). TÖ allows volunteers to help under the guidance and coordination of ARC. Volunteers sign up and are utilised according to their qualifications and their distance to the crisis area (Grunnan and Maal, 2014).

In this paper we discuss the crowdtasking approach that incorporates volunteers into the work of professional disaster relief organisations in a way that is a) more formal and more structured than the grassroots approach and b) less formal and less structured than the TÖ approach. The aim of this idea is twofold. First to increase the numbers of volunteers by lowering the barriers to contribute and, secondly, to increase the effectiveness and efficiency of the volunteers work by loosely coordinating their work by a professionally trained employee of a disaster relief organisation.

This paper is organised as follows. We start with a brief overview of previous work that is relevant to this field. This is followed with a presentation of our approach and how we implemented it. Then we discuss the evaluation setup and outcome. Finally, we give a critical review of our work and conclude with an outlook on future work.

### CROWDTASKING

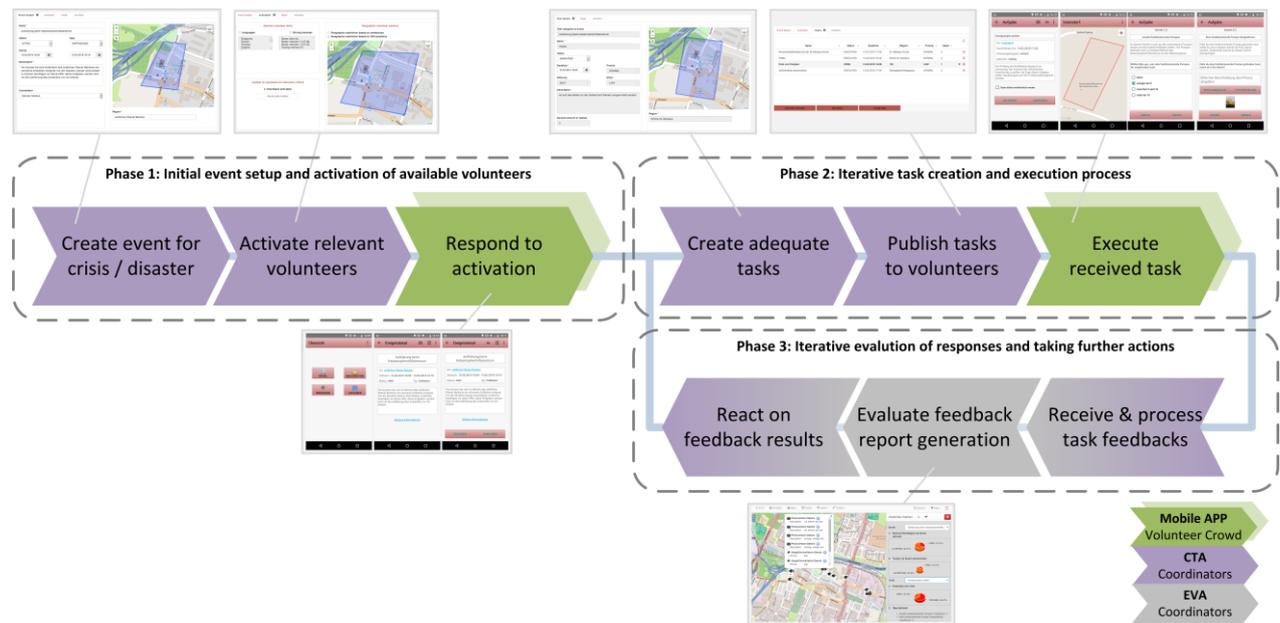
Crowdtasking is defined in (Schimak, Havlik and Pielorz, 2015) as a request for concrete and well-defined actions within a limited temporal and spatial scope, resulting in the performance of micro-tasks with no further obligations. This is not limited to online activities and puts an emphasis on the aspects of space and time of a task. In terms of crisis and disaster management, crowdtasking means: Tasks are selected and provided by a professional organisation allowing volunteers with specific skills or physical location to contribute to a disaster or crisis relief operation. We classify crowdtasking as a form of crowdsourcing. To give the reader a way of categorising crowdtasking, we use Liu’s crowdsourcing framework (Liu, 2014):

<i>Why – Identify information problem to determine crowd task</i>	To provide instructions for preparation before a disaster as well as coordinate volunteer efforts and receive information from the site during a disaster.
<i>Who – Types of crowds to target for the task</i>	Individual, pre-registered volunteers without discrimination and including as many social milieus as possible (Auferbauer, Czech and Tellioglu, 2015).
<i>What – Interaction flows for engaging crowds</i>	The term “crowd-seeding” used in (Liu, 2014) fits the crowdtasking interaction: an active, one-way request, strategically targeting members of a crowd.
<i>When – Temporal aspects in relation to the disaster management lifecycle</i>	Primarily intended for mitigation / prevention, preparedness, response and recovery.
<i>Where – Spatial aspects of the crisis, crowds, and crowd tasks</i>	Applicable for mitigation, prevention and preparedness at potential disaster sites. Not intended for use inside hazard areas during response.
<i>How – Social, Technological, Organizational, &amp; Policy (STOP) interfaces</i>	Technological. CrowdTasker, an implementation of the crowdtasking approach, provides a web interface for professional responders and a smartphone application for volunteers.

