Driving Innovation in Crisis Management for European Resilience

D934.121 – EXPERIMENT 42 DESIGN & REPORT

SP93 - SOLUTIONS

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The DRIVER+ project

Current and future challenges due to increasingly severe consequences of natural disasters and terrorist threats require the development and uptake of innovative solutions that are addressing the operational needs of practitioners dealing with Crisis Management. DRIVER+ (Driving Innovation in Crisis Management for European Resilience) is a FP7 Crisis Management demonstration project aiming at improving the way capability development and innovation management is tackled. DRIVER+ has three main objectives:

1. Develop a pan-European Test-bed for Crisis Management capability development:
    - Develop a common guidance methodology and tool (supporting Trials and the gathering of lessons learned.
    - Develop an infrastructure to create relevant environments, for enabling the trialling of new solutions and to explore and share Crisis Management capabilities.
    - Run Trials in order to assess the value of solutions addressing specific needs using guidance and infrastructure.
    - Ensure the sustainability of the pan-European Test-bed.
2. Develop a well-balanced comprehensive Portfolio of Crisis Management Solutions:
    - Facilitate the usage of the Portfolio of Solutions.
    - Ensure the sustainability of the Portfolio of Solutions.
3. Facilitate a shared understanding of Crisis Management across Europe:
    - Establish a common background.
    - Cooperate with external partners in joint Trials.
    - Disseminate project results.

In order to achieve these objectives, five sub-projects (SPs) have been established. **SP91** ***Project Management*** is devoted to consortium level project management, and it is also in charge of the alignment of DRIVER+ with external initiatives on crisis management for the benefit of DRIVER+ and its stakeholders. In DRIVER+, all activities related to Societal Impact Assessment (from the former SP8 and SP9) are part of SP91 as well. **SP92** ***Test-bed*** will deliver a guidance methodology and guidance tool supporting the design, conduct and analysis of Trials and will develop a reference implementation of the Test-bed. It will also create the scenario simulation capability to support execution of the Trials. **SP93** ***Solutions*** will deliver the Portfolio of Solutions which is a database driven web site that documents all the available DRIVER+ solutions, as well as solutions from external organisations. Adapting solutions to fit the needs addressed in Trials will be done in SP93. **SP94** ***Trials*** will organize four series of Trials as well as the final demo. **SP95** ***Impact, Engagement and Sustainability***, is in charge of communication and dissemination, and also addresses issues related to improving sustainability, market aspects of solutions, and standardization.

The DRIVER+ Trials and the Final Demonstration will benefit from the DRIVER+ Test-bed, providing the technological infrastructure, the necessary supporting methodology and adequate support tools to prepare, conduct and evaluate the Trials. All results from the Trials will be stored and made available in the Portfolio of Solutions, being a central platform to present innovative solutions from consortium partners and third parties and to share experiences and best practices with respect to their application. In order to enhance the current European cooperation framework within the Crisis Management domain and to facilitate a shared understanding of Crisis Management across Europe, DRIVER+ will carry out a wide range of activities, whose most important will be to build and structure a dedicated Community of Practice in Crisis Management, thereby connecting and fostering the exchange on lessons learnt and best practices between Crisis Management practitioners as well as technological solution providers.

Executive summary

This document is the "D934.121 - Experiment 42 Design and Report" deliverable of the DRIVER+ project. It is one of the "legacy" deliverables and describes the design and outcomes of Experiment 42 (EXPE42), as the Trial was called before the project's temporary discontinuation.

The purpose of the EXPE42 was to evaluate the usability and value of solutions and methods for the interaction of professional first responders with citizens and to explore the (technical) capabilities of underlying software tools for a later integration in the test-bed infrastructure. In the context of DRIVER+, the experiment results are important lessons learned for the upcoming Trial 3 "Volunteer Management" in SP94 as well as for evaluating the solution usability in the DRIVER+ Test-bed context. Main lessons learned on this level can be summarized as:

- **Application of a Common Information Space (CIS)** was demonstrated to be a good approach for this type of experiments. Technical interoperability of the solutions involved in the experiment 42 was shown. In the case that substantial amount of information needs to be shared; only the reference to actual data can be shared over the CIS.
- **Most of the communication needs in our experiment were adequately satisfied by the tested solutions, situational awareness of the professionals was enhanced**. Apart from ensuring interoperability, an imperative request was to avoid information overflow, e.g. the information officer working with the volunteers needs to see all information gathered from the volunteers, but only the key findings need to be presented to the commanders. Likewise, the citizens need to be presented only with the contextual information that is really relevant to them and with requests they can fulfil.
- **Scalability of crowdsourcing and crowdtasking is strongly affected by ability of the information officers to rapidly analyse the data gathered from the volunteers.** Two promising approaches for rapid ad-hoc analysis of such data were designed and partially implemented as part of the experiment.

Apart from documenting the experiment itself, the purpose of this report is to highlight the lessons learned related with design and execution of the upcoming Trials in SP94 in DRIVER+. Key lessons learned include:

- **The probability of CM professionals not being able to attend some of the planed events due to real world emergencies turned out to be high.** Many CM professionals were not able to attend the experiment 42 as planned, due to an incident taking place the day before. Therefore, it is recommended to: (1) plan with redundancies in personnel; (2) involve professionals from several geographic locations; and (3) minimize the training requirements, e.g. by letting the trained technicians operate or help operating the solutions rather than expecting the CM professionals to do so on their own.
- **Time flows differently for CM professionals and for the volunteers in the field.** The former need to be given enough time for discussion and planning, whereas the later get bored fast if they get nothing to do. Looking back at the EXPE42 design, volunteers should have been involved only for a few hours, while more time is allocated to rehearsal, preparations and hot debriefings.
- **Solution providers and CM professionals are interested in experience and solid methodology, as well as provision of tools that are needed to successfully plan, select and organise complex Trials**.
- For the sake of efficiency, **DRIVER+ should provide reusable tools and methods for connecting the individual solutions, for injecting the data into a system during Trial and for collecting and analysing the data during the Trial**. Trial teams should also be supported in designing research questions and KPIs, in designing Trial observations and surveys as well as in assuring the long-term storage of all collected data.

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List of Acronyms

Acronym	Definition
ACRIMAS	Aftermath Crisis Management System-of-Systems (FP7 Project)
ARC	Austrian Red Cross
AT	Action Team
CAP	Common Altering Protocol
CIS	Common Information Space
COP	Common Operational Picture
COPI	Command on Place Incident
CM	Crisis Management
CT	CrowdTasker
DEWS	Distant Early Warning System
EMSI	A protocol used for sending e-mails between FidoNet-standard-based bulletin board systems
ESRI	Environmental Systems Research Institute
EXPE42	Experiment 42
GIS	Geographical Information System
GUI	Graphical User Interface
HAC	Head Action Centre
IM	Information Manager
JE	Joint Experiment
OS	On Scene Crisis Management Leaders
OSM	OpenStreetMap
PoS	Portfolio of Solutions
PoES	Portfolio of Emerging Solutions
ROT	Regional Operational Team
SOTA	Stae-of-the-Art
SP	Sub Project
TRL	Technology Readiness Level
UN OCHA	United Nations Office for the Coordination of Humanitarian Affairs
VGI	Volunteered Geographic Information

1. Introduction

The "Interaction with Citizens" experiment series investigated the interaction of professional first responders with citizens and unaffiliated volunteers in crisis and disaster management. It was part of the second round of experiments in the first phase of DRIVER[1] and consisted of three field experiments with increasing complexity:

1) The crowdtasking experiment with 2 crisis managers and 10 volunteers - hosted by Magen David Adom (MDA) in Tel Aviv, Israel (January 2016);
2) The crowdtasking experiment with more than 10 professional crisis managers and 200 volunteers, hosted by the Austrian Red Cross (ARC) in Vienna, Austria (February 2016);
3) A combined experiment testing several CM solutions[2] with more than 50 professional participants[3] and 300 volunteers - hosted by the Security Region Haaglanden (VRH) in The Hague, Netherlands (April 2016).

The first and the third of these field experiments were part of experiment 42 (EXPE42) in DRIVER SP4 and focused on the acceptance of the offered technical solutions by crisis managers and volunteers, whereas the second experiment in Austria was formally part of the experiment 36.2 in DRIVER SP3. In the DRIVER+ context, these experiments provide some added value to SP94 and Trial 3 "Volunteer Management", although the methodology applied is not coherent with the methodology developed in DRIVER+. The added value arises from the demonstration of technical interoperability of the examined solutions as well as from feedback from both volunteers and professionals collected in the frame of the experiment.

This document provides the "D934.121 - Experiment 42 Design and Report" deliverable[4] with focus on the experiment design and report for the experiment in The Hague and the success in terms of understanding how to use the offered solutions and improving the functionality and interoperability of the software tools that were involved in experiment. Apart from documenting the experiment itself, the purpose of this report is to better understand and highlight the lessons learned to improve the design and execution of the upcoming Trials in SP94 in DRIVER+.

Former DRIVER SP4 experiments used controlled settings to test new software and hardware solutions, as well as to test an increasingly complex interaction of solutions. SP4 revolved around the needs of the first responders and tackled several key issues such as interoperability, information sharing, situation assessment, early warning, resource management, capacity building and interaction with citizens. The performed experiments took the form of in-field demonstrations, benchmarking and laboratory experiments, but they could also include table-top exercises. Novel solution offers were compared to the current practices to assess their potential operational benefits. By gradually stressing the new solution in terms of the complexity of the considered scenario, the usefulness and technical interoperability of the solutions was assessed and the feedback used to improve their capabilities.

Within the experiment in The Hague, three categories of CM solutions were considered: ***collaboration and situation awareness solutions, early warning solutions as well as communication solutions***. The solutions were evaluated in the frame of the given scenario of a coastal flooding Although all the experiments of the "Interaction with Citizens" campaign were designed to be "close to reality", all scenarios were virtual, i.e. in no case the experiment or volunteers have been involved in actual CM or support activities, no flooding occurred in The Hague and no real refugees have been involved in the Austrian experiment. Also, an unforeseeable large-scale operation the day before the start of the experiment led to a shortage of practitioners, who had been instructed specifically for this experiment.

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[1] First phase of DRIVER+ from May 2014 to July 2016

[2] In this deliverable, we follow the DRIVER+ naming convention. Therefore, **a combination of one or more software tools and methods for using them in CM context is called "CM solution".**

[3] Professional participants had one of the following roles: crisis managers, tool owners, evaluators, observers or technical support.

[4] Formerly known as DRIVER D430.42 "Experiment 42/36.2 Design and Report"

2. Experiment design

The purpose of the DRIVER+ experiment 42 (EXPE42) in The Hague was to evaluate the usability and value of solutions and methods for the interaction of professional first responders with citizens and to explore the (technical) capabilities of the underlying software tools for integration in the test-bed infrastructure. In the context of DRIVER+, the experiment results are important lessons learned for the upcoming Trial 3 "Volunteer Management" in SP94 as well as for evaluating the requirements on the Test Bed.

To provide the involved crisis managers with an overview of similar solutions and methods, all solutions involved DRIVER T430.3 (first phase of DRIVER+) were used in parallel in a simulated urban coastal flooding scenario in the City of The Hague in April 2016. While first responders could test the backend of these solutions during the field experiment, unaffiliated volunteers could use at the same time the corresponding frontend applications to inform the crisis managers about the simulated crisis situation.

Starting from the gaps and the concepts to be investigated by EXPE42, we are giving in the following sub-sections details on how the scenario was designed. This includes a detailed specification and description of the scenario, a discussion of the applied evaluation approach and the methodology for analysing the data gathered during the experiment as well as experimentation report per solution and a discussion of the lessons learned.

2.1 Background

The rise of social networking has allowed ad-hoc groups of citizens to organize large-scale activities in a flexible manner. From a crisis manager's point-of-view, the appearance of such loosely coordinated groups of unaffiliated volunteers can be beneficial, but at the same time difficult to manage and to steer, as citizens do not fit into the hierarchical procedures present in crisis management teams.

Unlike first responder organizations, such as fire brigades or medical first responders, these ad-hoc groups lack a command structure, mechanisms to distinguish information from misinformation, as well as procedures to prioritize and split tasks among themselves. The merit of unaffiliated volunteers has been demonstrated on various occasions (1). Nevertheless, the absence of efficient coordination can render such groups inefficient. This is in particular the case when volunteers are concentrating on a few, evident tasks, while omitting to address equally important, but less visible needs. In the worst-case scenario, the positive impact of the ad-hoc volunteers could even turn into a potentially very destructive smart mob (2). Whether to profit from resources offered by unaffiliated volunteers, or simply to avoid the worst-case scenario, crisis management professionals need to improve their ability of communication with citizens.

Many organizations already use social networks for crisis communications (3). However, the type of information that is posted through social media is often not very different from what is posted through mass media. The one notable exception from this rule is provided by interactive web-based crisis maps. Such maps allow citizens to easily obtain relevant information according to their geographic position, e.g. reports on crisis situations and needs in their neighbourhood. Such behaviour has been observed on multiple occasions, for example during the devastating earthquake that struck Haiti in 2010 (4).

A more crucial problem is that the general-purpose social media does not sufficiently support many-to-one communication, which is a major shortcoming from the point-of-view of first responders. In crisis situations, these organizations can allocate limited amount of personnel for monitoring social media activities and communication with their users. Thus, liaison officers are frequently overwhelmed with the flood of information through online social media (5).

A related issue is the one of trust and validity of information. In social networks real information and misinformation is posted alike so that distinguishing between the two is difficult. A recent discussion of the various ways to use the information received from volunteers, ranging from passive social media data mining, over the use of dedicated crowdsourcing tools to crowdtasking of the volunteers is described by the authors in (6).

2.2 Goals and expected outcomes

The overall goal of DRIVER+ EXPE42 was to test usability and improve technical interoperability of used software tools for context-aware informing and tasking of unaffiliated volunteers, as well as to evaluate these activities from both the citizens' (focus of EXP36.2) and crisis managers' perspectives (focus of EXPE42).

During the experiment design phase, the involved partners refined this to the following main functionalities, which were to be evaluated by the data gathered during the experiment with the help of the participating tools:

- Provision of context-aware[5] and timely information tailored to specific needs of different societal groups over various channels to improve their understanding of the crisis situation and to minimize the adverse impacts.
- Context-aware (micro-)tasking of unaffiliated volunteers to perform real and virtual tasks.
- Efficient gathering of situational information about an incident from unaffiliated volunteers.
- Efficient usage of the received information from unaffiliated volunteers to improve the situation awareness of crisis managers and consequently their handling of the crisis.

Comparing these functionalities to the gaps discovered by the "Aftermath Crisis Management System-of-systems Demonstration Phase 1" (ACRIMAS) project team reveals that our experiments targets specifically the following gaps in European crisis management [5]:

- **Gap 1 - Inform & involve society via crisis communication:**
  - Flows of validated, balanced information to the public
- **Gap 3 - Volunteer management:**
  - Co-ordination (tasking) of unaffiliated volunteers (see also Experiment 36.1/36.2)
- **Gap 4 - Early warning capabilities:**
  - Dissemination of disaster alerts
- **Gap 10 - Acquisition of information from external sources:**
  - Getting information from the public about a crisis incident and their reactions on the warnings received (citizens as a sensor)
  - Information with respect to where and what kind of help is needed

To investigate these gaps as part of our experiment, we further agreed on how to understand them and on an approach for evaluating them.

It has to be noted that these "old gaps" from ACRIMAS have partial similarities with the new gaps of DRIVER+, but are not the same. Although direct comparison with the results of Trial 3 of DRIVER+ will therefore not be possible, the outcomes of EXPE42 provide nevertheless added value for in particular Trial 3.

Gap 1 - Inform & involve society via Crisis communication

EXPE42 approach: To provide a dedicated platform that can be used by crisis managers to address selected groups of people and provide them with information derived from situational awareness solutions.

Gap 3 - Volunteer management

EXPE42 approach: Registration, activation, selection and tasking of unaffiliated volunteers according to the needs of the responders to support the professional response in the best possible way.

[5] Context is defined here as a combination of the user's profile, position, situation on ground and the needs of the crisis managers.

Gap 4 - Early warning capabilities

EXPE42 approach: Dissemination of disaster alerts.

Gap 10 - Acquisition of information from external sources

EXPE42 approach: Getting information from the public about the crisis situation and the reactions on warnings (citizens as a sensor) Information where and what kind of help is needed.

2.3 Scenario Specification

2.3.1 Overview

The experiment scenario is based on a storyline designed by practitioners, who were involved as experiment platform providers. They defined a fictitious disaster event based on past experiences. This has resulted in a realistic and relevant scenario. The scenario included a ground truth describing a flooding in a central region of The Hague. This ground truth illustrated flood levels at different locations and further flood related insights, e.g. displaced people, damaged infrastructure or supply needs. To test the quality of the information flow from the volunteers to the crisis managers as well as the review process, an information conflict was designed between a forecasted ground truth for crisis managers and an actual ground truth for volunteers in the field. Only if information is provided by volunteers in sufficient quantity and quality, crisis managers are able to recognize the new situation. Additionally, the scenario was split into two phases. The morning session was dedicated to disaster preparation and the afternoon to disaster response. Therefore, the ground truth included information on potential needs and damages before the crisis event, and incidents occurred after the crisis event. With these two different settings, the experiment studied the participation of volunteers and the utility of tested solutions changing with the disaster phase.

The crisis managers were asked to perform their regular procedure and the team of information managers from the crisis management team was assigned with a task of transferring the information collected by the tested CM solutions to the crisis manager and back. Furthermore, the actual handling of the software tools was delegated to trained technicians from the solution owners' organisations. This approach was chosen in order to minimize the training effort for the CM professionals and assure that they can concentrate on the task at hand rather than thinking how to operate the solutions.

2.3.2 Involved organizations and solutions

The main DRIVER+ tools participating in this experiment are CrowdTasker (AIT), GDACS Mobile (WWU), SafeTrip (HKV), DEWS (ATOS), LifeX COP (FRQ) and csWeb COP (TNO). These tools are used as a technical base for CM solutions supporting context-aware alerting, informing and tasking of citizens, gathering of the Volunteered Geographic Information (VGI), as well as for using the information obtained from the citizens to improve the situational awareness in a crisis incident.

Additionally, the Frequentis Common Information System (CIS) prototype is used as a backbone to allow exchange of information between the systems and support the workflows that require such information exchange; HKW MEGO is used to provide the simulated "reality" for the final experiment and the XVR 3D simulation environment to illustrate how the experiments could be partially or fully virtualized in the future[6].

[6] In the context of DRIVER+ project, these tools would be considered part of the "support" infrastructure that is provided and supported by SP92.

2.3.3 Hosting platform

The area of the safety region The Hague County consists of nine municipalities in the Netherlands and is home to around a million people within a 40.000-hectare area. The idea behind the safety region is to advance the health and safety of all the people living and staying in the area and to stimulate and facilitate the cooperation between civilians and private and public parties. In DRIVER+, the safety region and, in particular, the city of The Hague, plays an important role, since they provide a platform for testing the DRIVER+ solutions in a realistic environment (see Figure 2.1 and Figure 2.2). Located in the building next to the local fire department, the platform provides a computer-equipped working space with simulation and meeting rooms in the 9th floor that is ideal for the setup of experiment 42. During our experiment, the DRIVER+ technical and organizational personnel as well as the first responders were using the entire floor. A second floor was used mostly by external observers, who could follow the experiment on two screens showing a live feed of the experiment.

Figure 2.1: The Hague platform – building

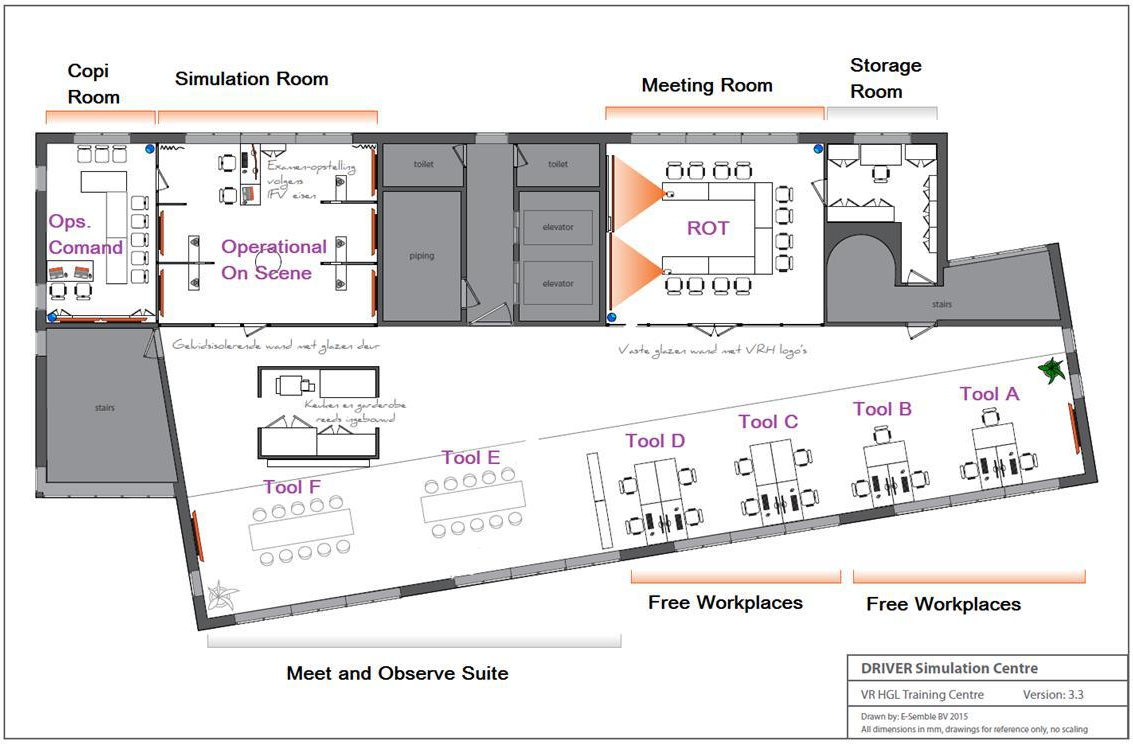

Figure 2.2: The Hague platform – plan of the 9th floor

2.3.4 Participants and roles

Due to the complex setup of using several tools for communicating with unaffiliated volunteers, experiment EXPE42 required many internal and external participants. During the two days, where the experiment was executed more than 300 participants were actively involved. Their main roles during the experiments were either of the following ones:

- Senior crisis management **decision makers**, working in the high-level decision pool (= Head Action Centre HAC in the Dutch system).
- Crisis management **information and communication managers**, working in the action centres (= Head Information Management IM/HIM in the Dutch system).
- **Tool operators**, working together with the information and communication managers on scene crisis management leaders (= Officer in Charge OVD/COPI in the Dutch system).
- **Unaffiliated volunteers**, working in the field.
- **Observers,** who can roam the experiment site and may, but do not have to, provide informal feedback after the experiment.
- **Dedicated evaluators,** who are charged with observing the event and providing a detailed report on what they saw.

While the tool operators were project internal and the decision makers and volunteers external to DRIVER+, all other roles consisted of both, internal and external participants. The relation of the different roles in the experiment is shown in the Figure 2.3.

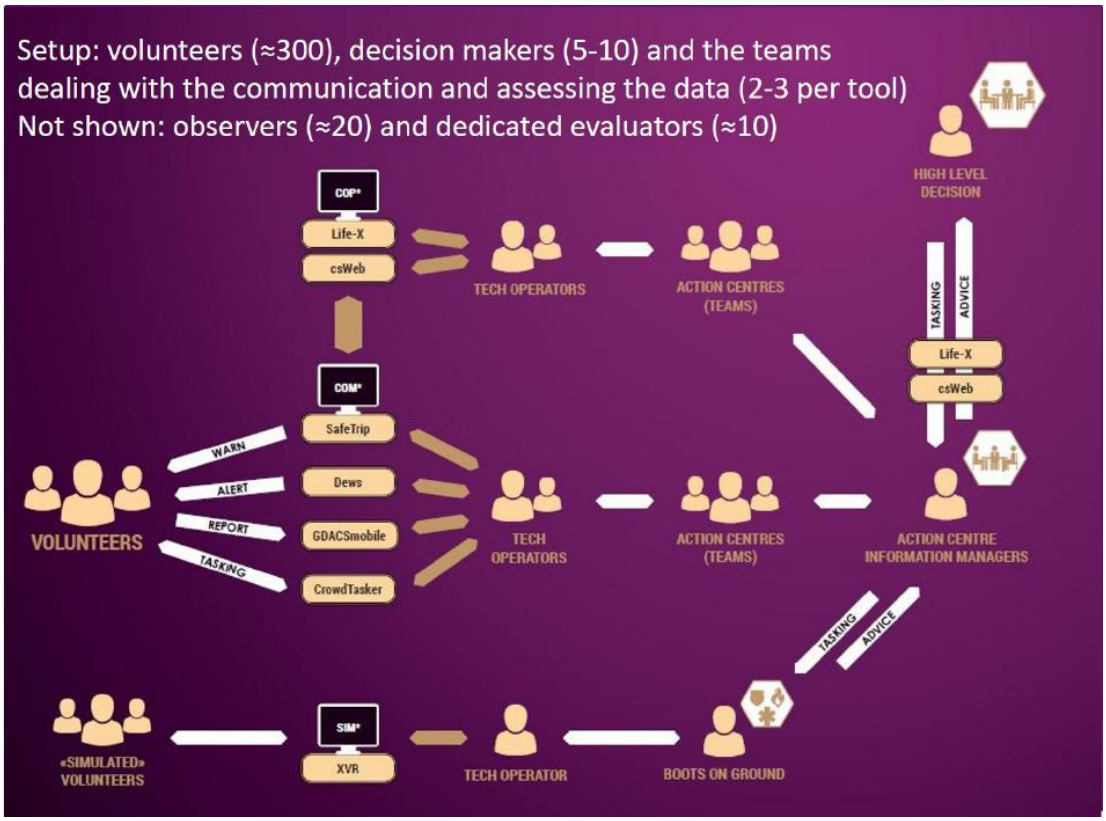

Figure 2.3: EXPE42 tools and participant roles

2.3.5 Scenario architecture

In EXPE42, most of the tools used were integrated with the prototype of the DRIVER+ Common Information Space (CIS). In practical terms, this means that the tools were connected to an enterprise service bus and able to exchange messages in this way. This was not the case for XVR simulation solution and the auxiliary tools such as the survey server, which were not integrated in the common architecture. Thanks to this setup, the two COP tools Life-X-Cop and csWeb COP that participated in the experiment could provide a visualisation of the data from SafeTrip, GDACSmobile and CrowdTasker. Furthermore, SafeTrip, GDACSmobile and CrowdTasker were all built as a client/server application with a client running on a mobile phone, which was used by the unaffiliated volunteers. Due to technical issues and lack of time it was not possible to completely implement DEWS in the experiment scenario, but the alerting system was partly tested with CrowdTasker.

2.4 Scenario description

2.4.1 Scenario constraints and underlying hypothesis

The experiment is setup like an open training exercise. All participants, i.e. volunteers and first responders, are explicitly briefed that they are not being reviewed and that their crisis response decisions and actions are not being assessed – rather, the tools deployed for the exercise were the focus of evaluation. In this way, CM professionals should feel more at ease in experimenting with the provided tools. The field experiment, i.e. the simulated flood event is limited to the region Haaglanden; hence the preparation team is setting up tasks for volunteers only in this area. The volunteers are pre-registered, briefed and have installed the required software for their tool before the experiment. It is not the intention that the participants run a full-scale crisis management exercise. The Regional Operation Team (ROT) meetings are

therefore setup as guided meetings, meaning that a DRIVER+ experiment coach ensures that the focus of the discussions is on use of Volunteer Management Tools.

The main hypothesis behind the experiment is that modern ICT technology, as represented by the DRIVER+ solutions, can be used to improve the societal resilience and professional response capability by facilitating crisis communication with citizens. Moreover, citizens can profit from context-aware communication by adjusting their behaviour in a crisis situation. On the other hand, crisis managers can use the citizens as auxiliary resources and as human sensors to improve their understanding of the situation and obtain their support for simple tasks.

Additional hypotheses are:

(1) The targets of the main hypothesis can be achieved without overwhelming the crisis managers.
(2) The tested methodologies and tools are complementary rather than overlapping.

More specifically it seems reasonable to assume that the solutions being used have the potential to improve the overall resilience of society as well as to change the role of population from "potential victims" to active participants in the crisis management process.

The success criteria can be separated into "organization" and "learning" criteria7. The organization can be considered successful if following criteria are met:

- Realistic scenarios (CT processes and tools) defined.
- Successful volunteer registration and activation of selected groups of volunteers.
- Successful recruiting and activation of the CM professionals and observers.
- Successful integration of the disparate tools in "DRIVER+ solution".
- Successful tasking and gathering of feedback data.
- Meaningful evaluation and feedback from responders (crisis managers) and volunteers.

The "learning" criteria will be considered successful if it proves that the methods and tools tested in experiment indeed address the gaps listed above. This means:

(1) Assess improved informing of the citizens, including dissemination of alerts (Gaps 1 & 4).
(2) Assess improved management of the volunteers (Gaps 1 & 2).
(3) Assess improved situational awareness thanks to information received from the citizens (Gap 10).

2.4.2 Scenario Storyline

For our field experiment, we focus on the Wateringse Veld area, which is shown in Figure 2.6 and Figure 2.7 (page 25 and 26), surrounded in red. Other parts of The Hague and Westland are also under threat, but the Wateringse Veld is where the volunteers are deployed and managed by the experiment team during the experiment.

A giant North-Westerly storm is foreseen for the Western part of The Netherlands and a weather alarm code red is declared. The storm coincides with high tide and could threaten to overrun the coastal defence. The Water Authorities (national and regional) warn for a severe risk of flooding.

The Experiment focuses on the way a Regional Operation Team (ROT) can benefit from DRIVER+ tools and is split into 3 Phases over 2 days:

- Day 1 - Phase 1: **Introduction Phase** - Getting familiar with the possibilities of the tools that are used in the experiment. In the morning, the focus was on presenting the backend tools to information managers (**Phase 1a: Tutorial session for the professionals**). In the afternoon, the

[7] During the experiment preparation we only advertised the second set, but the organisational aspects are important for this report and organisation of the further experiments.

focus was on teaching the unaffiliated volunteers how to use the mobile apps (**Phase 1b: Tutorial session for the unaffiliated volunteers**).

- Day 2 - Phase 2: **Preparedness Phase** - Decision making prior to the crisis. Focus on gathering of information and informing and involving the public (volunteers).
- Day 2 - Phase 3: **Response Phase** - Decision making after the crisis. Focus on assessing the extent of the damage and tasking the public (volunteers) to collect extra information.

2.4.2.1 Day 1- Phase 1a: Tutorial session for the professionals

The tutorial session was organised as a "canned" mini-experiment where a very simple and unrealistic scenario of a "flood in the office" is resolved with the help of the tools used in experiment. The tutorial session comprised the following sub-activities:

- Tool preparation & introduction of the tools to the professional information managers of the ROT.
- Training of professional information managers from the Safety Region Haaglanden.
- Utilizing each tool in their mini situations.
- Discussion on experience & conclusions.

The difference between this tutorial session and the actual experiment is illustrated in Figure 2.4. Simplified timeline of the phases 1a and 1b is shown in the Figure 2.5. The complete script of the mini-experiment is presented in the "Day 1 – Tutorial script" annex.

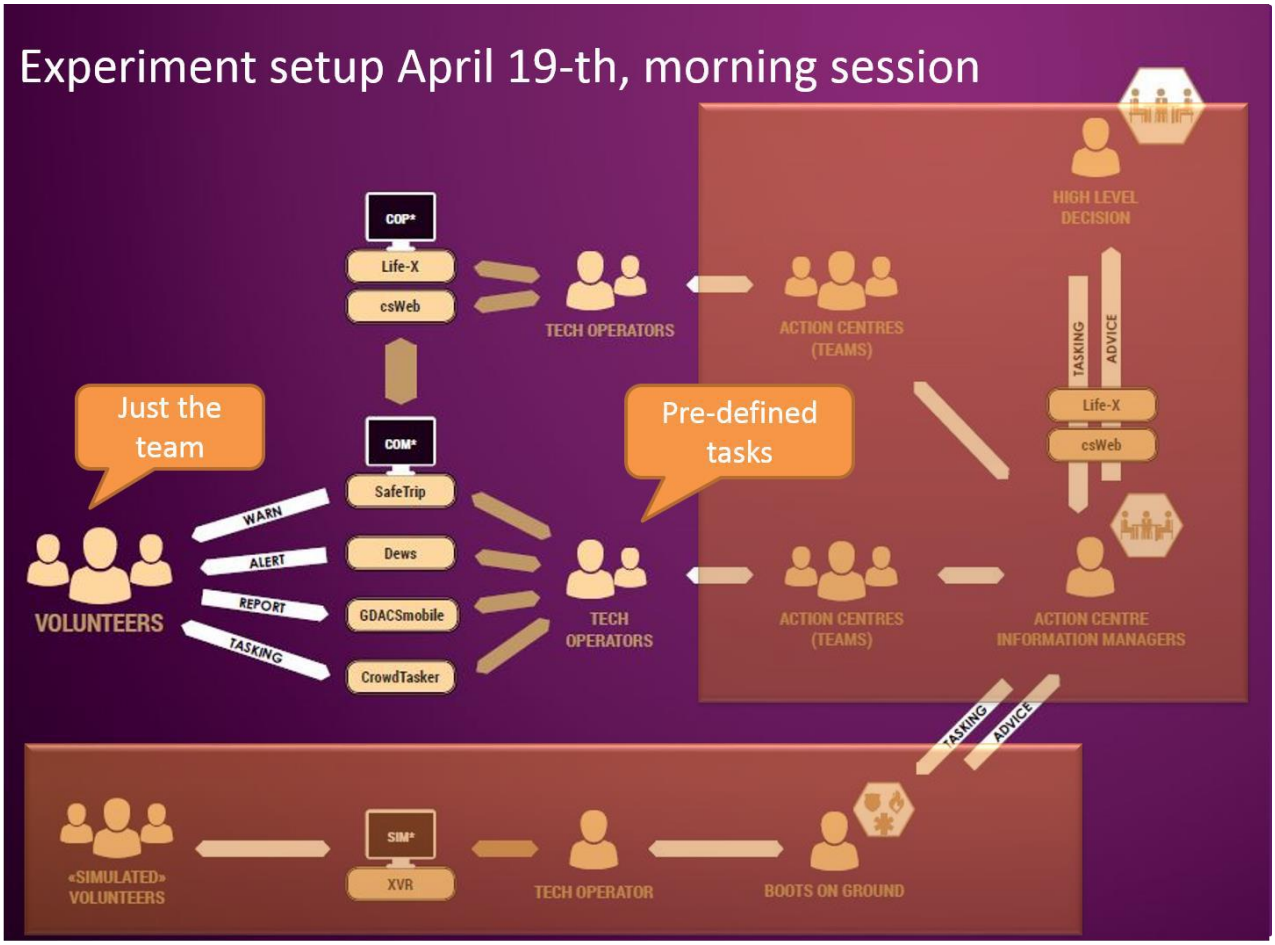

Figure 2.4: EXPE42 tools and participant roles – day 1

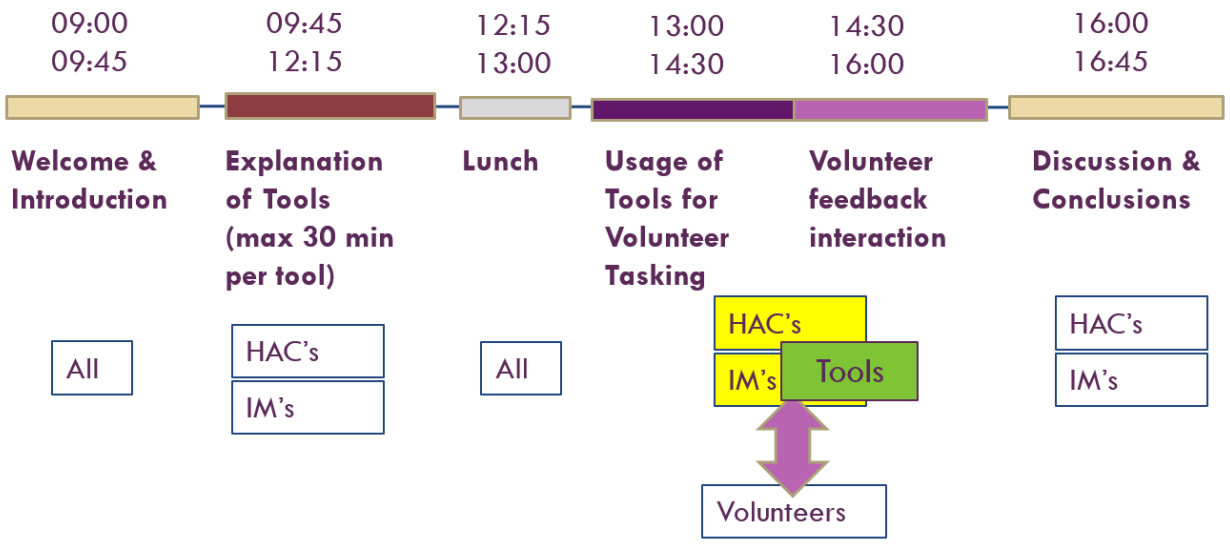

Figure 2.5: Timeline of the EXPE42 "day 1" (phases 1a and 1b)

2.4.2.2 Day 1 - Phase 1b: Tutorial session for the unaffiliated volunteers

In the afternoon of the first experiment day, the volunteers were given a chance to test the mobile front end of CrowdTasker, GDACSmobile and the SafeTrip app. For this occasion, basic instructions were sent to the users per e-mail and the users were requested to use the tools in an arbitrary location (e.g. at their home). For CrowdTasker, a simple "tutorial tasking" session was automatically started as soon as the user has opened the app for the first time and additional (mostly trivial) tasks were generated by the operators. For the GDACS, the users were instructed to browse through reporting categories and send a few observations.

2.4.2.3 Day 2 – Phase 2: Preparedness Phase (2 days before the breach)

On a second experiment day, a dedicated volunteers group is deployed in Wateringse Veld area. Search and rescue and fox hunt activities are organised tied to the experiment.

Table 2.1: Schedule for Experiment Day 2 (April 20th, 2016) – Phase 2, Morning

Time	Situation	Expected Action	Inject, if too late
09:00	**Arriving at VRH Platform.**	**Welcome message and explanation of Experiment.**	-
09:15	Briefing of ROT with imminent crisis situation	Definition of questions to be answered to ROT.	Steer ROT towards minimum questions to be requested of AT.
09:45	ROT ends.	split into Action Teams (AT) to work with tools.	Secretary of ROT to call and ask ROT to join another meeting.
10:00	AT decides on tool usage.	Deciding on message(s), request(s), taks(s).	Force choosing of tool.
10:15	AT works with Tool owner.	Preparing tool, sending messages.	Send out dummy tasks to keep volunteers active.

Time	Situation	Expected Action	Inject, if too late
10:30	**Tools must be activated.**	**The volunteers should be activated / tasked.**	**Force activation of Tools.**
10:45	Volunteers in action.	Data should be coming in to Action Teams.	Check with Tool supervisors if no data coming in.
11:15	AT's receiving data.	Analysis of data and reporting to ROT should be initiated.	Secretary of ROT to call and ask "don't forget the report to ROT in 30 minutes".
11:45	Start second ROT.	Discussion of incoming volunteer data.	Assess if a useful discussion emerges. If not, start guiding the ROT with questions.
12:00	End ROT, start asking evaluation questions.	Critical feedback on usefulness of volunteer data.	Force stop of discussion, request feedback on exp.
12:15	Lunch.	Mingle and eat.	Shorten lunchtime.

Morning session simulates the situation shortly before the crisis. Weather is calm. It is cold and cloudy but (still) dry. A giant North-Westerly storm is forecasted and a weather alarm code red is declared. The storm coincides with high tide and could threaten to overrun the coastal defence. The Water Authorities (National and regional) warn of a severe risk of flooding.

The Safety Region has been alarmed by the Water Authorities and has called for the Regional Operation Team (ROT) as a planning staff. The Strategic Team (RBT) has met once but wants to be informed continuously and will meet only when crucial decisions must be taken. The Water Authorities have provided the ROT with a map of the estimated area that will be flooded (Figure 2.6). This area contains a part of Wateringse Veld. The volunteers are informed of the forecasted crisis and asked to perform last minute preparations. The main activities for the volunteers include: micro-learning, mapping the potential secondary hazards, informing friends and neighbours and conducting last-minute preparations for the flood.

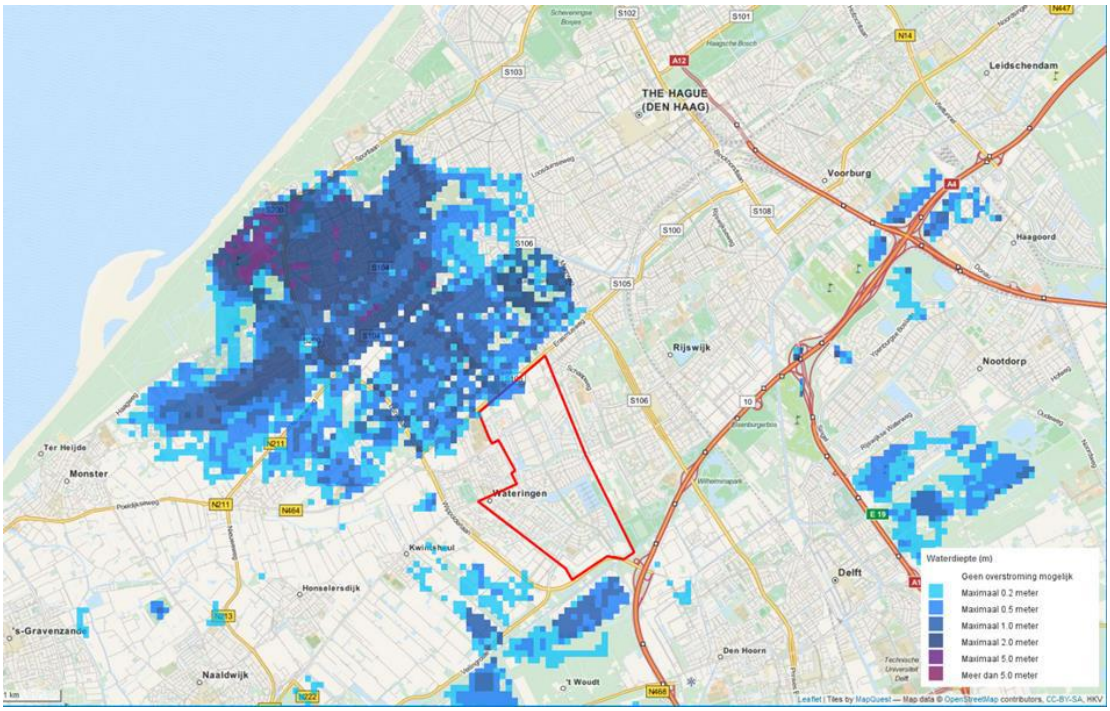

Figure 2.6: Map provided to the first responders of the ROT as forecast for the region of The Hague

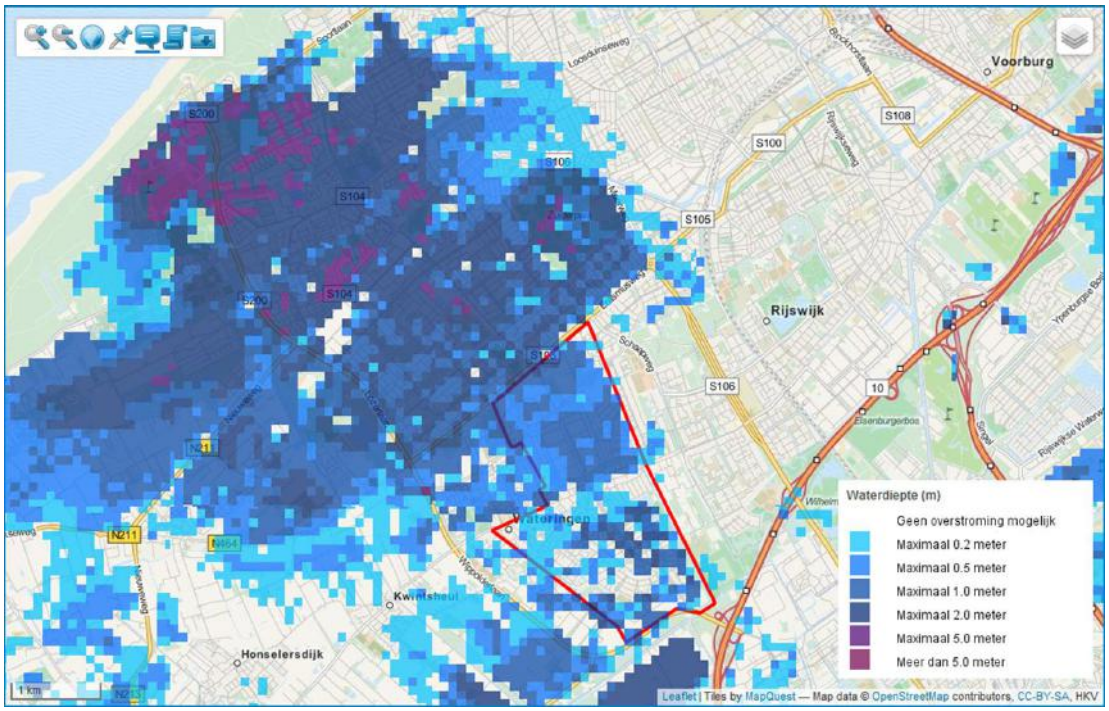

Figure 2.7: Actual map of the maximum water depth (ground truth), which is unknown to the ROT

2.4.2.4 Day 2 – Phase 3: Response Phase

Afternoon session simulates the situation after the flood (see also Figure 2.7). The volunteers are provided with information on the overall situation and asked to contribute more information on the situation in the field. The main activities for the volunteers include: mapping the damages and victims, informing the crisis managers on the urgent needs for assistance and performing auxiliary tasks (e.g. helping the elderly neighbours) to free the professional helpers for the core activities.

Table 2.2: Schedule for Experiment Day 2 (April 20th, 2016) – Phase 3, Afternoon

Time	Situation	Expected Action	Inject, if too late
14:15	**Tools must be activated.**	**The volunteers should be activated / tasked.**	**Force activation of Tools.**
	COPI's 1st Report must be in.	HAC to instruct COPI with new tasks.	Instruct COPI Lead to contact HAC and report.
14:30	Volunteers in action.	Data should be coming in to Action Teams.	Check with Tool supervisors if no data coming in.
	COPI sees effect of Tasked volunteers.	Update communication between COPI and HAC.	Trigger volunteer action in COPI simulation.
15:00	AT's receiving data.	Analysis of data and reporting to ROT should be initiated.	Secretary of ROT to call and ask "don't forget the report to ROT in 30 minutes".
	Volunteer error at COPI.	COPI should respond to changed crisis situation.	Inject missing volunteer into COPI information.
15:30	Start second ROT.	Discussion of incoming volunteer data.	Assess if a useful discussion emerges. If not, start guiding the ROT with questions.
16:00	End ROT, start asking evaluation questions.	Critical feedback on usefulness of volunteer data.	Force stop of discussion, request feedback on exp.
16:15	Experiment is finished.	Gathering to discuss complete flow of experiments. Gather data on feedback and thank participants for their effort.	Delay finish of experiment.

2.5 Ethical, legal and societal considerations

2.5.1 Stakeholders

To gather data and coordinate the experiment execution, the following roles need to be filled by DRIVER+ partners:

- **Observers** are needed to gather first hand data in the field. This includes both the control centre and the environment of the volunteers. Observers will follow participants and, without interfering, make recordings (notes, audio, video) that can be analysed at a later point. This role may be filled by any person affiliated with the project who can be trusted to conduct non-intrusive observation. Participants that perform this role may also be interviewers (see next paragraph) without generating a conflict of interest.
- The **Experiment Manager** is the person that oversees and where necessary controls the flow of the exercise. Ideally, this person is occupied neither with gathering data (observation, interviews) nor technological support (device setup). His/her task is to know the current state of the experiment

and recognise deviations from the experimentation plan. Requirements for this position are good knowledge of the experiment design and planning as well as an understanding of the research questions and their relation to the exercise.

- **Technological Support** is an important role to facilitate a smooth experiment run. It includes the setup of the systems that are to be evaluated during the exercise as well as the preparation of devices required to gather data. Support will be necessary where the participants are not familiar with their equipment. Technological support is critical, should problems occur with the tools used by non-DRIVER+ participants (volunteers, coordinators). Accordingly, requirements for this role include an in-depth knowledge of the systems being evaluated during the experiment.

In addition, two types of non-DRIVER+ participants are involved in experiment: unaffiliated volunteers using the mobile apps and the CM professionals who participate (mainly) in the back office, inform and coordinate the volunteers and analyse the data received from them.

2.5.2 Potential impacts and mitigating measures

All the participants in the EXPE42 experiment(s) were able-bodied adults and the experiments were organised in a way that did not put these participants in any danger.

The worst-case scenario was the one where some volunteers are asked to perform a task that is potentially dangerous for them or for their environment. This was mitigated by instructing the participants with access to the tasking software to avoid issuing any requests that could be potentially dangerous for the volunteers.

In order to ensure that a sufficient number, both of professionals as well as volunteers, are participating in EXPE42, a sufficient high number was invited to participate in the experiment. This measure turned out to be successful in so far, as a number of 72 professionals participated at EXPE42, although several invited professionals were not able to participate due to a real incident taking place the day before.

2.5.3 Informed consent and registration

All the external participants that were involved in the experiment were duly informed of the experiment goals and requested to sign the informed consent form that allows us to use the data gathered for research purposes. Professionals participating in the experiment have been asked to sign a paper form, whereas the volunteers were obliged to consent online as a pre-requisite for using the apps.