**Table 1: An attempt at classifying crowdtasking with the help of Liu's crowdsourcing framework**

As we only have a limited amount of content volume available, we refer the reader to (Flachberger, Neubauer, Ruggenthaler and Czech, 2015; Havlik et al., 2013; Neubauer et al., 2013) for a more in-depth description of crowdtasking. Implications are discussed in (Auferbauer, Czech and Tellioglu, 2015; Auferbauer, Ganhör and Tellioglu, 2015).

In 2013 a joint research effort started with the aim to implement a prototypical crowdtasking workflow. The project “Resilience Enhancement by Advanced Communication for Team Austria” (RE:ACTA) utilises new media and mobile handheld devices to support professional decision making and on-site resilience. The design of the workflow, interaction mechanisms and interface design was based on an iterative user centred process that included crowdtasking managers and volunteers. It culminated in a demonstrator implementation of the crowdtasking workflow called “CrowdTasker”. This prototype realised the core functionality of crowdtasking: defining tasks, distributing them to selected volunteers (based on their skill and/or location) and visualising the results for crisis managers.



**Figure 1. Crowdtasking Workflow for Crisis and Disaster Management**

The workflow supported by the prototype is depicted in Figure 1 and can be summarised as follows:

1. An event is compiled; a volunteer crowd is selected based on skills, current location or home address.
2. Requests for participation are sent out to the selected volunteers.
3. Volunteers accept or decline the participation request, resulting in a list of active volunteers.
4. Active volunteers receive, choose and execute tasks as they are published by volunteer coordinators.
5. Task results (photos, text, selection of predefined answers, etc.) are visualised for crisis managers.
6. Repeat steps 4 and 5 until incident is resolved.

A detailed technical description of the prototype would exceed the volume limitations of this paper, but will be forthcoming in future publications. We refer you to (Auferbauer, Czech and Tellioglu, 2015; Flachberger, Neubauer, Ruggenthaler and Czech, 2015) for slightly more detailed accounts of that system.

**FIELD STUDY**

To evaluate the crowdtasking approach and the implementation “CrowdTasker”, a field test was arranged during project RE:ACTA. This field study was a coordinated effort between the Austrian Red Cross, the Austrian Institute of Technology, Frequentis AG and the Vienna University of Technology. The goal was to assess the acceptance on both sides: that of volunteers and that of volunteer managers (referred to as “coordinators”). Methods used during the field study were observation and recording on the one hand and semi-structured interviews on the other.

The Austrian Red Cross provided the facilities for the exercise. Their disaster relief centre at the outskirts of Vienna is used during actual crisis and disaster management situations. Similarly, it served as a command and control centre for volunteer management during the field study while volunteers executed predefined tasks in the vicinity of the premises. We consider participants to have been “in the field” as they were not in a controlled environment during the exercise.

Altogether 12 participants were involved in the field study. Nine of them had the role of volunteers and three acted as coordinators. All participants were in some way affiliated with the Austrian Red Cross. All coordinators had been trained previously in volunteer management by TÖ. The volunteers consisted of two adults with prior experience as volunteers in TÖ, two young adults (age 18-20) in the service of ARC, one volunteer paramedic (age 24) and three members of the ARC youth group (age 16-18).

All tasks executed during the field test revolved around gathering intelligence in the field with the help of volunteers. Examples include determining the volume and density of traffic at a nearby intersection, verifying

the functionality of several emergency pumps located nearby, reporting fuel prices in the area or checking the weather conditions. These tasks were designed in cooperation with the Red Cross to ensure that they reflect the needs in actual emergency situations. At the beginning of the field test each of the three coordinators was given a total of four tasks in written form. As none of the coordinators had had any prior experience with crowdtasking, instructions and hints were very detailed for the first task. However, the amount of information and help was gradually reduced with each task and the last one was to be carried out without any descriptive help. The coordinators at the command and control centre were observed by one author during their sessions.

Participants acting as volunteers in the field were given no introduction to the tools at all, as would presumably be the case in a real disaster event. We wanted to test how well they would cope with the smartphone app and workflow without preparation. Volunteers were organised in groups of three, each being observed by a member of the Vienna University of Technology. Each volunteer was equipped with a small microphone, which was connected to the smartphone s/he was running the mobile crowdtasking application on. This provided the authors with audio recordings for each participant, allowing an analysis of events even when direct observation was not possible. After a session the volunteers returned to the command and control centre and each group had a discussion with their respective observers. The discussions were held in a semi-structured manner and aimed to investigate how the participants perceived the workflow in general and the usability of the implemented tools in particular.

## INSIGHTS

The field test showed the feasibility of crowdtasking (via the prototype implementation) for rapidly gathering relevant intelligence from the field. We also found several opportunities for improvement and challenges that need to be met in future implementations. Here, we want to discuss selected topics relevant for practitioners in information and communication technologies and crises and disaster management.