3. Evaluation Methodology

The experiment in The Hague served as Trial on two levels: firstly, to test crisis management solutions, both as stand-alone tools and as a combined interoperable solution that address different needs of citizens and crisis managers. Secondly, there was a Trial of methodology for data gathering and evaluation of the experimentation process itself. As such, there is an abstract level to the evaluation of this event in The Hague that not only provides an insight into the usability and viability of solutions and their joint deployment, but also regarding lessons to learn about experimentation methodology.

From the perspective of evaluating crisis management solutions, the overall goal of the experiment is to test the concepts and applications for context-aware informing and tasking of volunteers, as well as to evaluate the value of these activities for, both, citizens and crisis managers. Accordingly, the experiment is evaluated from three viewpoints: that of (a) the volunteers using the apps, (b) the professionals using solutions and (c) the dedicated observers. These viewpoints, differentiated by aspects to investigate, are displayed in the matrix in Table 3.1.

Table 3.1: Evaluation viewpoints of the experiment

	Volunteers	Professionals	Observers
Methodology acceptance	Citizens' perspective: usability of information, performing tasks, posting reports.	Professionals perspective: informing, alerting, tasking, situation awareness	X
Impact on crisis management	Informing, Involvement and tasking of citizens	Situation awareness, information dissemination and crisis management	X
Tool Usability	Citizens perspective (mobile apps)	Professionals perspective (backend applications), combined use of tools (interoperability)	X
Tool reliability	Mobile apps	Backend applications	X
Experiment setup	-	-	X

The methodology is predominantly of an exploratory nature. The Trial organisation team had limited experience with the deployment of these (partially experimental) crisis management tools in a simulated, joint environment. It was therefore considered necessary to investigate how the crisis management professionals could efficiently use the tools at hand or which of their intended workflows were supported at all. On a more abstract level, the event was also intended to develop and test methodology for collecting and assessing information in preparation for subsequent "joint experiments" in the DRIVER+ project.

To this end, it was decided by the project organisation to test several methods for assessing the experiment outcomes in parallel. In the order of expected quality of contribution to experiment evaluation, the methods used were as follow:

1) **Observation of the experiment by "evaluators"**
   These are dedicated DRIVER+ team members, who weren't involved in the development of the experiment and were given the task to report on their observations during the experiment on a pre-defined observation sheet that differentiated between categories and severity levels of observed events.
2) **Online questionnaires**
   Two online questionnaires were distributed: one for participants in the field acting as volunteers and another for crisis management professionals, solution owners and other DRIVER+ team members that participated in the experiment. These questionnaires were designed to provide quantifiable information on specific aspects of the experiment – most notably on the level of

satisfaction with specific aspects of the experiment organisation and tools. Full questionnaires are reproduced in the annex of this document.

1) **Briefing and hot debriefing** of experiment participants and hot debriefings with the DRIVER+ team. These discussions were designed to capture the overall sentiment and ideas of the participants before, during and after the experiment in an informal way, thus complementing the evaluator's reports.

3.1 Evaluator Reports

Evaluators are part of the extended experiment team – DRIVER+ participants that haven't been actively involved in experiment design. They were tasked with collecting observations on how the participating crisis management professionals use the DRIVER+ solutions to inform and task participants in the field acting as volunteers about the (simulated) flood event. Each observation had to be recorded electronically in a prepared form. To keep the process of noting observations fast and simple, while still allowing for quick categorisation of entries, the form provides pre-defined options for the observers to denote key parameters of the observed event. Each row offers the following categories and options of choice for the observer to select:

- **Observed item:** CrowdTasker, SafeTrip, GDACSmobile, LifeX COP, csWeb COP, Command Room, Other
- **Relevance:** Acceptance, Impact, Usability, Reliability, Communication, Experiment, Other
- **Importance:** Low, Normal, High, Critical
- **Sentiment:** Devastating, Bad, Neutral, Good
- **Observation:** Free text description of the evaluator's observation

Table 3.2: Example of an observation with timestamp

Timestamp	Observed Item	Relevance	Importance	Sentiment	Observation
20.04.2016 13:35	CrowdTasker	Usability	Normal	Good	The task was sent out successfully. CMs are going to Live Cop to see the reactions.

Table 3.2 shows an actual entry to the observation form, taken from one of the evaluator feedbacks. In this case, the evaluator has noted that a crisis manager has successfully sent a task with one tool and is now proceeding to the next one to check for results. This describes successful tool cooperation within the normal crisis management workflow. The evaluators were briefed about their task in a teleconference prior to the field experiment and once more in the morning of April 20th (second experiment day) with a short overview presentation of the experiment purpose and timeline. A third briefing was given shortly before the actual start of observations. Additionally, they obtained a two-page guideline as a reference on what and how to observe during the experiment. This document also contained a more detailed description of the different relevance aspects (third column of the observation sheet), which is reproduced in Table 3.3.

Table 3.3: Description of different relevance aspects for the observation

Aspect	Description
Acceptance	The professional's assessment of the tool during the exercise, as far as it is discernible during the experiment. What do the crisis managers think about the concept of the tool? Do they offer any remarks on whether they would use it during a crisis?
Usability	As "usability" we understand the fitness of the tool for the purpose it was designed to fulfil. We are interested to see how well the tools can be used for the needs of the professional crisis managers.
Reliability	How stable do the software tools work during the exercise? Are there technological issues?

Aspect	Description
Communication	Communication between professionals. We are interested in what kind of assignments or tasks are given from the command room to the operational level, i.e. the people supervising the tools, and vice versa, e.g. is there a feedback loop between the tool users/supervisors and the command room?
Experiment	These observations are meant for remarks on a meta level. They concern the methodology and the way that the experiment was conducted. If you e.g. see something in the experiment setup that obstructed participants, we would like you to let us now.
Other	We do ask you to concentrate on the categories defined above. However, if you feel that there are remarks that are very important, yet do not fit anywhere else, then use this.

Observers were especially instructed regarding the following critical points:

- Their observations should be non-participatory. This means that evaluators should refrain from influencing the course of the experiment or interact with the participants they are observing. Ideally, evaluators should stay in the background and take notes without interacting with the crisis managers or tool owners at all.
- Observers should rotate between tools they are observing and the control room. Each evaluator will have a unique viewpoint that will influence his/her way of observation (what and how). Through this rotation, it was expected to get a wider variety of observations for each tool.
- All observers should switch their positions at the same time on a 30 minute schedule to avoid creation of unnecessary "traffic" during the experiment.

3.2 Questionnaires

Two online questionnaires were developed for the experiment: one targeting the volunteers and one targeting the professional participants (crisis managers, observers, and the experiment team)

- The volunteer's perspective in this experiment consisted of understanding the methodology, the crisis information and tasking that we provided the volunteers with, as well as the usability of the mobile applications. To gather the volunteers' opinion on these issues, we used online questionnaires.
- For crisis managers, observers, and the experiment team, a different online questionnaire was used. In our analysis, responses are distinguished according to these groups. From the professional perspective, the evaluation was focused on the methodology of informing, tasking, alerting and information gathering, and the usability and impact of the collected information for the crisis management, as well as usability of the tools regarding the backend applications.

Each of these questionnaires consisted of several parts:

- Questions aiming at profiling of the participants. These questions inquired about age, sex, previous experiences with volunteering, expectations and for the "professionals" allowed to differentiate between crisis managers, observers, and the experiment team.
- Questions aiming at the experiment organization and own participation in it. These questions inquired about the understanding and satisfaction of the participants with the way experiment was organized, understanding of the goals, information they were given etc.
- Questions aiming at tools. These questions inquired at the level of satisfaction with different aspects of the tool (e.g. usability, ease of use, reliability and value for specific purposes). The volunteers were asked to assess the apps that they used, whereas the professional participants were asked to assess the tools that they either used or at least saw someone else using and thus had knowledge to assess.
- Questions allowing the participants to provide additional free-form comments and suggestions.

- Final question asking how likely they are to participate in a similar experiment again.

3.3 Debriefings

After the morning (disaster preparation) and afternoon (disaster response) sessions, a debriefing discussion was held with the crisis managers involved in the experiment. After the conclusion of each of the two sessions, professional crisis managers that participated in the use of tools or situation assessment were asked to participate in “hot debriefings”, where they were to give thoughts and observations on the usability of tools and experimentation process. These discussions were planned as an open forum to exchange ideas and experiences from the experiment. They were held on the premises, in a conference room immediately adjacent to the main solution deployment area (c.f. Table 2.2). It was expected that debriefings should provide rich qualitative context to the otherwise quantitatively-oriented experiment data.

The aim of the first debriefing session was to establish a relation between current practices of crisis management professionals regarding their interaction with citizens. This was considered important to be able to establish a context for their utilization of the DRIVER+ solutions during the event. The intention of the second debriefing was to discuss the experiment progression and reflect on the use of tools by crisis management professionals with regards to their current workflows.

4. Experimentation Report & Results

In early 2015, a selected number of crisis management tools was presented and evaluated within the DRIVER+ community, by both tool providers and practitioners. Based on a structured evaluation regarding the availability, relevance and maturity of specific crisis management functions, such as e.g. the gathering of situational awareness, appropriate tools were identified for the considered experiments (Figure 4.1). The main tools utilized in the experiments are:

1. **CrowdTasker, GDACS mobile, SafeTrip and DEWS:** Each of these tools, shown on the left-hand side of the Figure 4.1, represents one of the increasingly more relevant methodologies for interaction with the population in crisis situations encompassing one-way emergency alerting as well as dedicated micro tasking (In this section we call these tools communication tools).
2. **csWeb and the LifeX COP:** These two tools represent two approaches to providing a Common Operational Picture. As a part of the experiment, they have also implemented two approaches for interpreting the data received from the volunteers in ad-hoc manner.
3. **DRIVER+ CIS prototype:** A solution that connects all tools and allows them to automatically exchange messages during the experiment. To ensure technical interoperability was one of the major goals of this experiment.

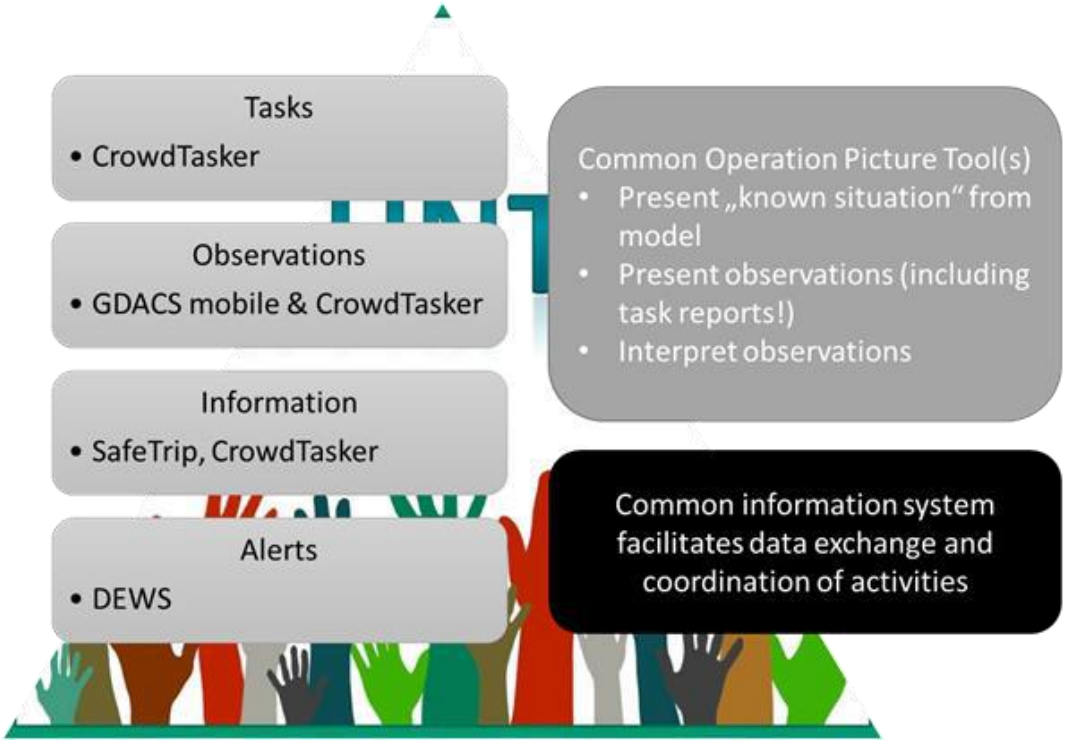

Figure 4.1: Overview of the tools and functions tested in EXPE42

Communication tools used in this experiment also provide some functionality that was presumed important for volunteers or crisis management professionals and are described below:

- GDACSmobile features Twitter integration. That is, GDACSmobile messages are exchanged over Twitter and new messages can even be posted using a standard twitter client instead of the GDACSmobile app (Hellingrath, & De Groeve, 2013).
- Both, GDACS and CrowdTasker provide mechanisms for improving the trust in volunteers and validating the information they provide.
- CrowdTasker provides an easy to use mechanism for choosing the best qualified volunteer(s) for a task at hand from a large group of unaffiliated volunteers.

Each tool supports the implementation of the methodology applied in the experiment and fulfils a specific role, as listed in Table 2.1. These roles are not distinct among the tools and create areas of cooperation. They align with the introduced gaps to be addressed by the experiment scenario.

(1) **Observing:** collection of geo-located crisis information from volunteers (e.g. citizens).

(2) **Tasking:** assigning tasks to groups of volunteers and collecting results and completion notifications.

(3) **Informing:** providing crisis information to volunteers and the general public.

(4) **Alerting:** providing targeted information to a defined group of recipients.

Table 4.1: Assignment of tools to roles within EXPE42

Role	Gap	Tools
Observing	(1), (3), (4)	GDACSmobile, CrowdTasker
Tasking	(1), (2), (4)	CrowdTasker
Informing	(1), (3)	SafeTrip, GDACSmobile, CrowdTasker
Alerting	(1), (3)	DEWS

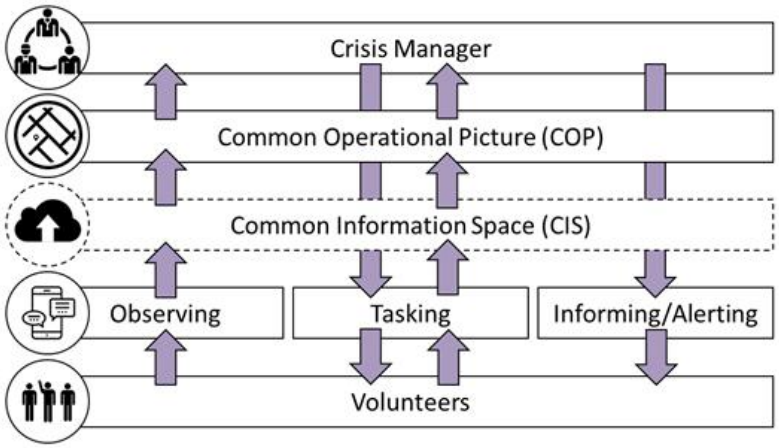

Figure 4.2: Communication layers and information flows

4.1 Experiment Execution and Results

EXPE42 experiment has been designed as an exploratory experiment chain, with increasingly more and more complex test setups and storylines. Neither the participants with crisis management background nor the volunteers had any previous experiences with the DRIVER+ experimentation methodology.

After structural changes in the planning phase AIT took over the experiment lead in November 2015, the first team teleconference took place in December 2015 and the final demonstrator in April 2016. In this time, the EXPE42 team had to perform the following tasks:

- Develop the missing features for the CIS, that was in an early development phase at the start of the preparation.
- Improve the tools involved in the experiment, following the feedback from first two events and from the two live meetings of the extended EXPE42 team that were organised prior to the actual experiment.

- Integrate the tools used in experiment in an interoperable system of systems with the CIS acting as central distribution module.
- Develop the detailed storyline of the experiment.
- Prepare the surveys, instructions and tools for evaluators.
- Prepare and execute the event with 72 participants at the main event location and 362 volunteers.

4.1.1 Design decisions and issues encountered

To improve the chances of success, the team has opted for an approach similar to AGILE development with weekly "progress tracking and planning" teleconferences. These teleconferences and the two live meetings have served as a main communication and planning mechanism. In addition to the core EXPE42 team, participants on these events included the methodology experts, communication experts and other experts from various DRIVER+ SPs that were expected to contribute to the success of the experiment.

This mechanism has worked perfectly for the core EXPE42 team and allowed us to rapidly improve various aspect of the experiment preparation in a very short time. Unfortunately, this did not work quite as well with the "associated members" of the team that weren't officially working in SP4 and therefore had a different schedule and overlapping duties. In particular, the connection with the methodology experts from SP2 did not work well. This issue was further aggravated by the fact that the EXPE42 members considered the methodology document too abstract and had to deal with far too many high urgency issues at a same time. As a result, the team has never developed a full and intuitive understanding for the DRIVER+ experimentation methodology.

This has made it very difficult to define adequate KPIs and measurement methods for collecting the information that will allow us to assess the level of success of the experiment. Concrete measures to overcome the encountered issues, described above were:

- Concentrate on assuring that the core EXPE42 tools can work together properly and no major technical issues such as failed or hampered information exchange are encountered during the final event.
- Develop a sound storyline and build a scenario that is relatively realistic and that can be executed in the final event and consider it a success if this is achieved.
- Increased focus on time management (e.g. assure that the invitations for the CM professionals, volunteers, evaluators and other participants are sent out in time) and the event logistic (organisation and functioning).
- Develop tutorials for teaching the invited CM professionals and volunteers how to use the tools and assure that the participants have absolved these tutorials before the main experiment.
- Try out several methods for collecting the data on experiment in parallel, with the objective that this will allow us to better understand and interpret the experiment later.

First three points worked out beyond expectations. In early April, we have managed to produce a relatively robust technical setup and a very detailed and structured experiment storyline. Moreover, the invitations were prepared and sent to all required actors and the only remaining risk that we saw was that the volunteers may not show up.

Point four is where we encountered the **first major impediment**: **many of the CM professionals that were invited to the event did not show up** at all three occasions where their attendance was expected. Some were not able to attend the first training prior to the actual event, others were not able to attend the Tutorial session on the first day of experiment. Worst of all, **many of the CM-professional invitees were prevented to attend the second (main) day of the experiment due to a real-world emergency that they had to fight against in the preceding night**.

As a result, we suddenly ended up with an adapted, **limited experiment setup that is presented in the Figure 4.3. This has by far exceeded our anticipated "worst case" scenario. The major issue encountered was that due the untrained CM professionals with no or limited understanding on how to use the tools**

severely limited our ability to rely the decision-makers requests to the volunteers during the experiment. Instead of the planned full-time interaction of the CM professionals with the technical operators, this interaction was de-facto limited to short periods when the high-level decision makers physically moved from the command room to the room with solutions.

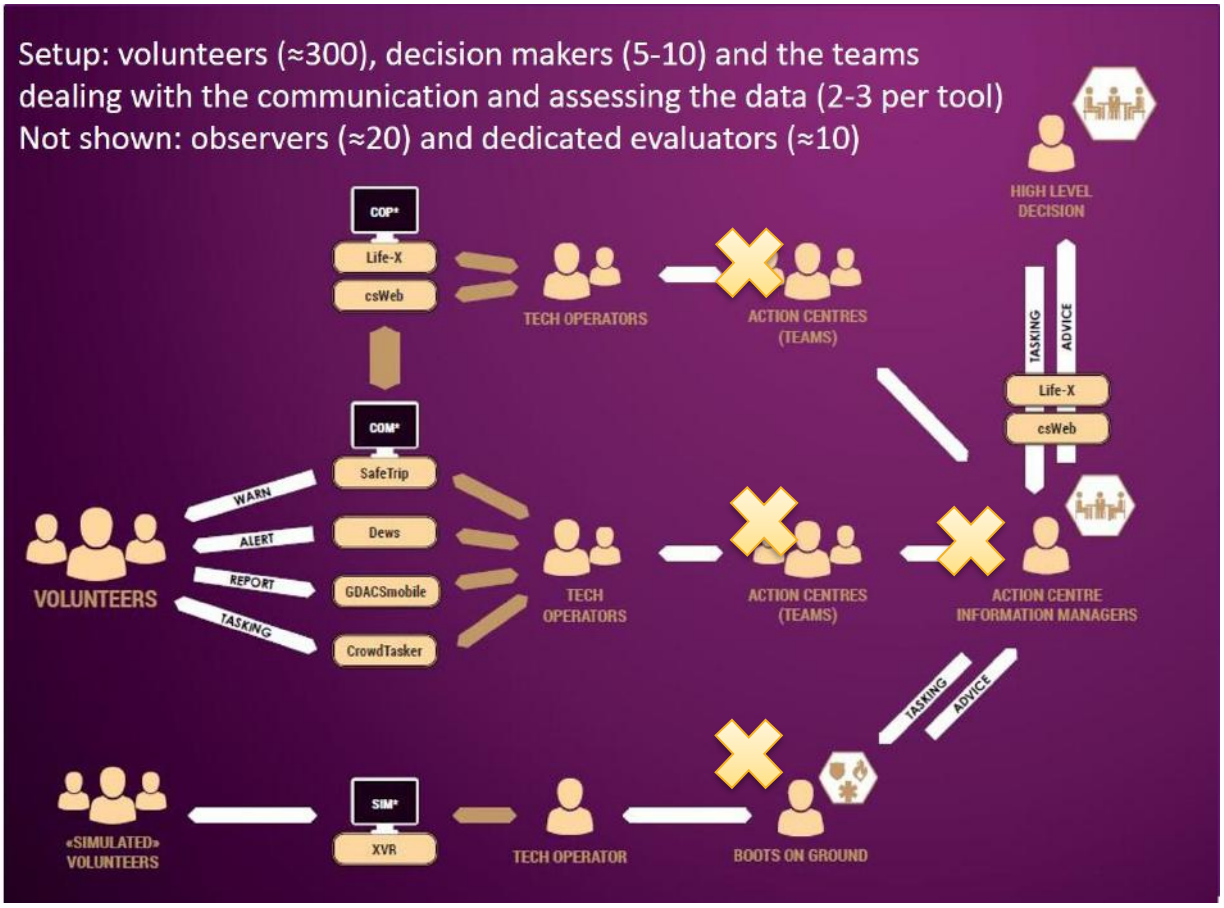

Figure 4.3: EXPE42 participants that did not show up on the second day of the experiment

Despite this, the results of the survey performed at the end of the experiment show that the participants were generally satisfied with the experiment, considered the experience educational and were willing to participate in a similar event again. According to our survey results:

- 45% of the volunteers[8] and 55% of the professionals would definitely participate in a similar experiment again
- Further 39% of the volunteers and 36% of the professionals would probably participate in a similar experiment again.

4.1.2 Evaluator Reports

This section gives a summary of relevant points taken from the individual evaluator reports. It is structured according to the methodology of the evaluator reports (see section 3.1) and does only partly include statements on specific tools, because some evaluators did not give statements to all tools. Nine internal DRIVER+ members evaluated the experiment and filled in the evaluator reports.

[8] More precisely: "participants that completely answered the volunteers survey".

4.1.2.1 Acceptance

At the time of the execution of the experiment volunteer management was not used by CM professionals in the Netherlands due to legal concerns. In such a case, the command officer in charge would be responsible for their actions without authority or control over their actions.

For instance, Burgernet is a Dutch self-organized organization, which aims to improve local security by using the assistance of citizens for search and rescue missions, but this organization was not mentioned by the CM professionals and seems unfamiliar to them. It was stated that self-organized groups have the advantage that they are more reliable than other unorganized groups and they have a group leader to contact.

The evaluators concluded that the acceptance of csWeb COP, LifeX COP, SafeTrip, CrowdTasker and GDACS mobile by CM professionals is high, though it would be more trustworthy to target people according to their specific profile. In that case, pre-registered volunteers would need a validated profile. Social media apps have the advantage that people have them installed already, CM apps are new and thus must be installed first. It also has to be considered, that CM professionals do not know how tools fit in their command chain yet and a structured way to organize volunteers has to be clarified first.

4.1.2.2 Usability

According to the evaluators, usability of tools for volunteer management strongly depends on the ability of CM professionals to formulate precise, understandable and feasible tasks. This also encompasses the decision about to ask for text messages or photos instead. In the experiment, the interaction time of end users with the tools was considered to be too short.

Some CM professionals stated that the efforts required to receive information in LifeX COP are a bit too high. Another concern was about GDACS mobile, where an information centre would be needed to filter data, if many volunteers are involved, otherwise CM professionals will be stalled by too much not structured and validated data. Regarding SafeTrip it was stated that it would be useful to have a configuration option in order to have the possibility to receive a notification when there is new content (interpretation from the authors: SafeTrip does not have to option to automatically receive all available travel warning notifications).

4.1.2.3 Reliability

Although it is sometimes difficult to manage a big amount of responses from volunteers, the response from many volunteers is needed to evaluate the reliability of incoming information from them. In the experiment, tool providers filtered the incoming information by hand, but this is difficult to be done without a CM background.

Problems with the reliability of information appeared in cases where volunteers did not activate GPS on their mobile phones and thus it was not possible to locate their position and reference their information. There are language issues if volunteers send messages in another language as the CM professionals are able to understand.

4.1.2.4 Communication

Language problems became evident in different situations. During the experiment, some discussions between CM professionals were held in Dutch and were therefore not understandable for evaluators. Some volunteers sent text messages in Dutch which were not readable by tool providers who filtered messages.

To improve the workflow, CM professionals would like to have immediate response from volunteers, if tasks are accepted and when they can expect responses, otherwise further planning is more complicated.

Generally they are very interested in the tools and tool providers answered questions and helped explain the functionality of the tools.

Communication with citizens via tools can have a big advantage compared to alerting via sirens, because in some situations people should stay indoors but they show up on the incident scene instead.

4.1.2.5 Experiment

CM professionals were clearly satisfied with the experiment but for future experiments, they recommended to be involved in the scenario planning. Regarding the organization structure during the experiment, it was mentioned that it was too complex due to the large number of involved organizations. It is recommended to keep the number of involved organizations rather low in future experiments.

4.1.3 Questionnaires Volunteers

The volunteer's perspective in this experiment consisted of understanding the methodology, the crisis information and tasking that we provided the volunteers with, as well as the usability of the mobile applications. To gather the volunteers' opinion on these issues, we used online questionnaires.

4.1.3.1 Volunteer profiles

Altogether 149 participants out of 362 have answered the survey, but only 100 surveys were completed. Out of these, slightly more than 1/2 were male and two responders chose not to disclose their gender (Figure 4.4).

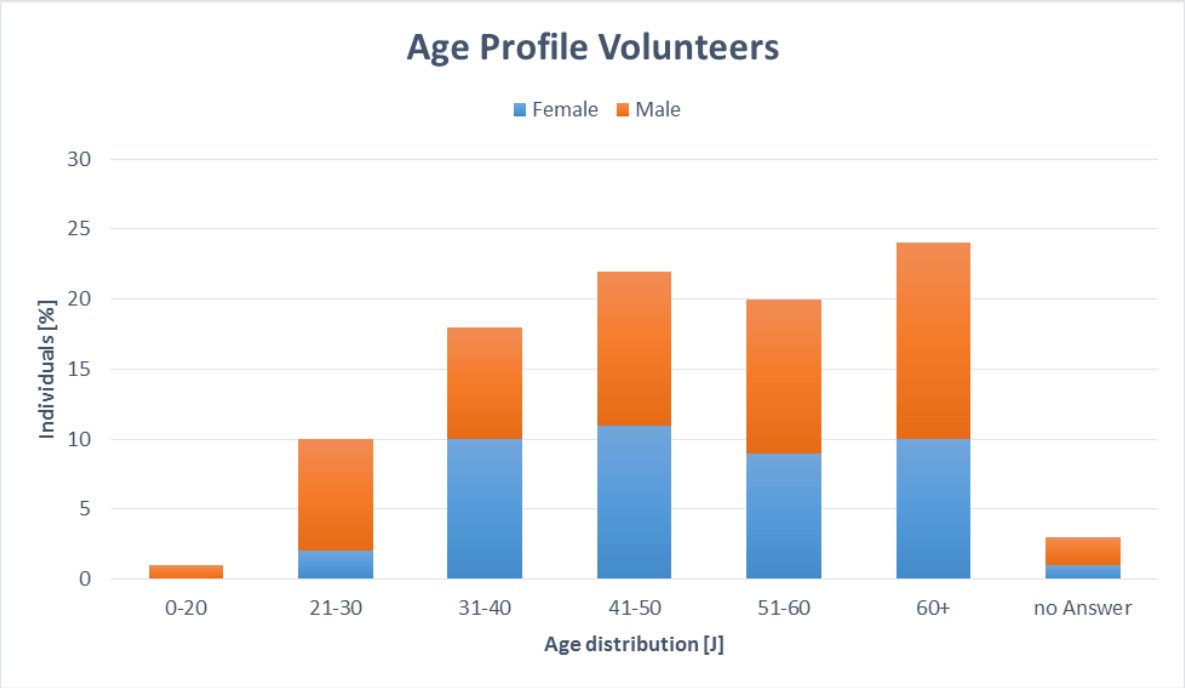

Figure 4.4: Age profile of volunteers

Figure 4.5 shows that nearly half of the volunteers have previous experiences with volunteering in a loose organisation like Burgernet and about 1/3 of the volunteers in a formal organisation like Red Cross. Only the numbers for volunteering in a self-organised group are quite low.

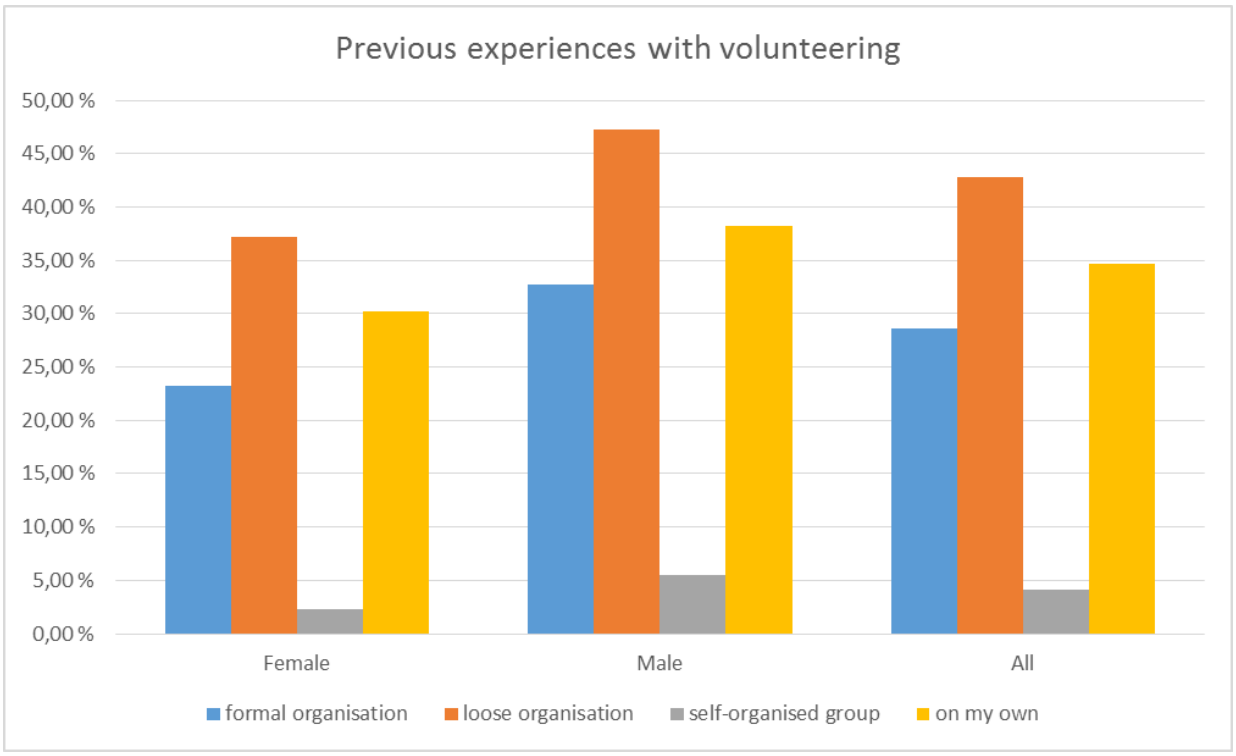

Figure 4.5: Volunteers previous experiences with volunteering by gender

The analysis shows an obvious difference in the numbers filtered by age (Figure 4.6). In this case, the graph shows a similar picture for the age class 21 to 40 the number of people volunteering in a formal organisation shows a strong decrease from 43% to 21% towards the elderly participants. Especially more than half of the volunteers in the class 60+ have experiences with a loose organisation, but only 21% of them in a formal organisation and 8% helped on their own.

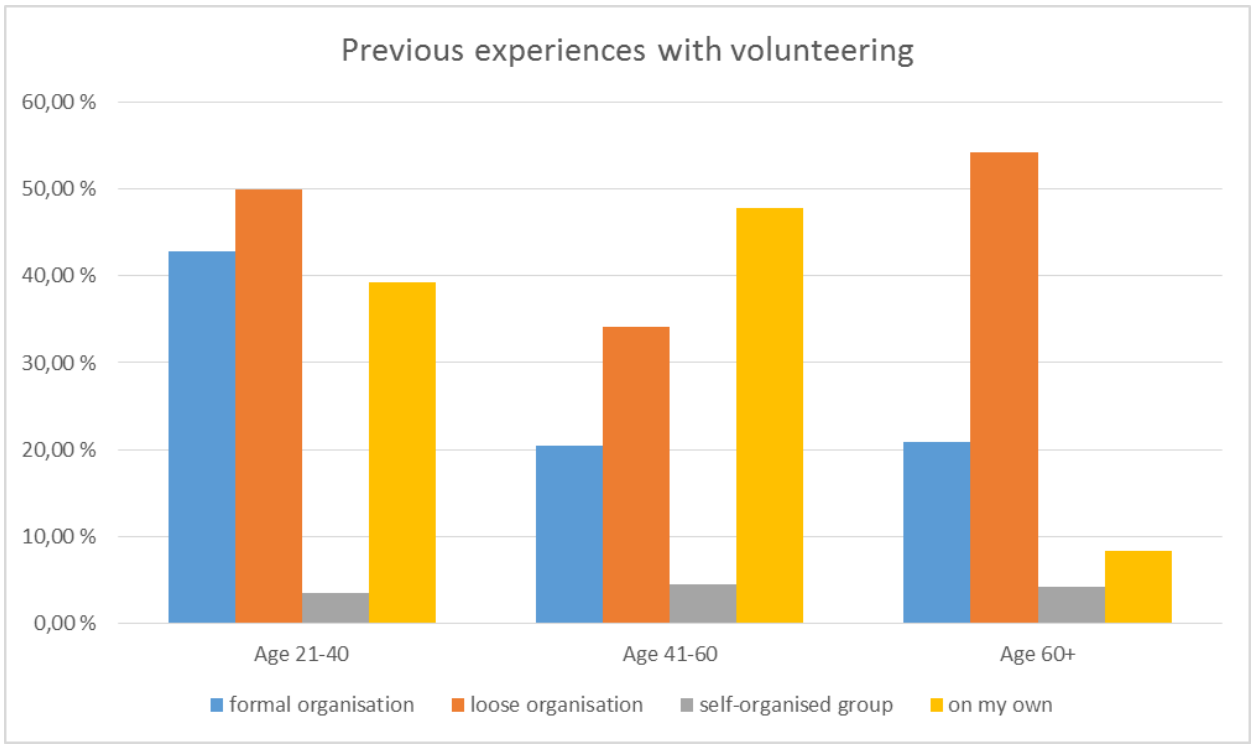

Figure 4.6: Volunteers previous experiences with volunteering by age

4.1.3.2 Volunteer expectations

In Figure 4.7 Volunteers rated the importance of different aspects of volunteering by using numbers between 1 and 5 in which 1 is the worst option and 5 the best option. Though there is no big difference between male and female volunteers, there is a difference in some aspects in the age classes. The biggest difference is in the importance of institutional volunteering where the rating of younger volunteers with 4,7 is very high, but the older volunteers rated it rather low (3,5 and 3,8). This reflects the previous experiences of the age classes. Generally all aspects are rated very high, the lowest numbers were given for the long-term engagement of volunteers and making own decisions.

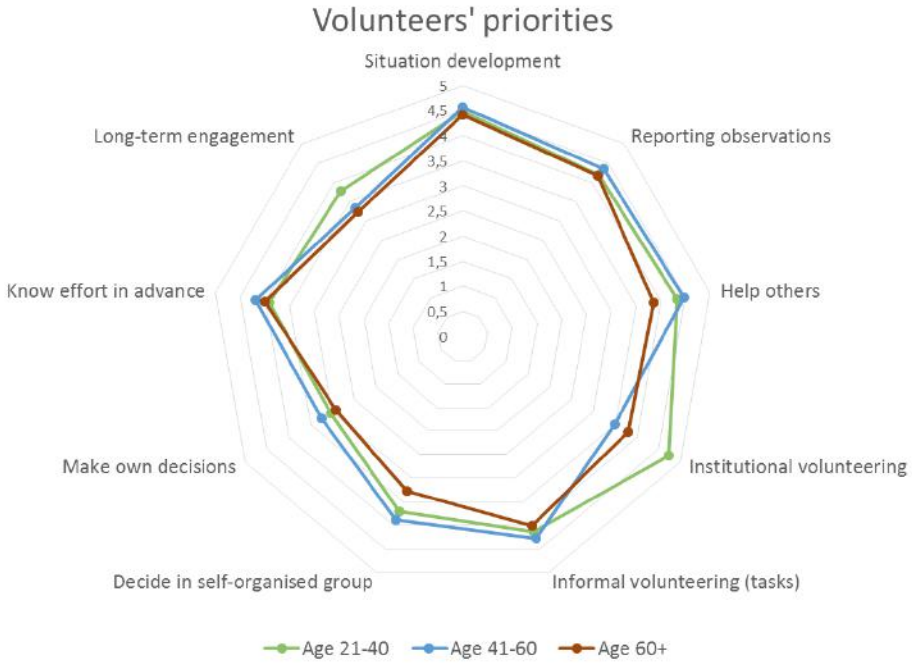

Figure 4.7: Volunteers expectations by age; 1 – worst option, 5 – best option

4.1.3.3 Volunteer information satisfaction

Volunteers were asked about their satisfaction with the experiment organization. All Questions about the Quality of information provided were clearly better rated by male participants then by female participants (Figure 4.8).

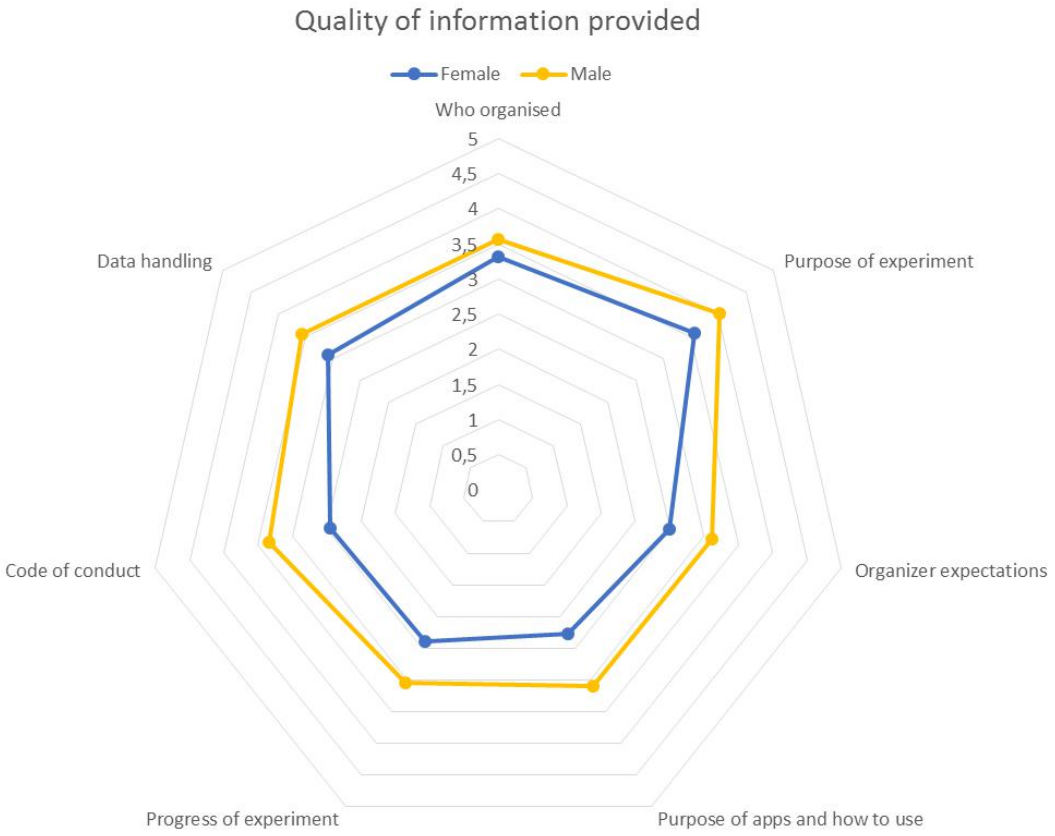

Figure 4.8: Volunteers information satisfaction by gender; 1 – worst option, 5 – best option

Going deeper into the details it is shown, that female users of the CrowdTasker and GDACS mobile gave similar judgements related to their satisfaction on the organisation of the experiment and use of tools (Figure 4.9). The satisfaction of volunteers without tool, was considerably lower, this is probably because they were unhappy that they were not strongly involved in the experiment.

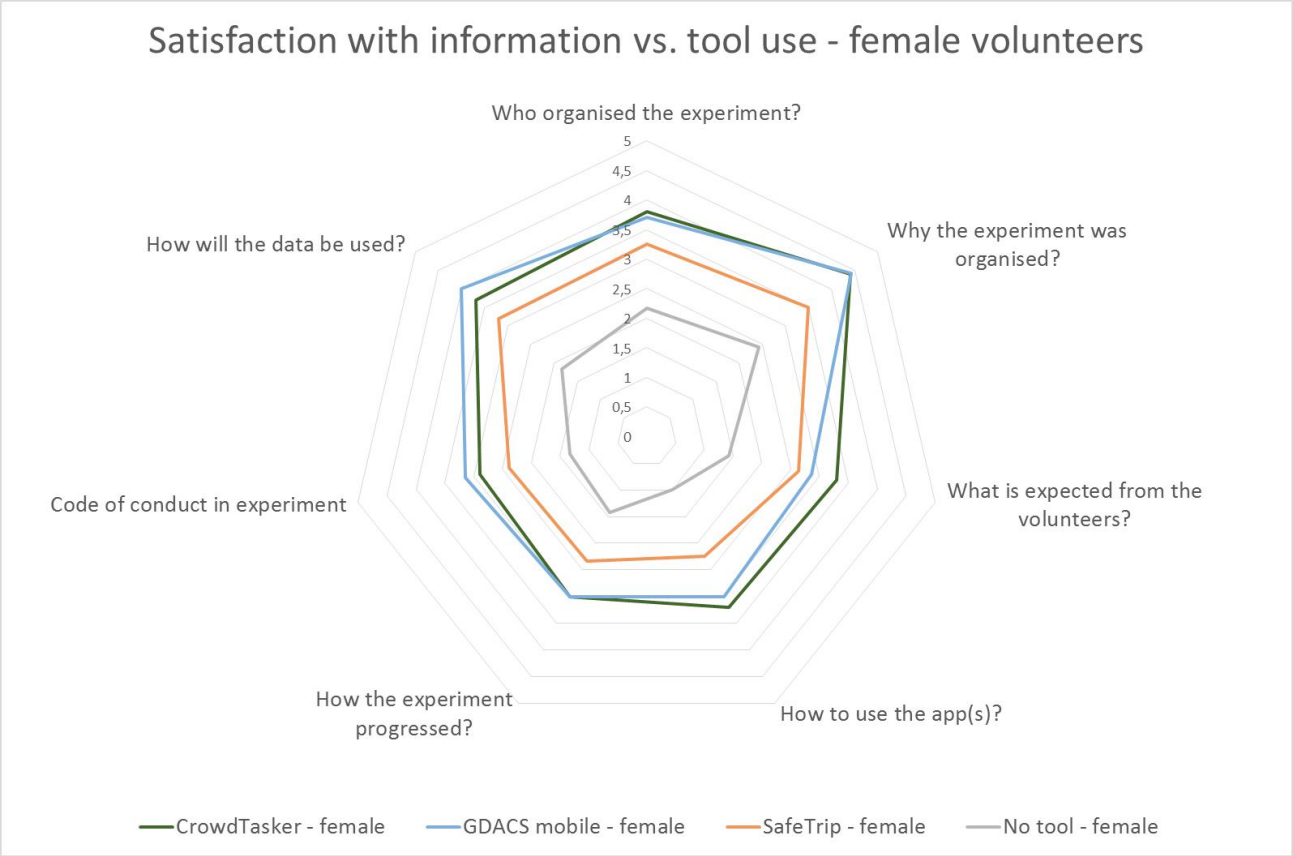

Figure 4.9: Volunteers information satisfaction by tool - female; 1 – worst option, 5 – best option

All experiment participants have been explained who organised the experiment and why. CrowdTasker users were reminded of this information during the experiment. GDACS ones weren't.

On the other hand, the tool users were far better informed about the way apps are used and had a possibility to witness the experiment progress through the tools, whereas the other participants only received the information posted per e-mail and on a blog.

We anticipated that this will lead to lower overall satisfaction among the participants that did not use CrowdTasker or GDACS mobile, but we did not anticipate a gender gap, as can be seen from Figure 4.8.

4.1.3.4 Future volunteer participation

Asked about their slant to participate in a similar experiment again, 45% of all volunteers answered with a clear yes (Figure 4.10). There is no big gender difference, but volunteers in the age class 21 to 40 are more interested in participating again, then the older volunteers.

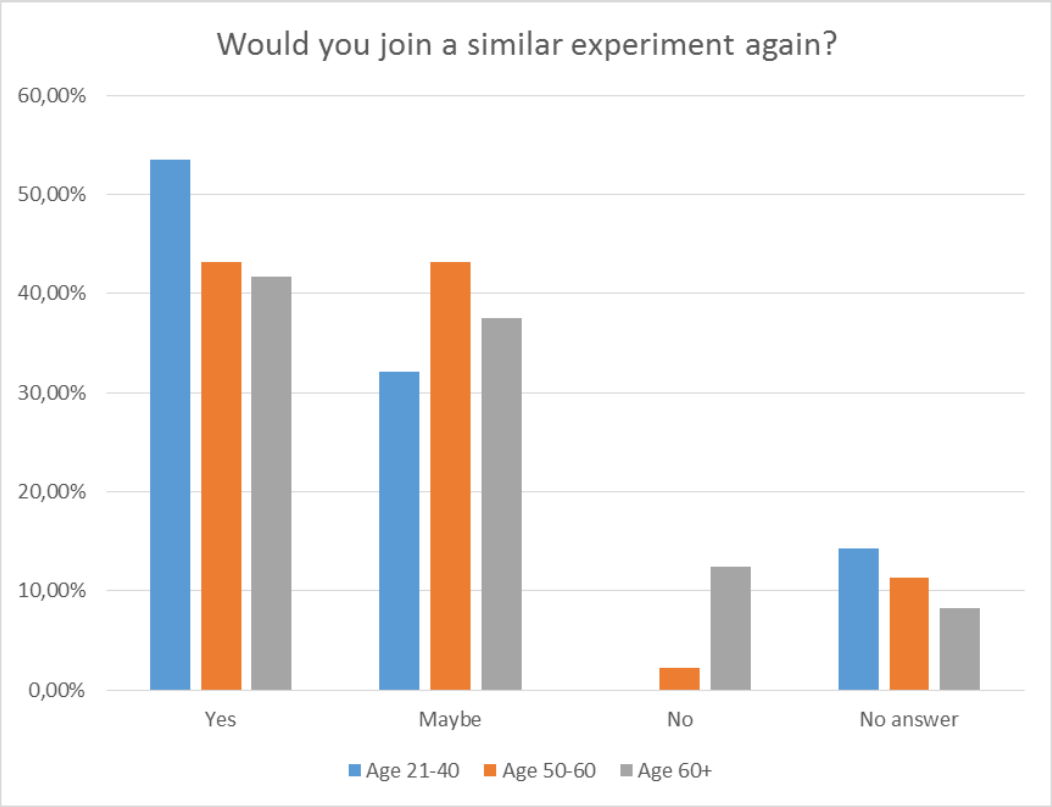

Figure 4.10: Future volunteer participation by age

It is also possible to have a look at it from the perspective of involvement, which is shown in Figure 4.11. Volunteers who were strongly involved in the experiment (using CrowdTasker or GDACS mobile) would more likely participate again. Only 40% of the volunteers who were less involved (no tool users and SafeTrip users, who considered them less involved) are strongly interested in another experiment like this.