*Providing status updates:* During the field test we noticed prominently and repeatedly the participants' need for status information and updates. Volunteers grew impatient shortly after receiving the first notification about an active event while waiting for further notice. They remained stationary for a few minutes, then grew increasingly restless, expecting to be called upon and given further instructions. Predictably, not being informed about the current status of their assignment resulted in frustration for all volunteers. To mitigate this, a status indicator may be implemented in the CrowdTasker app, informing volunteers about their assignment status. Due to this addition volunteers can be informed that a coordinator has received their acknowledgement of participation, but currently does not have any tasks available. Another issue is the lack of a connection status indicator in the app. Several participants suspected a bad network connection to be the reason for not receiving tasks immediately. This resulted in them repeatedly checking settings and connectivity, possibly causing unnecessary battery drain.

*Notification overload:* A design decision for the mobile app was to keep volunteers informed about all events, even if they are not immediately relevant for them (e.g., they took place in other parts of the country). However, none of the participants reacted favourably to this, questioning why the application was showing items that did not require action on their part. At best the information was just ignored. At worst it resulted in verbalised annoyance and subsequently less enthusiasm for messages that actually did concern the participant.

*Guiding volunteers:* Relying on volunteers' navigation skills proved to be insufficient. A purely textual description of the target location did not reliably guide volunteers to the desired location. Most of the volunteers encountered uncertainties even when the (textual) task description was factually correct and unambiguous. Three of the participants became lost on their way to the target location at least once. Providing an interactive map with each task that shows the location of the current objective in relation to the user's current position could possibly solve a majority of such problems. Participants also stated that displaying the current distance to the target location is helpful information when first skimming over a task description. Two participants claimed that this (distance to target) would be the most important information for them when deciding whether or not to accept a task.

*Splitting tasks:* Splitting task execution into smaller, discreet steps worked well. Participants were intent on fulfilling the individual steps one at a time and never gave the impression of being overwhelmed. They were able to easily pick up again on a task step after being distracted – something that happens frequently in the mobile context (Oulasvirta, Tamminen, Roto and Kuorelahti, 2005). None of the participants gave negative remarks regarding the workflow of task execution.

*Cooperation, communication and initiative:* During the field test we observed that especially young adults sought a more active role for themselves. For example, they voiced their irritation about only being able to provide information that was specifically asked for. Instead, they would like to send information about subjects of their own choosing at any time. They complained about not being able to call for help from the coordinator or from other volunteers. These views were mostly shared by three participants of the youth group. The remaining participants also expressed their wish for a direct channel of communication to the coordinator, but to request clarification on objectives rather than personal support.

## CONCLUSION

We deem this first field test of the crowdtasking approach to have yielded promising results. Due to the small sample size, we do not consider this a full validation. However, the results indicate that “traditional” crowdsourcing can be complemented with the novel crowdtasking approach. The prototype was able to rapidly provide relevant information at the request of coordinators. Even though none of the participants have had any prior contact with the idea or its implementation they were able to quickly gather intelligence from the field in a joint effort.

Acceptance of the crowdtasking approach was high among coordinators using the system and crisis managers of the Red Cross observing the exercise. The workflow of task definition, distribution and result visualisation was received well. Acceptance among volunteers was also good, especially among those that had previous experience in volunteer work with TÖ. These volunteers opined that crowdtasking was a preferable way of receiving instructions and tasks. However, additional efforts will have to be made to engage younger audiences. The authors have noticed their wish to communicate with others through the app as well as to report about subjects they find useful or important.

Accommodating and fostering volunteers’ urge to form networks and report information on their own initiative will be a challenge for future development. The challenge can be approached in different ways:

1. Ignoring the volunteer’s needs. This could easily drive volunteers away towards platforms that better fulfil their needs, e.g., social media like Twitter or Facebook, where information is less accessible and harder to filter out and process for first responders.
2. Providing the demanded communication channels. Even though it would not be a problem from a technological point of view, this would cause issues with the intended crowdtasking idea. Unsolicited information from volunteers can reduce the quality and relevance of data received, possibly negating one of the distinguishing points and advantages of the crowdtasking concept. Volunteers requesting help from headquarters via direct communication further puts a serious strain on personnel requirements.
3. Use third party tools to provide the communication channels and volunteers to cope with the additional influx of information. Crowdsourcing solutions like GDACSmobile (Link, Hellingrath and Groeve, 2013) or Ushahidi (<https://www.ushahidi.com/>) could be used to complement crowdtasking. Volunteers can review the so obtained flood of information and pick out important bits. Likewise, volunteers at command and control could be used to take care of direct communication requests from volunteers in the field.

The following best practices for crowdtasking will likely be relevant for other crowdsourcing and micro-tasking approaches: First, split tasks into discreet steps on mobile applications. Second, provide volunteers with visible status indicators about their assignment and connection status. Third, reduce notifications to items that actually require the user’s attention, skip informative messages. Fourth, provide guidance for reaching the target destination from within the mobile application.

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