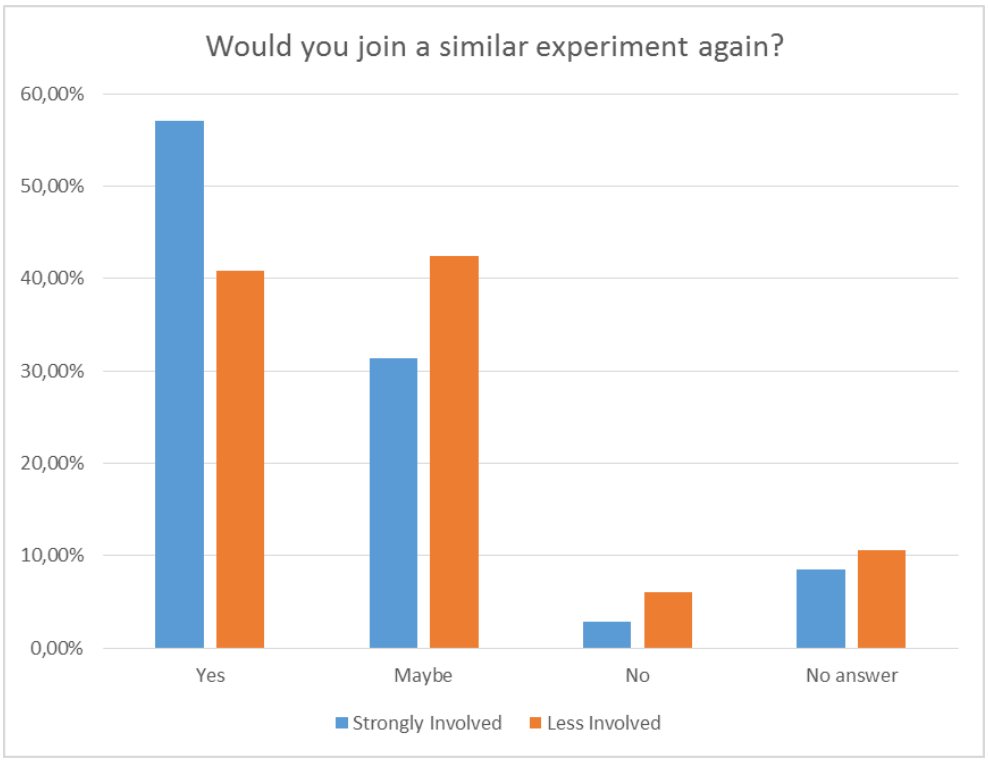

Figure 4.11: Future volunteer participation by involvement

4.1.4 Questionnaires Professionals

For crisis managers, observers, and the experiment team, a different online questionnaire then the questionnaire for volunteers was used. In our analysis, responses are distinguished according to these groups. From the professional perspective, the evaluation was focused on the methodology of informing, tasking, alerting and information gathering, and the usability and impact of the collected information for the crisis management, as well as usability of the tools regarding the backend applications.

At the end 33 out of 72 team members and observers have answered the survey.

4.1.4.1 Professionals Background and Roles

Slightly less than half of the professionals were CM-professionals. Other professionals came from Industry, Research or ICT sector (Figure 4.12).

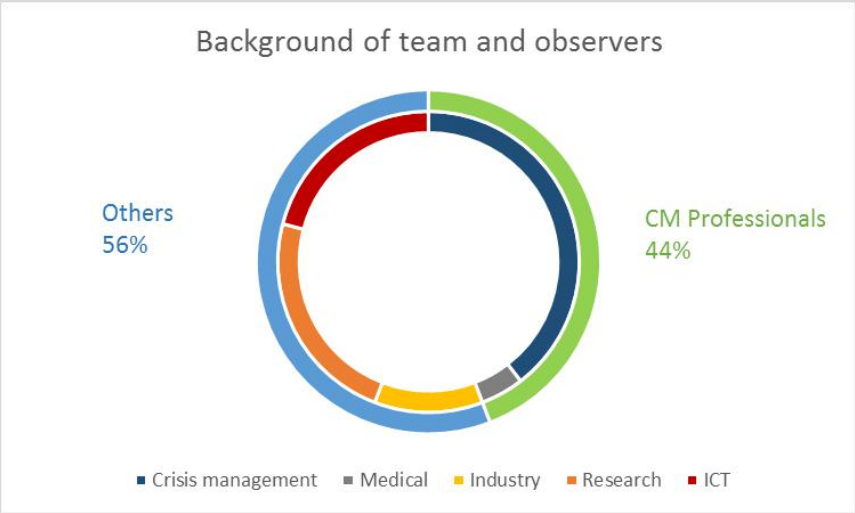

Figure 4.12: Background of professionals

Figure 4.13 shows, that about 1/3 of the professionals were part of the technical team or tool owner and hence strongly involved in the experiment. 22% of the professionals were in the crisis management team and the other professionals were less involved as observers, evaluators, reviewers or part of the support team.

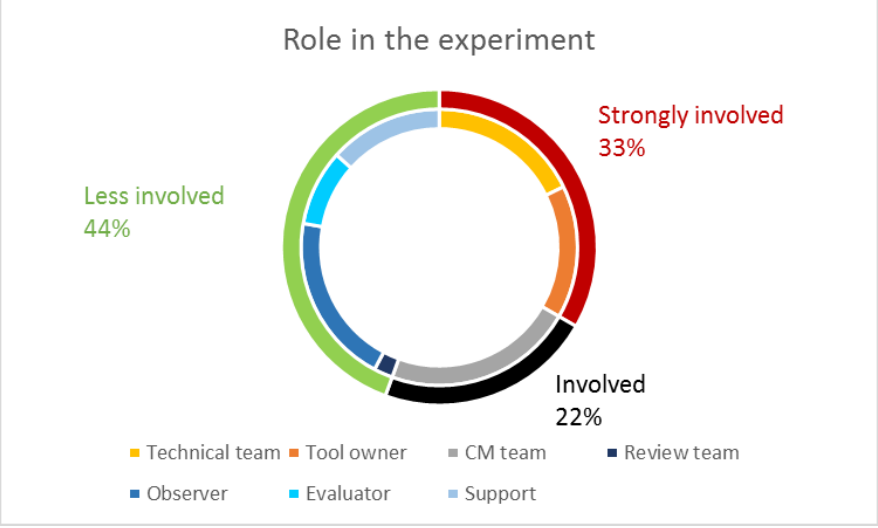

Figure 4.13: Role of professionals in the experiment

4.1.4.2 Professionals' information satisfaction

The professionals rated the quality of information provided during the experiment (Figure 4.14) by using numbers between 1 (worst option) and 5 (best option). There are no substantial differences between CM-professionals and other professionals rating. The quality of information provided about the progress of the experiment was the only point rated very low by both groups of professionals.

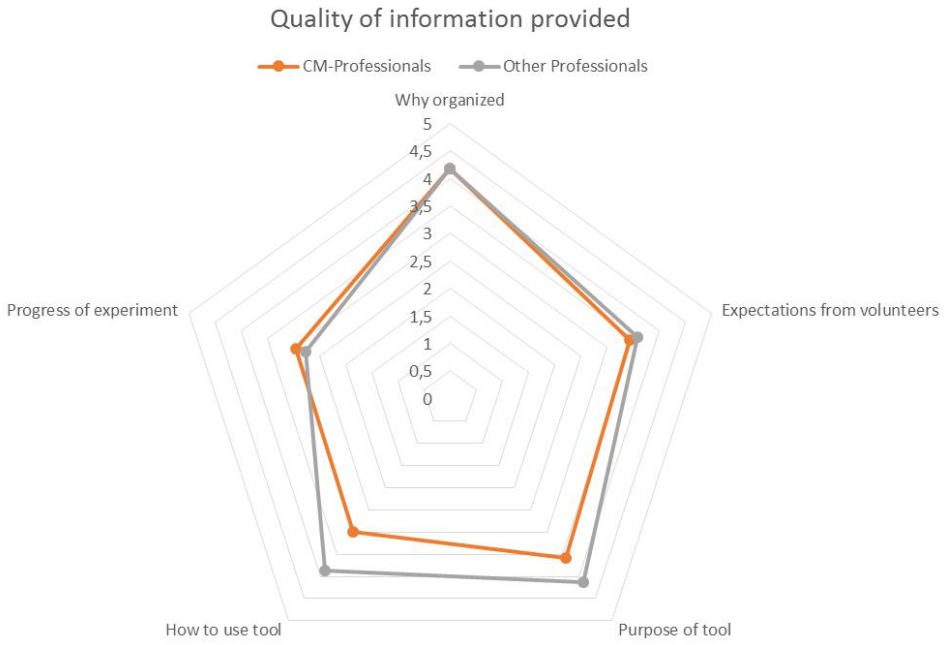

Figure 4.14: Professionals' information satisfaction; 1 – worst option, 5 – best option

The quality of provided information evaluated by strongly involved professionals (Technical Team, Tool Owner), involved professionals (Crisis management team) and less involved professionals (Review team, Observer, Evaluator, Support) shows a similar trend (Figure 4.15).

Figure 4.15: Professionals' information satisfaction by involvement; 1 – worst option, 5 – best option

4.1.4.3 Future professionals' participation

Indicated in Figure 4.16, about 80% of the professionals are interested in participating in similar experiments again. More than half of the professionals are strongly interested in participating again.

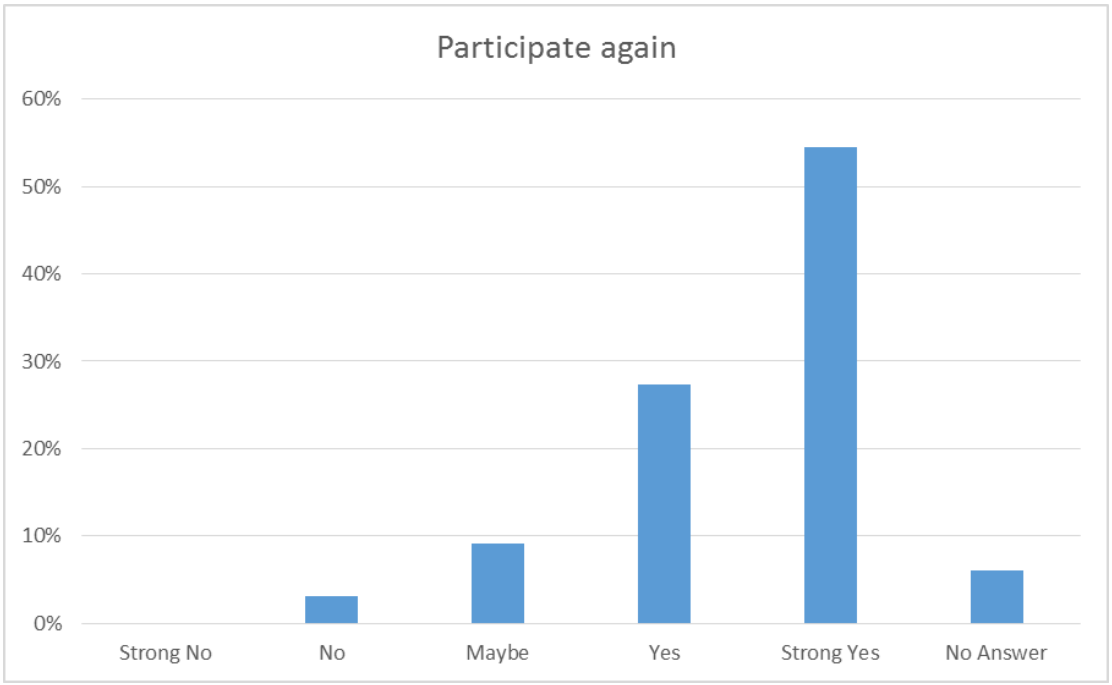

Figure 4.16: Future professionals' participation

4.1.5 Debriefings

The first debriefing session, with the aim of providing context for the utilization of DRIVER+ tools by establishing current practices of interaction with citizens of professionals, showed that the practitioners who were present at the exercise had little prior experience with the handling of informal volunteers. If at all, informal volunteers are used only outside of affected areas and not during the response phase. Major concerns were voiced regarding the legal framework of enlisting the help of such unaffiliated volunteers, due to incident coordinators and commanders will be responsible for injuries of or damages inflicted by informal volunteer "under the command" of an emergency organisation in the Dutch legal framework. Further concerns were given regarding the reliability of informal volunteers. Furthermore, the participants stated that, in their experience, convergence of volunteers is not an issue. There were reports of usage of social media tools such as Facebook, Twitter and WhatsApp to communicate with citizens (not necessarily volunteers), but there is no formal organisational policy or methodology for such virtual interaction.

This contextual information is relevant to the interpretation of the further results presented in this document. The context of the experiment was the interaction with, and coordination of, volunteers in a potentially affected area during the immediate response phase – which the participants have stated is not currently part of their intended procedures. Effectively, they were asked not only to use tools, but also procedures they were unfamiliar with. This should be taken into consideration when contemplating the time required adapting to the new tools and accordingly the frequency and manner of their utilization.

4.2 Report per solution

4.2.1 CrowdTasker – AIT

Crowdtasker's role is to provide a middle ground between crowdsourcing approaches like that of GDACSmobile (see on page 49 and following) and the command and control paradigm by issuing stepwise partitioned and well-defined tasks to a selected crowd of pre-registered volunteers, thereby yielding data of known structure and high relevance to the operator (7).

4.2.1.1 Tool Overview

CrowdTasker, an implementation of the crowdtasking concept, was originally developed by the AIT Austrian Institute of Technology in co-operator with the Austrian Red Cross (ARC), Frequentis, the Vienna University of Technology and INSET Advisory in the frame of the national research project "RE-ACTA" to address the need for the management of spontaneous volunteers by applying new media technologies. The aim of project RE-ACTA was to transfer the best practices in the management of spontaneous volunteer that the Austrian Red Cross has gathered through their work, especially with regards to the "Team Österreich" initiative, to state-of-the-art ICT (8). Both the technological implementations of CrowdTasker and LifeX COP (see page 58 and following) were developed and evaluated in a field exercise as outcomes of this project. In The Hague, the CrowdTasker was used in conjunction with multiple other tools for the first time during a live exercise. As such, this event gave the CrowdTasker team not only an opportunity to gauge the acceptance and gather feedback from practitioners and operators, but also to test the feasibility of data exchange and cooperation with other tool providers.

4.2.1.2 Results Questionnaires

The overall satisfaction with CrowdTasker for volunteers is very high. Females rated some functionalities higher than men, for example the reliability of the tool, the understanding of the situation and the information what to do in the situation (Figure 4.17).

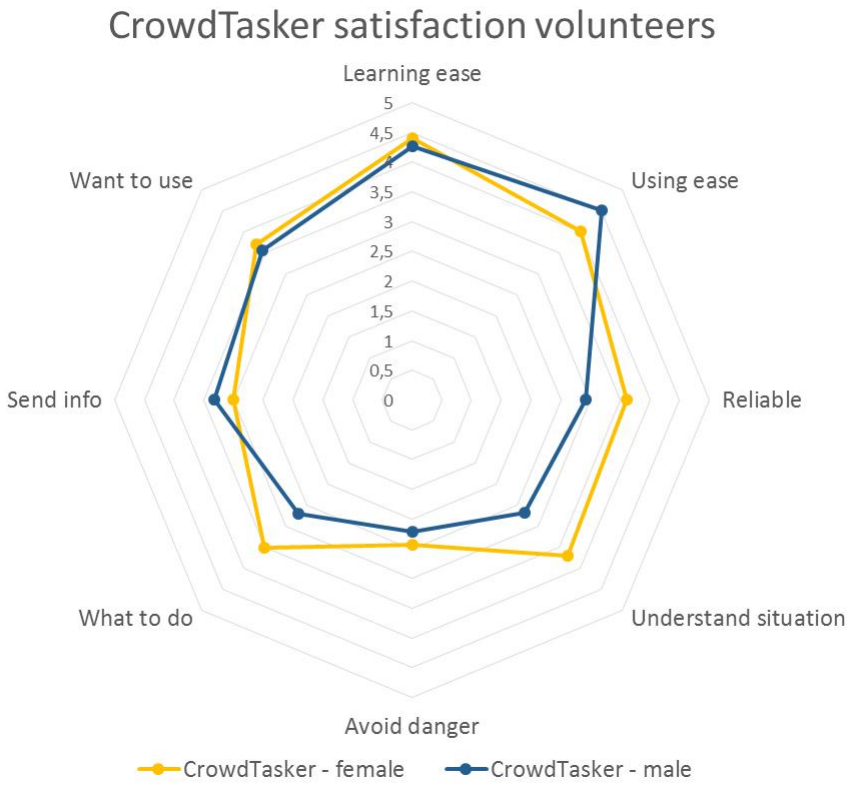

Figure 4.17: CrowdTasker satisfaction of volunteers by gender; 1 – worst option, 5 – best option

In Figure 4.18 there is not a big age difference in the rating of different functionalities, but some of them are clearly better rated by the younger volunteers and some are clearly better rated by the elderly.

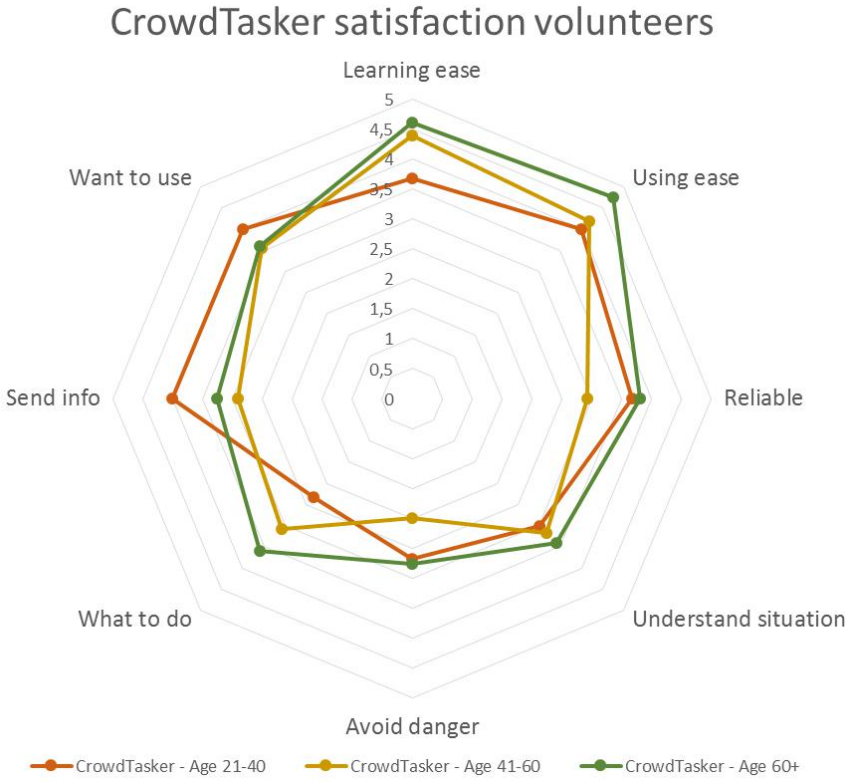

Figure 4.18: CrowdTasker satisfaction of volunteers by age; 1 – worst option, 5 – best option

Professionals also rated the CrowdTasker very good, the documentation got the lowest rating from all categories (Figure 4.19).

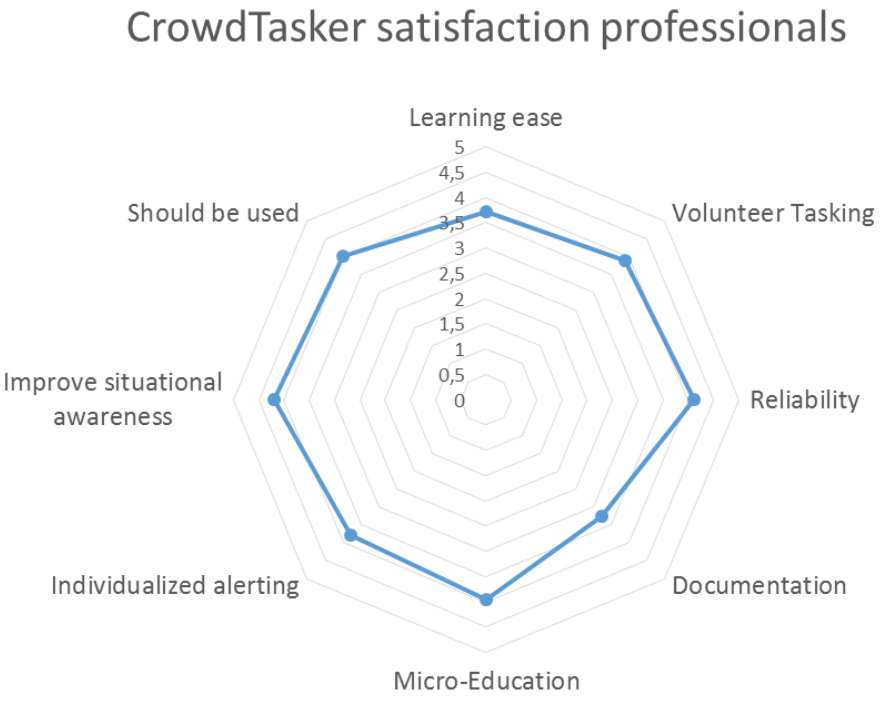

Figure 4.19: CrowdTasker satisfaction professionals

Asked for improvements suggested by the questionnaire, professionals rated the possibility to have multilingual tasks and to assign meanings to reports (e.g. Legend or scale to a map) as the most useful improvements (Figure 4.20).

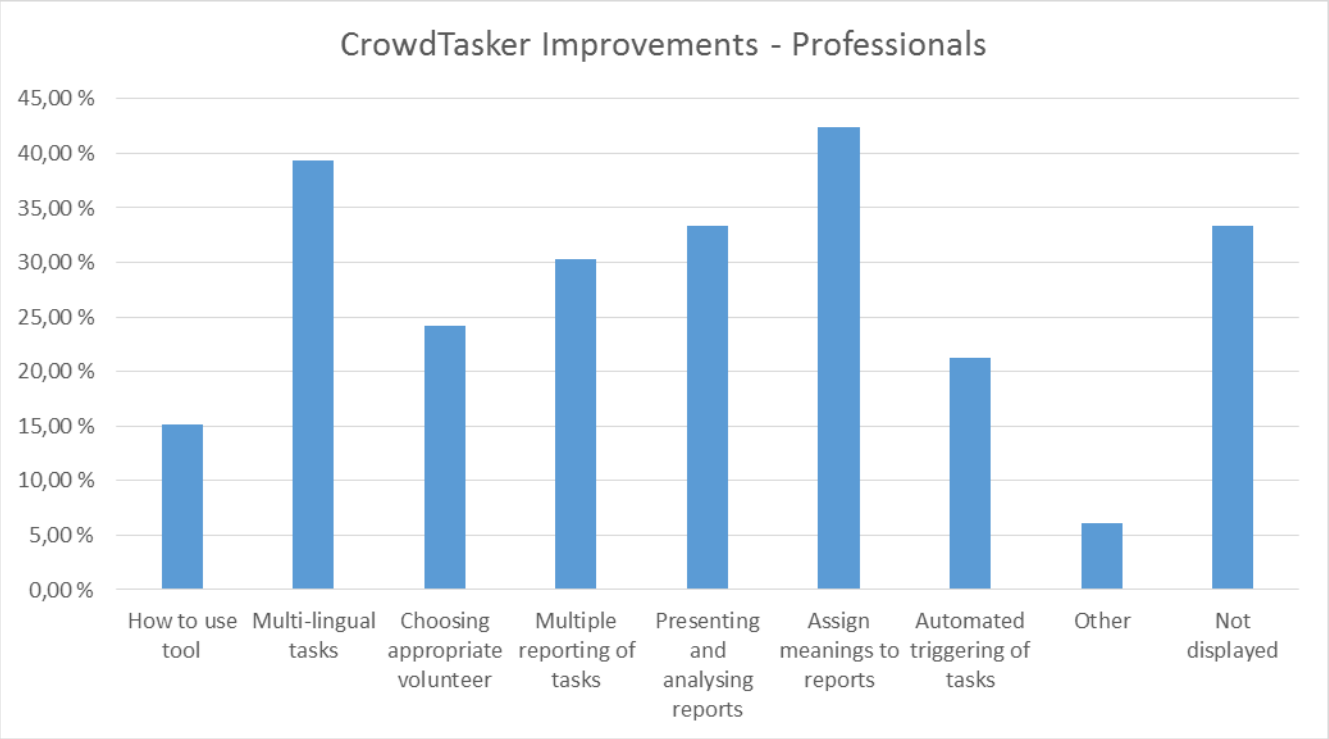

Figure 4.20: CrowdTasker improvements professionals

4.2.1.3 Lessons Learned

One of the interesting lessons learned in this experiment, especially regarding the goal of investigating synergies between the tools used in the field, was **the difference in use and usability of CrowdTasker and GDACSmobile. More generally, this is the difference between crowdtasking and Volunteered Geographic Information (VGI).**

CrowdTasker implements the crowdtasking workflow, where the volunteers are explicitly asked to perform a well-described task where the volunteers' coordinator already knows what he or she wants to get from volunteers. GDACS mobile, by contrast, implements a considerably simpler VGI workflow, where the volunteers are free to report whatever they consider important at any time.

Certainly, **crowdtasking workflow provides more functionality** than the VGI. In particular, crowdtasking workflow can be used for **micro-learning**, for issuing **contextual warnings** and for requesting the volunteers to **perform specific tasks** in an efficient way.

However, **both workflows can be used to improve the situational awareness**. When used in this way, **crowdtasking has both advantages and disadvantages** over the VGI crowdsourcing. Main advantages are:

- The available **volunteer resources are used more efficiently** since they do not waste effort at reporting information from the areas the crisis managers aren't interested in.
- The information received is likely to have a **better content to noise ratio**, and **sure to be of interest** to the volunteer manager, since it only contains the information that was explicitly asked for.

Main disadvantages are:

- Volunteers can only report on the topic they were explicitly asked to report on. Unless a special "report if you encounter something really critical" task is requested, they will have **no way to warn the coordinator that they have encountered something unexpected**, no matter how important this is.
- **More effort is required from the coordinator** to solicit the information. While no soliciting is needed in VGI crowdsourcing, the current crowdtasking implementation does not even allow the volunteers to perform the same task twice.

Through the exercise setup in The Hague, we have constructed an interesting context that has shown how these two methodologies of acquiring information from volunteers lead to drastically different user experience: During the first day of the event, volunteer users of both tools were asked to experiment and get acquainted with the respective application at home. The motivation for such tasks is generally low. However, the CrowdTasker web interface CTA was operated by the tool owner (AIT Austrian Institute of Technology) who knows the tool and crowdtasking concept very well. As a result, the users were given tasks that explain how to use the tool, which do not necessarily need to relate to crisis and disaster management, and what the purpose of the event is. They were also provided with typical preparatory tasks. As a result, we managed to motivate the CrowdTasker users.

On the second day of the event, GDACS staged a "treasure hunt" type of activity in the Wateringse Veld region of the field exercise. Volunteers were asked to search for signs placed by the event organisers, and to reported everything they considered interesting. At the same time, the CrowdTasker volunteers experienced prolonged times of inactivity while operational crisis managers with no experience in using CTA had to explore the tools options and interpret the situation. This led to a decline in satisfaction of user experience of CrowdTasker volunteers, due to the fact that they were given no options for participation or contribution while not having an active task to execute, whereas volunteers using GDACS could continually submit information (relevance and quality of these contributions being left out at this point).

The AIT as CrowdTasker solution provider has drawn the following conclusions and lessons from these observations at the Trial in The Hague:

1) Crowdtasking is well suited for micro-teaching, educational purposes and micro-tasking of the volunteers.
2) Implementation of the "re-occurring tasks" would significantly improve the usability of the tool.
3) Presentation of the data received from CrowdTasker on a COP system is not easy because the data model is defined in ad-hoc mode and the data does not contain any semantic information that would allow the COP tools to color-code it accordingly. Two ways for addressing this issue have been implemented in csWeb and LifeXCop (cf. sections 4.2.6 and 0).
4) Crowdtasking should not be seen as a replacement for data acquisition by VGI:
    a. VGI is a preferable method of data acquisition if and when the operator needs the information about situation at ground and does not yet have an overview of the situation good enough to query about specific conditions. This is true immediately after a crisis, when motivation among volunteers is high and quickly discovering relevant situations is of importance.
    b. Crowdtasking is better suited for soliciting reports on specific items (e.g. for verification of a report received through GDACS) that the volunteers might not consider inherently "interesting" or for soliciting reports from specific areas.
    c. Crowdtasking is also preferable in the preparatory phase, when the inherent motivation of the volunteers is low.

4.2.2 GDACSmobile – UNI Münster

4.2.2.1 Tool Overview

GDACSmobile aims at supporting two main target groups: people concerned with disaster relief, and the (affected) population itself. Both groups can use the application for sharing information, thus in turn creating a better situational awareness which is crucial for effective disaster response. The general workflow is depicted in the following Figure 4.21.

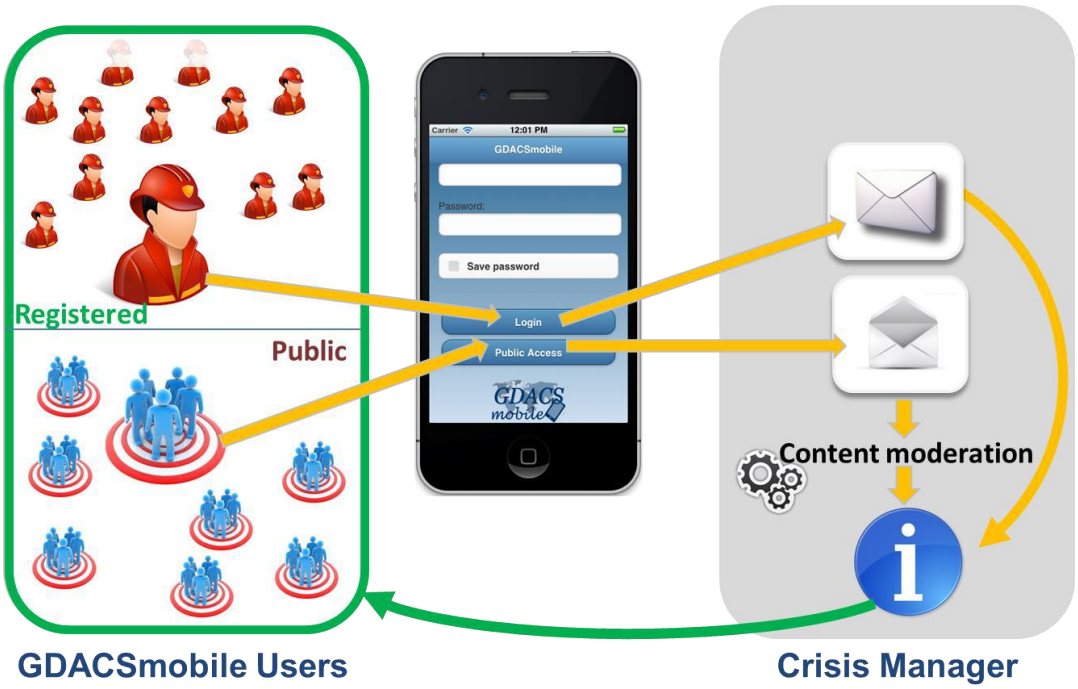

Figure 4.21: GDACSmobile Actors

Although both groups (registered users as well as public users) are able to use the application, different rights and roles are assigned to the users. With the focus on interaction with citizens of EXP 42, only public users have been addressed in the scenario. The primary focus lies on information retrieval to obtain a better awareness of the current situation. Consequently, the population will be provided with the ability to assess the current needs situation and submit this data to the server and thus to professional helpers receiving the information.

This also affects the workflow within GDACSmobile. All users provide observations as reports to a category, e. g. infrastructure, health needs, including further details like an image, text and geo-location. Reports from public users will be reviewed by professional or trained volunteers to filter wrong or invaluable information. Publicly accepted reports are furthermore visible to all users on the devices. Crisis managers are also able to share information by providing public reports, for example to highlight locations offering shelter.

4.2.2.2 Results Questionnaires

The overall satisfaction with GDACSmobile for volunteers is quite high. Males rated nearly all functionalities higher than women (Figure 4.22).

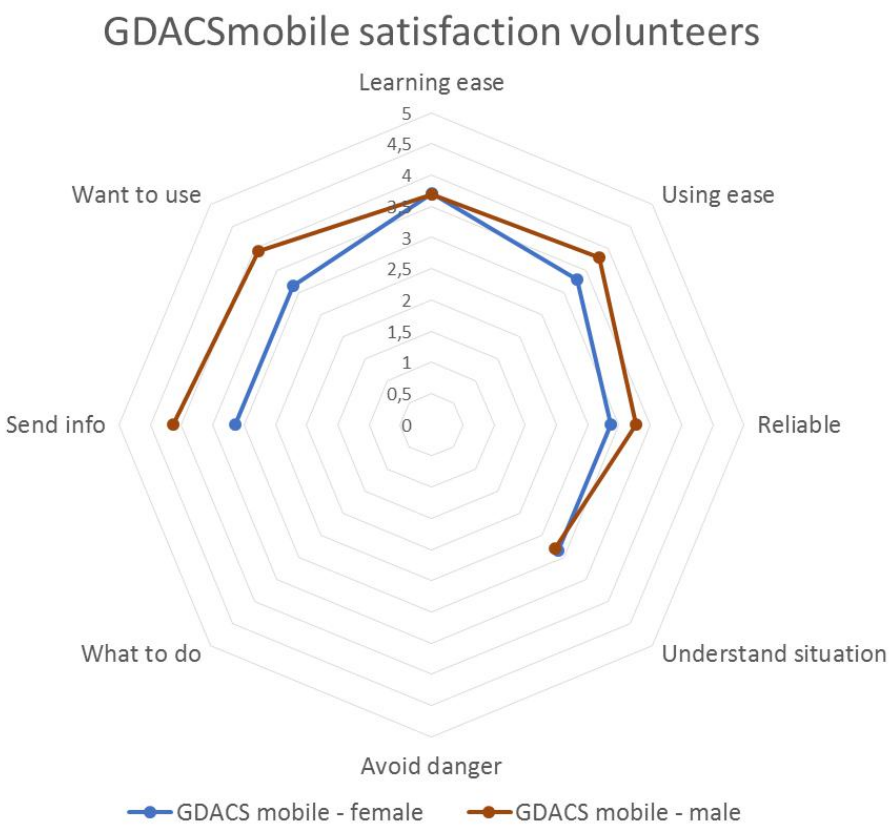

Figure 4.22: GDACSmobile satisfaction of volunteers by gender; 1 – worst option, 5 – best option

Figure 4.23 shows that nearly all functionalities are best rated by age class 21 to 40.

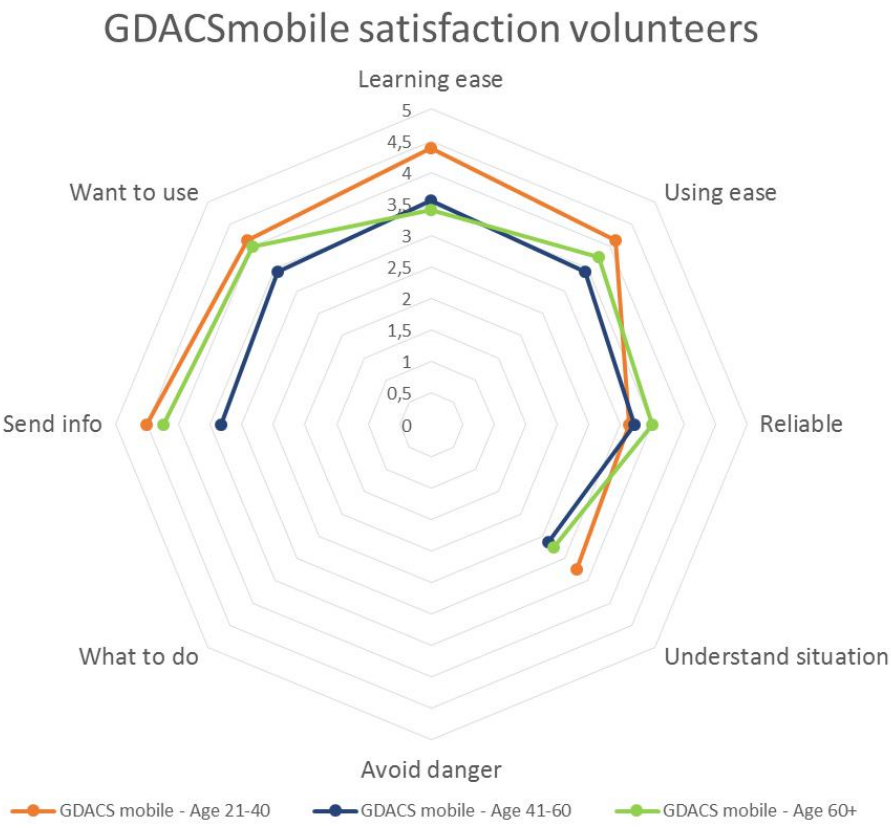

Figure 4.23: GDACSmobile satisfaction of volunteers by age; 1 – worst option, 5 – best option

GDACSmobile was also rated quite well by the professionals, but the functionalities “Quality assuring” and “Documentation” are only rated a bit better than 3 (Figure 4.24).

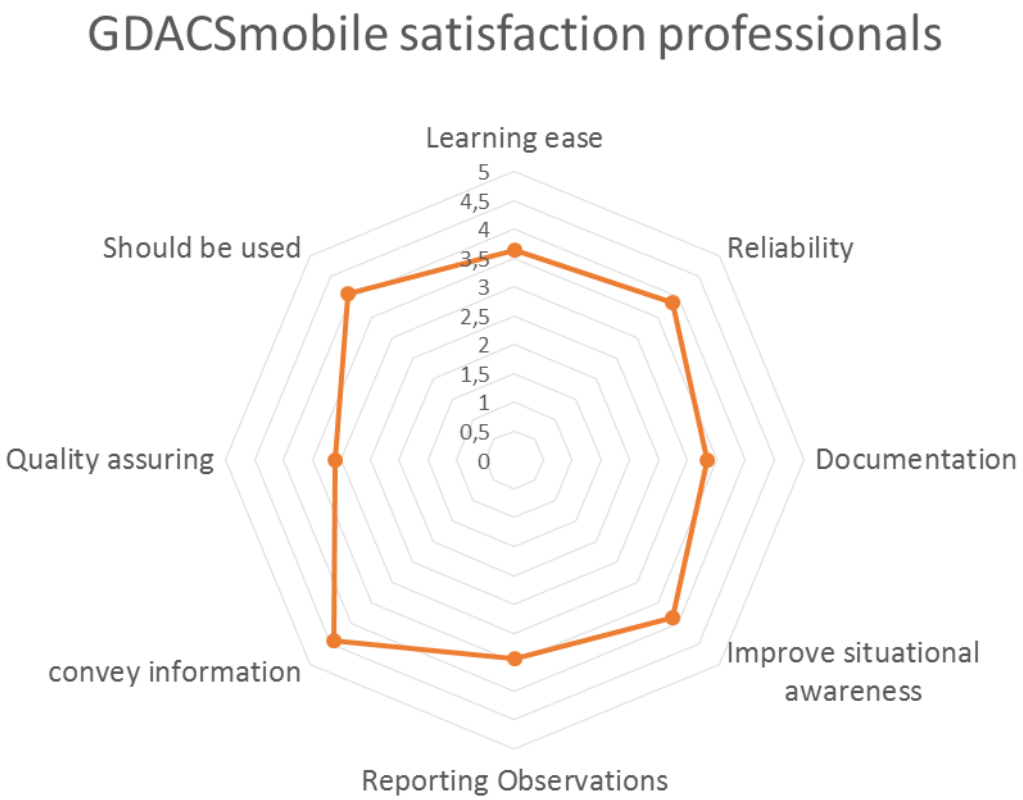

Figure 4.24: GDACSmobile satisfaction of professionals; 1 – worst option, 5 – best option

Figure 4.25 indicates that most of the professionals don’t see that the suggested improvements are needed.

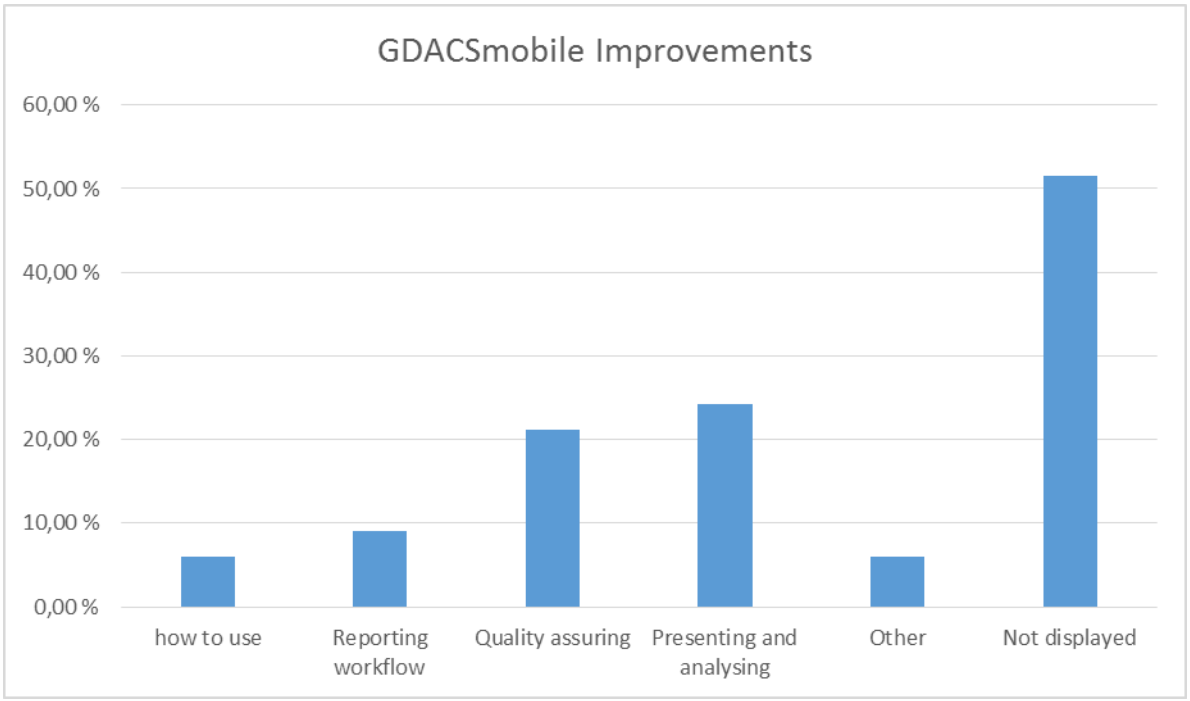

Figure 4.25: GDACSmobile improvements professionals

4.2.2.3 Lessons Learned

Although volunteers reported that they had difficulty selecting the right category for reporting their observations, the analysis of the reports in matches and mismatches however shows that the majority of reports were matched properly and only 2.6% of reports had no match of main categories at all. We therefore believe that **pictograms and assessment categories can be used by the affected population to communicate with crisis managers**. Because these are also understood by the crisis managers, we furthermore believe that pictograms and assessment categories make for a common language between affected population and crisis managers.

Thus, we can infer that using categories and pictograms supports the crisis communication cycle. Authorities can share information relevant to the community in an efficient way, so it meets the needs of the citizens. By doing so, crisis managers became able to stimulate first order objectives like announcing to not enter a particular area in a proper manner: the community benefits by e.g. not blocking roads or other bottlenecks. At the same time, the affected population gets supported in achieving the second order objectives, like finding the most appropriate roads or getting aware of not passable areas. This kind of a positive relation gets amplified by decreasing the efforts of sharing new observations by the audience.

Given that some reports indicated the lack of markers, and most of these markers were retrieved post-exercise, we conclude that the addresses given for the marker locations did not provide a good enough description for the volunteers to always find the markers. We believe that the **visibility over distance of the A4-markers was not good enough for the volunteers** to guarantee that they were found. Next to the reported missing markers, we also saw a significant difference between reported markers to which the volunteers were guided (text-markers) compared to same size markers without guidance (photo-markers). Due to the fact that all markers were hung up in the affected area at random, but volunteers were guided, they could have missed the markers. Therefore, **the effect and need of guidance needs further examination**. We do however believe that guidance of volunteers is recommended in field exercises where certain events need to be reported.

4.2.3 SafeTrip - VRH

4.2.3.1 Tool Overview

The SafeTrip tool[9] is a mobile application that aims to give travellers and tourists within Europe information on their actual safety within the immediate vicinity of their current location. In addition, it provides an easy to use way for tourists to inform their embassies of their respective locations, needs and conditions.

In our experimental setup, SafeTrip was used to inform potential tourists, presented by one group of volunteers, on the current and expected situation in their vicinity. To prevent accidental alarms on the operational app SafeTrip, a clone from the actual application, SafeTripSim, was used. It is exclusively meant for training and Trial purposes and ensures the use in a controlled environment. In SafeTripSim the flood warnings originated from a controlled test website to prevent misinterpretation of warnings.

The scenario in the DRIVER+-Trial comprised a flood warning based on weather forecasts, followed later that day by a flood alert (because of a presumed dike breach). On both accounts the crisis team communicated the warning/alert on the website, and thus by SafeTrip(Sim). To assess the effectiveness of the tool, the volunteering users were asked to fill in online questionnaires (in English and Dutch) on the use of SafeTrip in various phases during the Trial:

[9] http://www.hkv.nl/en/products/apps/231-apps.html

- Short questionnaire on the type of mobile phone used and the installation process.
- Short questionnaire during phase orange (flood warning).
- Short questionnaire during phase red (flooding).

The questionnaires were purposely kept short (only a few questions) to minimize the effort needed to answer them (which should be done during the Trial):

- Trial survey, with including questions on SafeTrip.
- Interviews with members in the crisis team (in Dutch).

The SafeTrip app was demonstrated to the crisis team using a large screen. This demonstration of SafeTrip was used in interviews/discussion on the usability of SafeTrip in crisis situations.

The response to the questionnaire was limited. The initial SafeTrip questionnaire was answered 56 times, the second had 22 responses and the last only 12. The Trial survey resulted in 23 responses related to SafeTrip, providing information on the users and user experience.

Finally, the interviews/discussions provided information on the crisis team experience using SafeTrip as an additional means of relaying flood warnings and crisis information to civilians.

4.2.3.2 Results Questionnaires

All functionalities of SafeTrip are rated well, the overall satisfaction is about 2.5 (Figure 4.26).

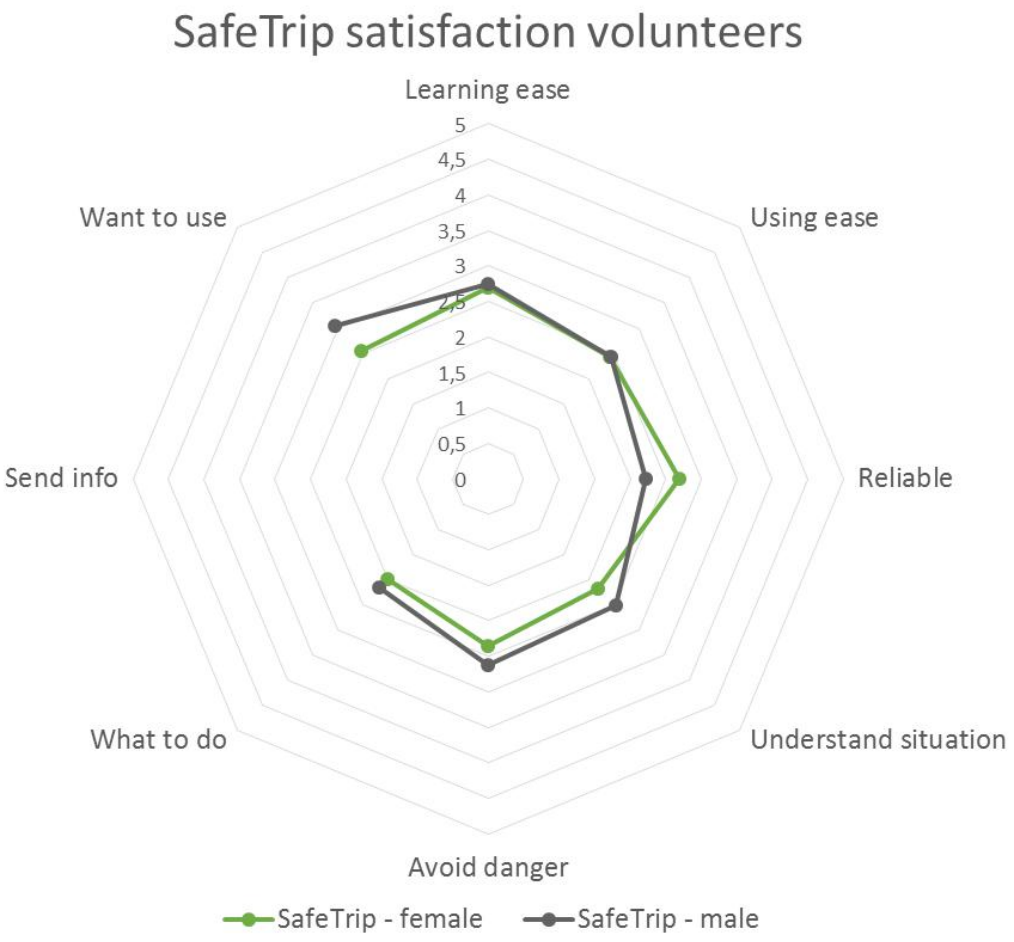

Figure 4.26: SafeTrip satisfaction of volunteers by gender; 1 – worst option, 5 – best option

In Figure 4.27 is a big age difference when it comes to the age class 60+. In this class, all volunteers rated the tool better than the others. The overall satisfaction for age class 60+ is about 3.1.

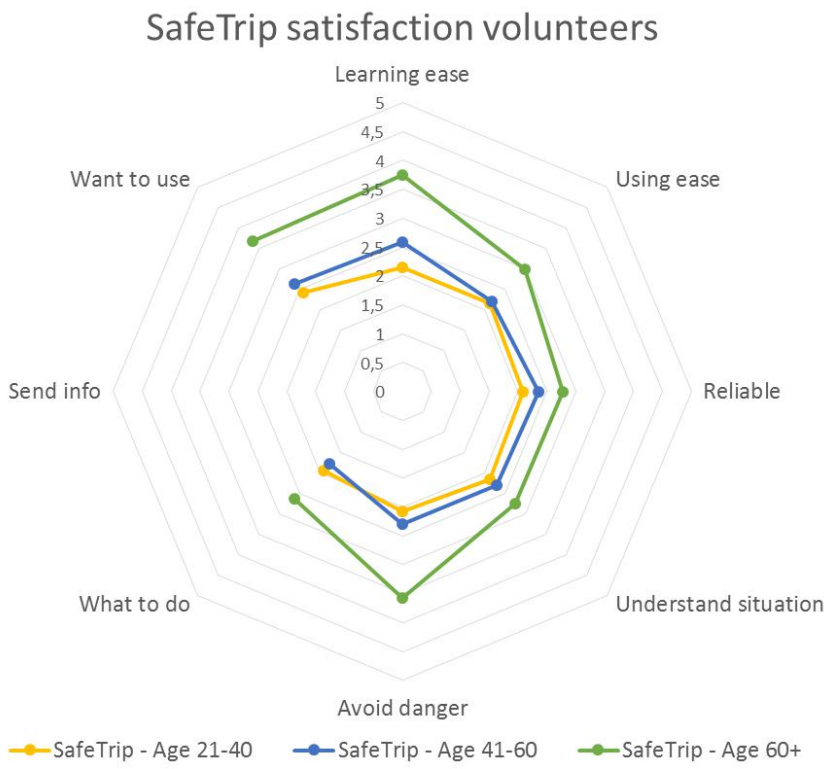

Figure 4.27: SafeTrip satisfaction of volunteers by age; 1 – worst option, 5 – best option

SafeTrip is clearly better rated by professionals than by volunteers (Figure 4.28). With an overall rating of 4, they also rated it better than the age class 60+ of the volunteers (see Figure 4.27).

Figure 4.28: SafeTrip satisfaction of professionals; 1 – worst option, 5 – best option

Figure 4.29 shows that only one suggested improvement, multilingualism of the tool, was rated with more than 25%.

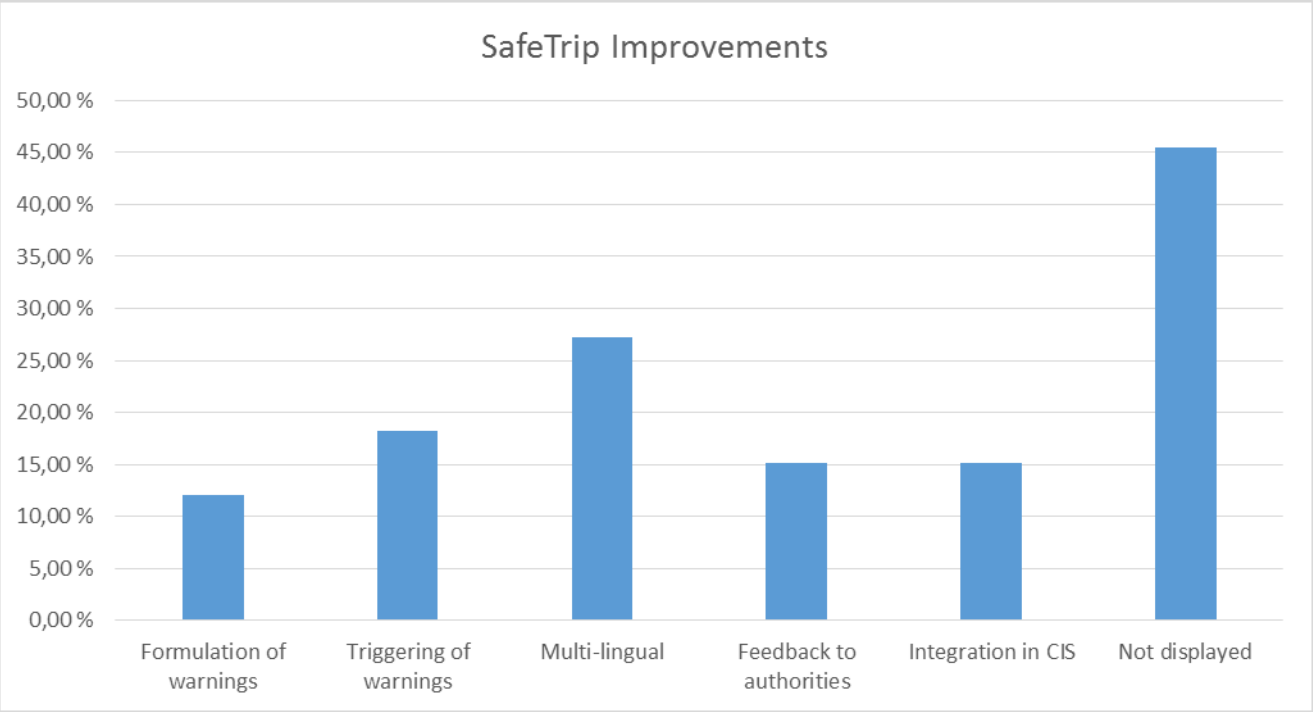

Figure 4.29: SafeTrip improvements professionals

4.2.3.3 Lessons Learned

The SafeTrip principle is to **inform tourist**, using official crisis management websites. SafeTrip relays the official message, without interpretation or translation of this message. This design principle guarantees unambiguous crisis communication. The Trial in The Hague prompted HKV to review this principle and the following points summarize the lessons learned for our application:

- SafeTrip was **successfully installed on over a hundred mobile devices for the Trial**.
- To ensure better Trial results a **short description of SafeTrip and its use in the Trial is needed**. The description must contain detailed instructions to the volunteers on how to use SafeTrip in the Trial. In our experiment, some users have expected the SafeTrip to generate push messages and therefore did not even find out which information was provided by the application.
- SafeTrip model foresees far less interaction with the users than either the crowdtasking or VGI. As a result, the volunteers that only used the SafeTrip felt somewhat "left out" the experiment and those that also installed other tools concentrated on them and consequently often 'forgot' to access the SafeTrip app and/or lacked the time to fill in the questionnaire;
- SafeTrip is most **useful for sharing the accurate information** on the flood threat (like extreme weather alerts) to provide them with options. Since the app does not send any push messages, it is **not well suited for alerting**.
- During a crisis, foreign people (like tourists) are a 'forgotten' group of people. The crisis managers indicated that the **SafeTrip app is a useful "low effort" addition in crisis communication: more people are informed, without causing additional workload for the crisis team**.

On a technical level, the SafeTrip performed perfectly: the flood warning was picked up seconds after publishing. For the crisis responders the use of SafeTrip caused no additional workload and they reacted positive on the extended reach of the communication messages. Those volunteers that understood how to use the app, have read the flood warnings on SafeTrip and reacted positively (in the questionnaire) to the short and clear messages.

A frequent recommendation from the volunteers was to use push-messages in SafeTrip to actively inform the user on new warnings. As a future addition to our application, we are assessing the possibility to include push messages in SafeTrip.

4.2.4 DEWS – ATOS

4.2.4.1 Tool Overview

The DEWS system was initially developed as a Distant Early Warning System for tsunamis and provides mechanisms for extracting the information from multi-sensor systems. From this information, specific alerts for various classes of users are generated based on the severity of the event, user profiles and geographical locations. In Experiment 42, only the alerting part of the DEWS system was used to distribute alerts based on user profiles and their positions. More specifically, the DEWS tool supported AIT's CrowdTasker tool by enabling it to disseminate notifications to the field volunteers using email and SMS channels. Thus, the DEWS tool acted as a gateway service for AIT's tool. Due to its REST interface, the tool was transparent for the other tool operators and field volunteers participating in the experiment.

The tool distinguishes between two types of messages: **Activation messages**, which are sent to the volunteer (via email and SMS) if it was detected that the CrowdTasker tool was not running on the volunteer's mobile device and asking to start the app and indicate whether he/she accepted or declined the assigned task. The notification message was customized with the volunteer's name and event name (provided by the CrowdTasker tool in the request sent to DEWS tool). **Task Reminder messages**, which are received by the volunteer (via email and SMS), if the task request sent by CrowdTasker had not been answered after a predefined amount of time. As in the former case, the notification message was customized with the volunteer's name and event name (provided by the CrowdTasker tool in the request sent to DEWS tool).

In addition to these notifications, the DEWS tool also logged information concerning delivery status of the disseminated messages, such as whether the emails and SMS message was successfully delivered to their recipients. In case a delivery error was detected, this commonly referred to errors in the email addresses/mobile phone numbers when these were provided during the registration process for using the CrowdTasker tool.

The DEWS tool automatically archived all notification requests (received from the CrowdTasker tool via a REST API) and the delivery status of each of the notifications disseminated by the DEWS tool in a MongoDB database. Each of these records contained the email address/mobile phone number and the corresponding timestamps of when the messages were sent, enabling the possibility to extract some statistics (e.g. how many messages were disseminated per hour, messages received per volunteer, failed messages, etc.).

4.2.4.2 Lessons Learned

Due to technical problems and lack of time a full integration into the overall experiment scenario was not possible. The integration of the CrowdTasker into the DEWS notification tool was successfully realized and worked as expected during The Hague experiment, enabling thus the possibility to send customized messages to the involved volunteers depending on their language, role and task assigned.

This also showed that in order to guarantee a **higher degree of confidence in the distribution of warnings and messages to field volunteers** (and population in general) during a crisis event, traditional channels such as SMS are still a very important means for communication. They can complement other more sophisticated approaches (i.e. use of Internet-enabled applications such as Whatsapp, Facebook, etc.) that may collapse more easily under stress conditions.

DEWS was not part of the Questionnaires for volunteers or teams and observers, therefore no results are presented for this tool.

4.2.5 Common Information Space (CIS) – FRQ

4.2.5.1 Tool Overview

The basic idea of the Common Information Space (CIS) is to share information automatically between tools of different organisations that do not have dedicated interfaces for daily cooperation. Instead of developing specific interfaces for every (potential) pair of partners, the CIS provides standardised interfaces that need to be implemented once per tool (CIS Adaptor).

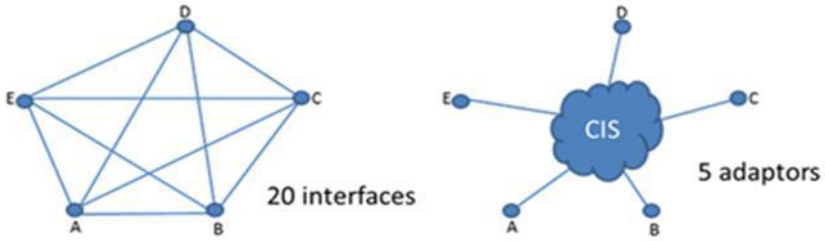

Figure 4.30: Adaptors reduce complexity of tool interfaces

The shared information is transported within the CIS as standard messages, using both standard formats (e.g. CAP, EMSI) and standardised taxonomy for key terms.

While creating/interpreting the standard messages sent / received via CIS, the CIS adaptor has to transform proprietary interface formats of the connected tool to the CIS standard syntax and semantic. That means the adaptor has first to transform the parameters of the tool to the elements of the used standard (syntactical interoperability). As a second step, it should map the terms and keywords used by the tool provider with standard terms used in CIS (semantic interoperability). Note that free text will not be translated by semantic mapping.

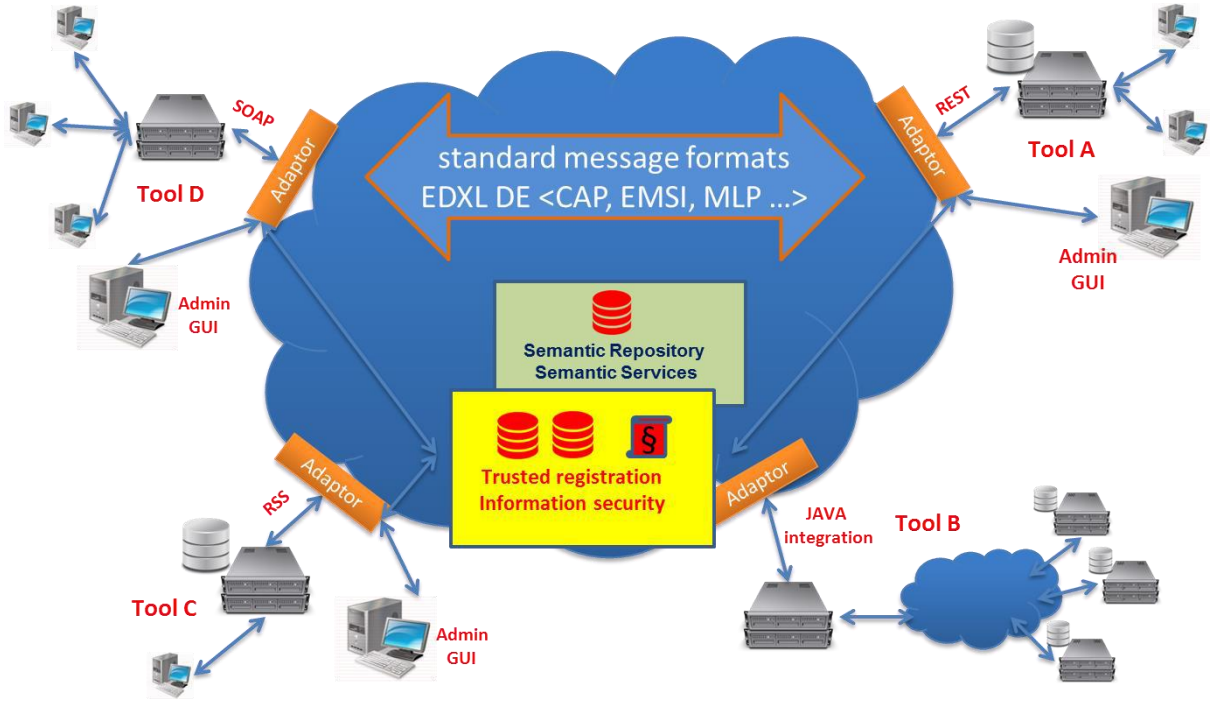

Figure 4.31: Common Information Space

The tool providers must implement the connector part of the adaptor, based on templates, which transforms the proprietary interface formats of the connected tool to the CIS standard syntax.

Furthermore, they should provide the mapping information for the semantic mapping (not ready for Expe42 in April 2016).

The adaptor core, applied message validation and security mechanisms as well as the distribution mechanism are hidden from the users and are provided by AIT and FRQ as a backend service.

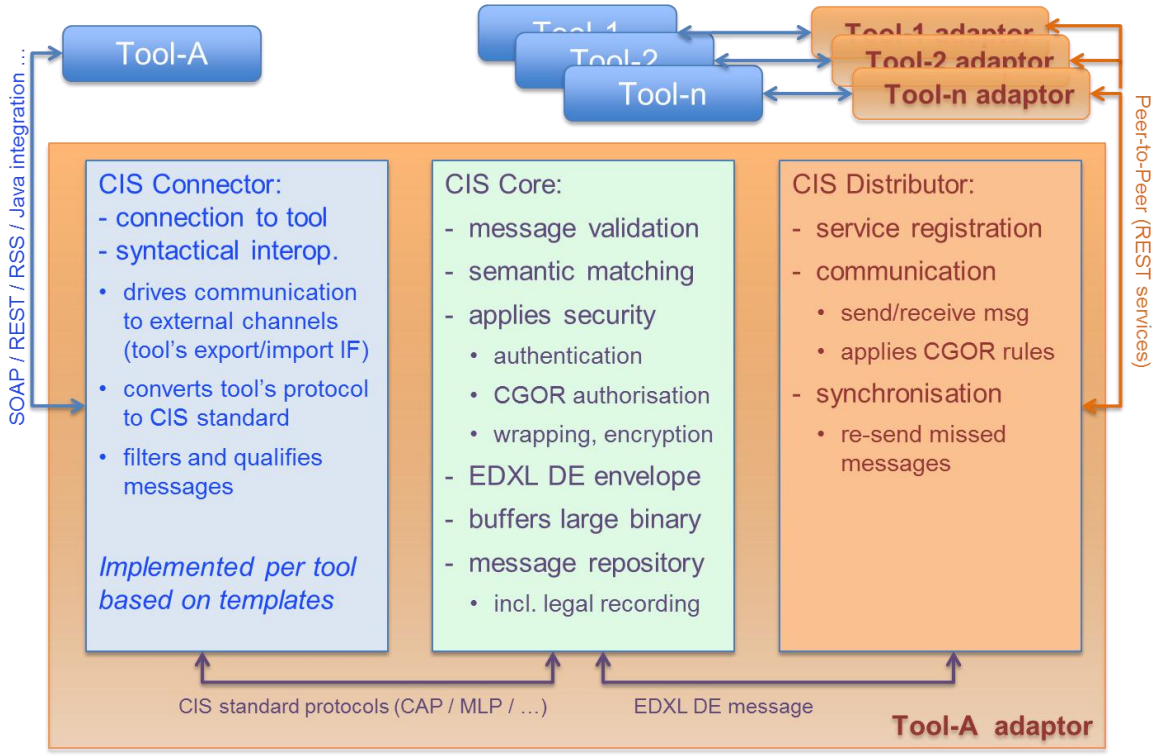

Figure 4.32: Internal structure of CIS adaptors

4.2.5.2 Lessons Learned

The information sharing via CIS was successfully implemented and tested during the EXPE42 exercise. Information was exchanged between the participating tools and the users could interpret the shared information within the respective tool. CIS was not part of the Questionnaires for volunteers or teams and observers, therefore no results are presented for this tool.

The distribution mechanism used in EXPE42 – the **Apache Kafka message bus handler - is a stable and easy to implement solution**, which met the requirements of the exercise to provide a reliable form of communication between the tools and the CIS.

During the preparation of EXPE42 it turned out that the **best way to develop and connect the adaptors to the tools is to build a stand-alone adaptor that communicates with the tool via REST interfaces**. The alternative way – a JAVA deep integration of the connector or the complete adaptor into the tool – led to an error-prone build process, which was hard to manage.

The provided Connector Template was a sufficient basis for the implementation of the individual tool adaptors.

It is recommended to use the Common Information Space architecture as a general concept for connecting tools in DRIVER+, and as a recommendation for the PPDR community.

4.2.6 LifeX COP – FRQ

4.2.6.1 Tool Overview

LifeX COP is a tool providing Geographic Information System (GIS) functions of a common operational picture to the tactical and operational crisis managers. This picture presents various layers of information on a map view in a graphical way. It positions icons and marks relevant areas in the map, while at the same time displaying detailed information related to the icons.

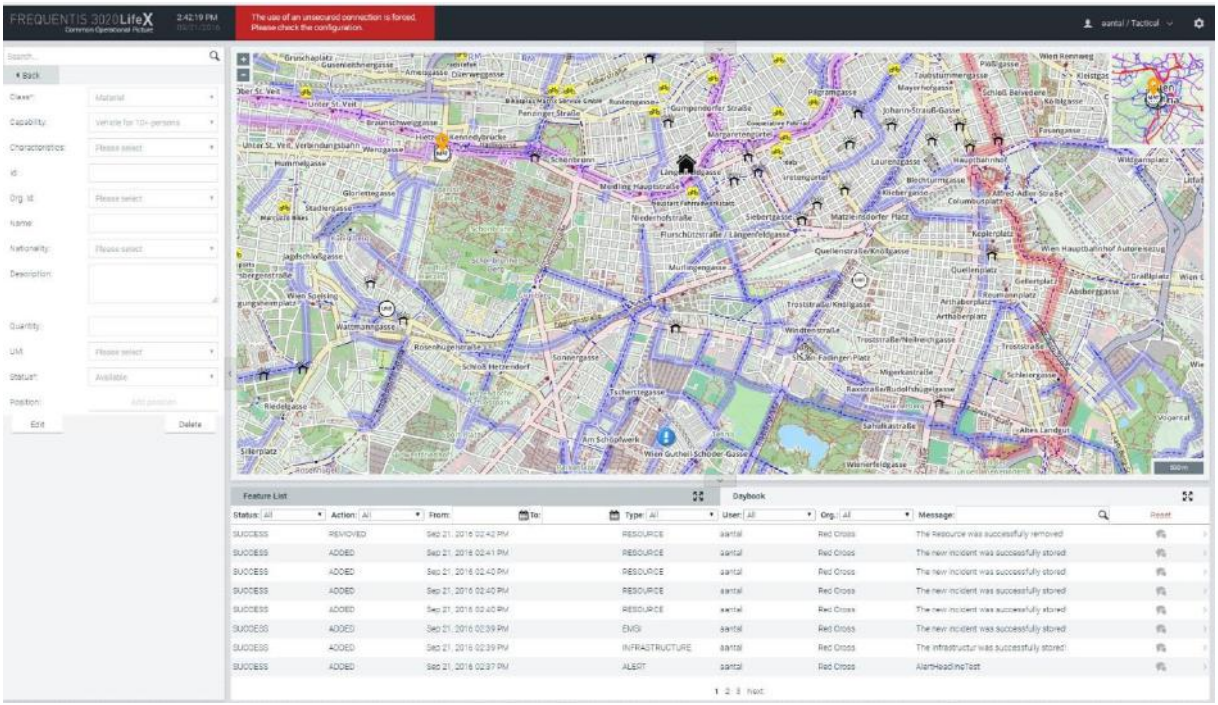

Figure 4.33: LifeX COP – map, feature list and details panel

Map services and information layers

The core of the Common Operational Picture is a graphical representation of the situation on a map. The map viewer comprises a selection of base maps (e.g. physical map, street map, and aerial image) and a number of information layers, depending on the user's role and authorisation.

The base maps and the layers have to be provided and configured as plug-ins and corresponding information in the GeoServer. Map features are represented by icons or as highlighted areas.

The icon symbol and style can depend on attributes of the feature. In case of attributes linked with taxonomy, there is a default LifeX COP standard icon set that covers the complete taxonomy and the possibility to add user-specific icon sets replacing the standard icons for a specific user organisation.

The following types of layers are supported:

1. **Visual information layers**

Present information that is visualised on the map, to be used for drawing a situation on the map with pictures, icons and simple annotations.

The source of the layer may be a geo-referenced picture (e.g. KML file, GeoTIF …) or a data source providing WMS layers. The link to this data source can be shared via Common Information Space and the data can be imported to LifeX COP without software modification.

2. **Features information layers**

Visualize information on the map which is associated with features, allowing drill down to further details or information processing. Clicking on a feature symbol provides additional information in a panel where the

related information is formatted and presented. In addition to the map view, the user can open a list view of the features. Filters for the key values according to the common taxonomy, time stamps or geo-fencing allow selecting specific information of interest. Filters applied in the list are reflected in the presentation on the map.

The functions for feature layers must be implemented as a COP plug-in and installed with the LifeX COP configuration.

The source of the layer is a data source providing WFS layers. This may be the internal LifeX COP database, where the features are imported (e.g. from CIS), or an external data source. The features may also reference to other data sources (e.g. photos stored on a server, video streams, sensor output, etc.).

3. **Interactive layers**

Feature layers allowing the user to insert, modify or delete the feature items (e.g. alerts, observations, resources or needs) including their position and adding area information (polygons) to the feature. These layers are used for managing the information under control of the COP user.

The layer source is the LifeX COP database. The items are either created in the COP GUI or exchanged with other systems via Common Information Space. Information that was edited in an interactive layer can be sent from LifeX COP to the CIS.

4. **Statistics layers**

Some specific layers allow a statistical analysis of data and show graphical representation of statistics, with the possibility of listing the underlying figures. In EXPE42, such layers are representing the answers from volunteers gathered with the CrowdTasker and provide an overview over defined and executed tasks.

Icon symbols and taxonomy

Features on the map are represented as icons. The icon symbol and style can depend on attributes of the feature. In case of attributes related with common taxonomy, there is a default icon set that provides symbols for the terms of the taxonomy. If a user organisation wants using their proprietary icons it is possible to add user-specific icon sets that replace the standard icons for a specific organisation. That doesn't affect the picture that users of another organisation get.

This function requires an unambiguous encoding of all terms that get an icon representation, and a mapping of terms used by organisations to the commonly used taxonomy.

Information exchange via Common Information Space

LifeX COP implements (in principle) the following information exchange mechanisms using CIS adaptors:

1. **Information layer import**
   Information layers can be imported ad-hoc. If a link to a WMS layer, a KML/KMZ file, or a GeoTIF image is sent in a CIS message, this information can be imported as a new information layer in LifeX COP. The new layer can be displayed by any COP user immediately.
   This function is available as an admin feature; a suitable adaptor has to be implemented for automated import form CIS according to the needs in PoC.
2. **Feature item import and export**
   LifeX COP stores the items of the common operational picture in the COP database, i.e. alerts, incidents, resources, and tasks. **Modifications of these items, made by the LifeX COP operators, can be sent to CIS; items created or modified by other systems can be received from CIS**.
   Alerts are communicated as CAP messages, the other items, concerning situation awareness, are represented as EMSI messages. A CAP adapter for LifeX COP is already operating; EMSI adaptors are prepared but have to be adjusted to the data flow in the simulated scenarios.

Ad-hoc interpreting of crowdtasked data

In the course of the experiment preparation, we have realised that the crowdsourced data cannot be adequately presented on a map. That is, we have no way to a-priory know if the response received from the volunteers is “good” or “bad” and color-code the results on a map accordingly.

As a result, we have designed and implemented a function that allows ad-hoc analysis of the data in a specific area. The way this works is illustrated in the Figure 4.34. In short, the LifeX COP can define an area and a filter that will limit the amount of the data shown and the tool will present the summary of the data in a graphical way. This can be used to e.g. rapidly find out if a certain area is “safe” or not and how many reports in this area require urgent further attention (e.g. indicate the need for assistance).

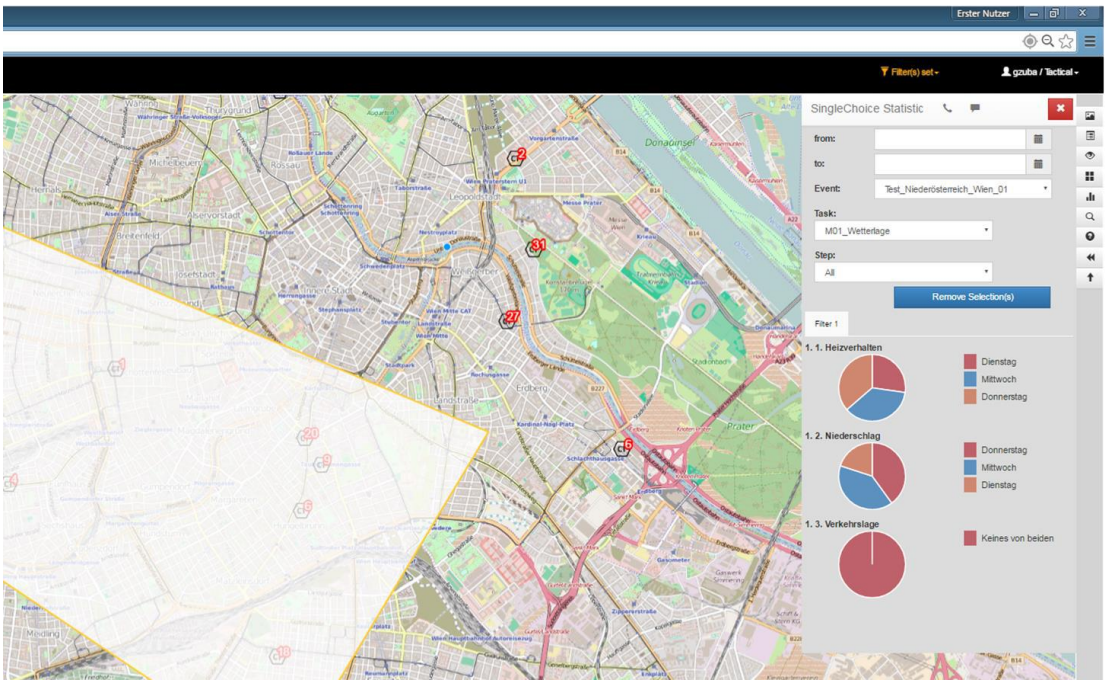

Figure 4.34: LifeX COP – ad-hoc analysis of crowdtasked information

4.2.6.2 Results Questionnaires

The lifeX COP tool was rated by the professionals quite good (Figure 4.35). Only "Learning ease" and "Documentation" are a bit below average.

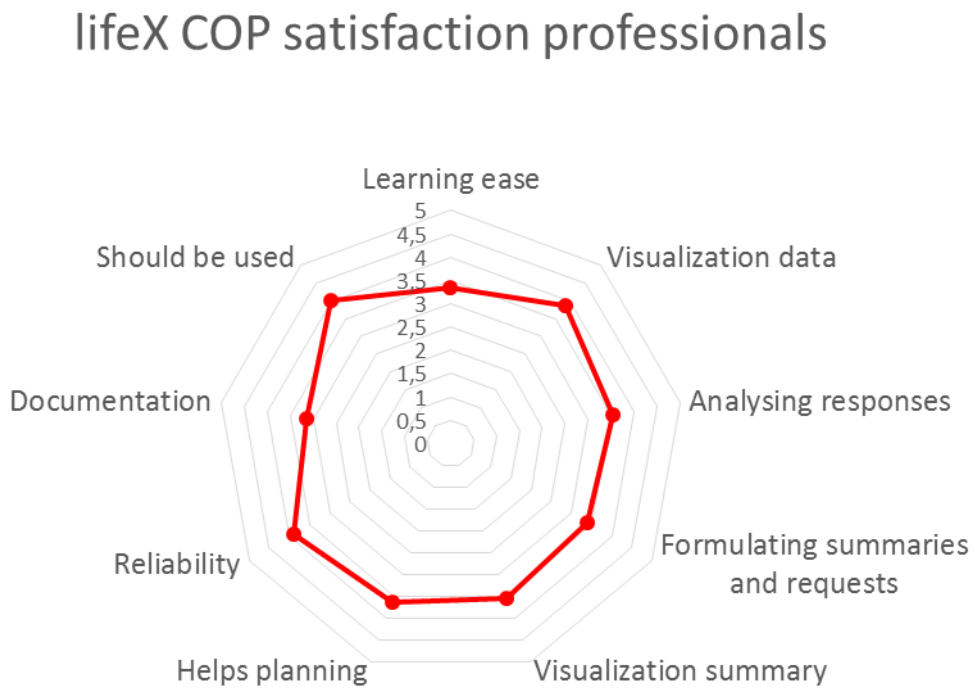

Figure 4.35: LifeX COP satisfaction of professionals; 1 – worst option, 5 – best option

There are some improvements that can be taken into account, for example the visualization of data, the formulating of summaries and requests and the visualisation of the summaries (Figure 4.36).

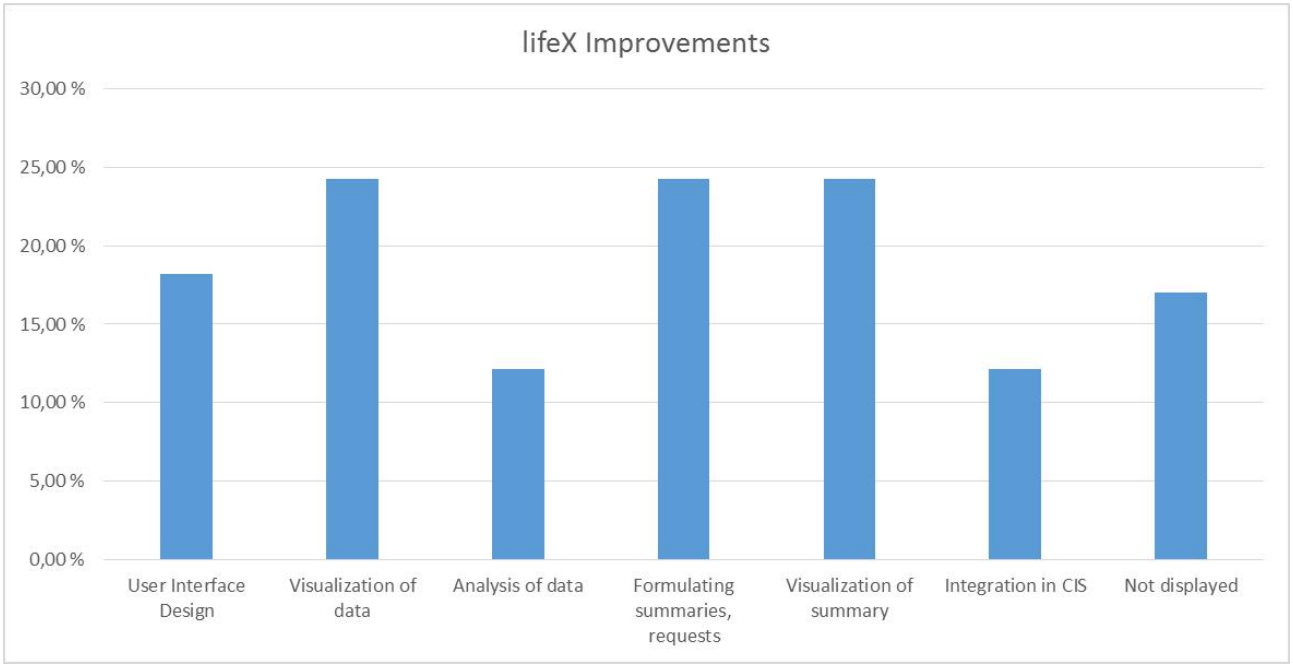

Figure 4.36: LifeX COP improvements professionals

4.2.6.3 Lessons Learned

The LifeX COP tool deployed in EXPE42 was a pre-mature prototype. It showed some bugs requiring work-arounds as well as usability and performance issues. The technical re-design that was performed after the EXPE42 exercise has addressed these issues, resulting in a far more mature tool.

In spite of these shortcomings, the common operational picture provided by LifeX COP was a very useful support for PPDM decision makers and gave an excellent overview over the evolving situation in real-time. Particularly the possibility of combining the general situation info on a map (big picture) with drilling-down to details of items in a place of interest (e.g. photos of destruction) is very helpful for decision making.

Thanks to the integration with the CIS, lifeX COP can be used as a communication tool at different levels of command:

- At a higher level (e.g. command room), only a summary data is shown and the requests for actions can be formulated as a polygon on a map with additional information and shared with the lower levels.
- At a lower level (e.g. volunteer manager), the situation at a field can be summarised, entered as a polygon with additional information and the result shared with the higher levels.

In this experiment, we have tested this principle using the CAP messages that were also supported by CrowdTasker and csWeb COP application. Although still at an early stage of implementation, this is certainly a very promising concept that should be further developed in the future.

The prototypic implementation of the ad-hoc data analysis is another promising and a step in the right direction, but currently too complex and too slow to efficiently use in an emergency.

4.2.7 csWeb – TNO

4.2.7.1 Tool Overview

Used for creating a Common Operational Picture maps in 2D or 3D, csWeb is a versatile open source web application that combines many information sources, from GIS data to news items. It can run either standalone, but can also be connected via REST, MQTT or WebSockets and allows it users to analyze the effects of a flooding critical infrastructure, e.g. for roads or electricity. To generate the simulation, the tool can use different types of input, e.g. background maps which can be obtained from OpenStreetMap or ESRI. Additionally, it is also possible to use your own maps.

During the experiment in The Hague, we received two kinds of messages: 64 CAP (50kb of data) messages and 2126 CrowdTasker (1Mb of data) messages. The data was recorded during the Trial: CAP messages were sent by other COP tools and by the GDACSmobile, whereas the CrowdTasker messages were sent by the CrowdTasker tool.

In order to analyze the data qualitatively with the practitioners, we used the open source csWeb (COP) tool. In total, there were 2 COP tools (csWeb and LifeXCop) and the CrowdTasker application, displaying the same data, and the practitioners could examine the differences in displaying the data.

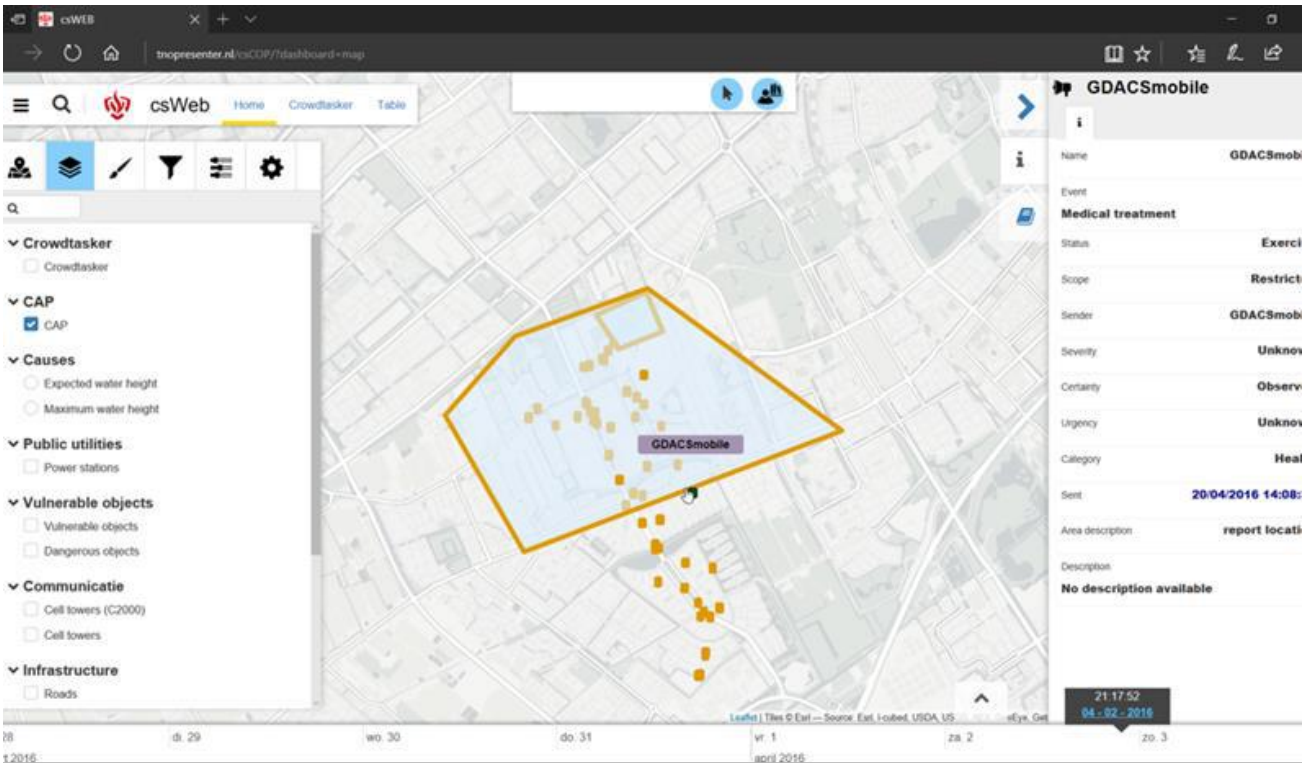

Figure 4.37: CrowdTasker dashboard (filtered data with estimated water height)

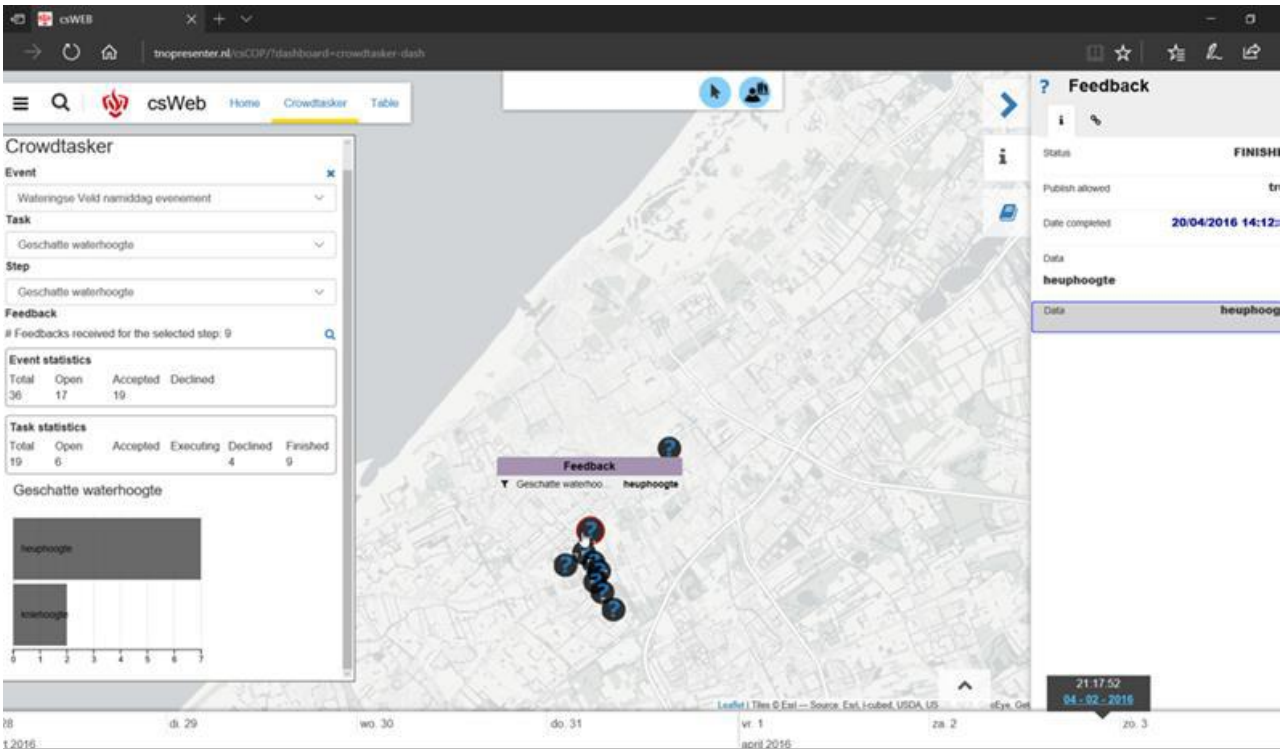

Figure 4.38: CAP messages generated by GDACSmobile

Ad-hoc interpreting of crowdtasked data

In the course of the experiment preparation, it was realised that the crowdsourced data cannot be adequately presented by a CAP tool. That is, there is no way to a-priory knowing if the response received from the volunteers is “good” or “bad” and color-coding the results on a map accordingly.

While the Frequentis team addressed this problem by implementing relatively complex ad-hoc data analysis functionality, our approach was to allow an ad-hoc color-coding of the data on a map. In the short time that was available for this implementation, we did not manage to turn this into a user-friendly feature, but our technicians have successfully demonstrated the principle by providing the ad-hoc color-coding definitions for several crowdtasked data sets and demonstrating that the presentation of the messages immediately changes.

4.2.7.2 Results Questionnaires

Like the LifeX COP tool also the csWeb tool is rated quite well and has only the “Documentation” and the “Learning ease” rated below average, which shows Figure 4.39.

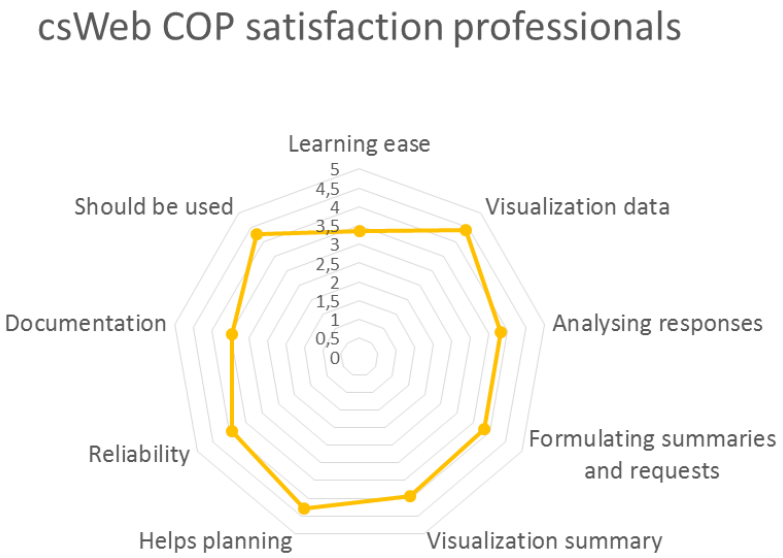

Figure 4.39: csWeb satisfaction of professionals; 1 – worst option, 5 – best option

The most interesting improvement of the csWeb tool for professionals would be the “What-if analysis of the situation” (Figure 4.40).

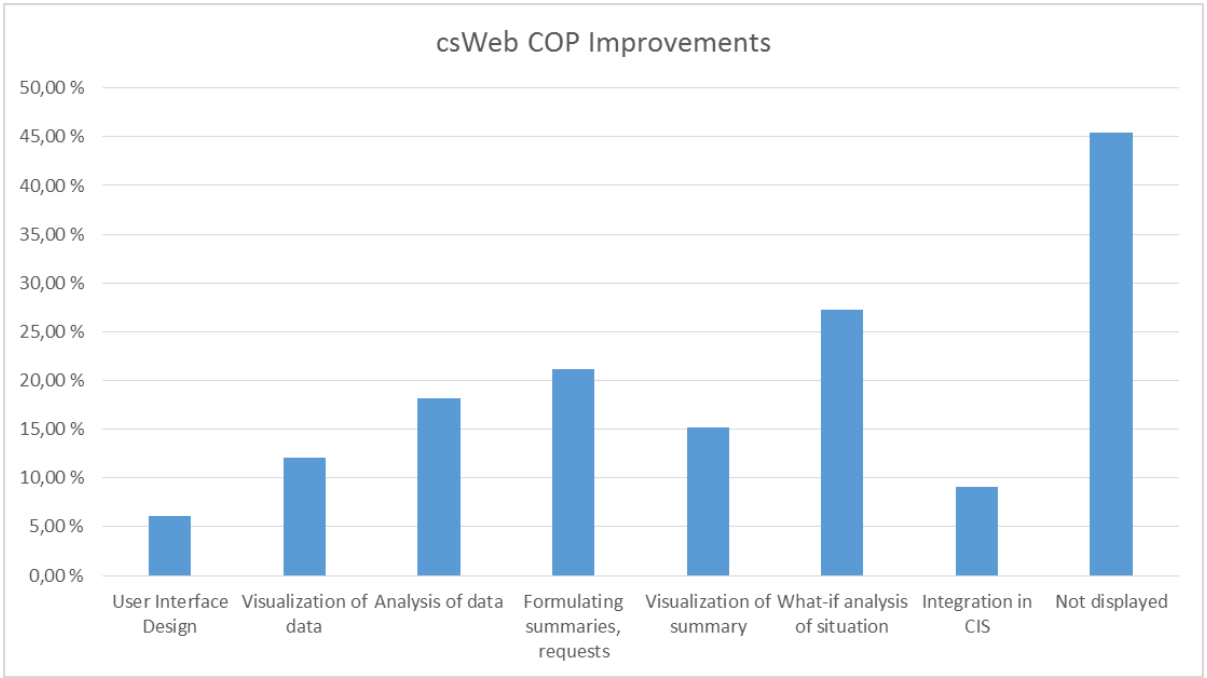

Figure 4.40: csWeb improvements professionals

4.2.7.3 Lessons Learned

TNO csWeb was successfully integrated with the other tools using the CIS prototype. This integration worked well for the part that was covered by the current implementation – most notably for the CAP messages.

Crowdtasker results had to be integrated separately, since their data model does not map well to the CAP data model. This is not surprising and illustrates the need for supporting **several standard data models at the CIS level and also at the level of COP tools**.

Furthermore, **the possibility to define ad-hoc rules for colour coding of the crowdtasking data is of a great potential value for the volunteer managers**. Unless the crowdtasking data model is extended to include some semantic information on the importance, severity and urgency of the reports, the volunteer managers will need to either perform some ad-hoc data analysis (as proposed by Frequentis) or define ad-hoc colour coding rules (as proposed by us) in order to work efficiently. In the absence of such functions, they will have to manually examine each incoming message as they arrive.

4.2.8 Simulation tool and VADAAR – XVR

4.2.8.1 Tool overview

In experiment 42, XVR set up and tested two tools: The first being our main XVR (simulation tool) product.

The second being a video recording system called VADAAR from Immersaview in Australia. XVR is a Simulation software designed to facilitate the quick creation of virtual 3D situations in a host of 3D environments. Allowing responder trainings in a first-person perspective, where the instructor has a bird's eye view and the ability to easily manipulate the situation.

During the experiment in The Hague, it was used to convey the simulated situations regarding the flood of the region to the participants. This allows for the participants to be emerged more into the situation as it becomes visible from a 1st person perspective by allowing them to walk around and interact with the simulated situation.

Secondly by simulating the incident reality, a difficult to organize and logistical nightmare of doing a real-life situation can be omitted. As flooding a location was not a feasible option, thus doing an evacuation of a flooded location was even more impossible. By allowing this to be visualized virtually the situation became "realistic" enough for the participants to immerse themselves. Thus, reducing the complexity of the overall Trial and allowing for a much smoother logistical setup.

The VADAAR application was used on the Trial management side and after-action review side. It allowed capturing of all involved monitor outputs, from the tools (solutions) involved, as well as from 2 x 2 IP cameras strategically placed to observe and listen to discussions of two teams of participants. Allowing after the experiment the evaluation team to obtain the taken video footage and look back and listen back to important moments.

4.2.8.2 Lessons Learned

Lessons learned here were that the virtual simulation indeed helped the participants to immerse themselves more into the situation. Moreover, small deviations between data interpretation from other tools was quickly synchronized after seeing the actual situation.

Lesson learned in the instalment of VADAAR is that IP Camera's need pan tilt zoom functionality to be aimed properly, and integrated microphones are highly desirable to omit the hassle of adding extra microphones to the streams. In addition, the collected video streams were not as Excessive in storage size as initially expected. The evaluation team was able to utilize the video's, please refer to them (AIT should remember the exact partners on that job) for their lessons learned.

Other lessons learned were that participants need about 6 to 8 hours of hands on experience to change their mind-set from exercise to experiment. In DRIVER+ this has already been taken up to incorporate an extra day of training to make sure participants understand the aspects of trialling.

Another lesson learned was that running a Trial needs a capable organizational person that in a few respectful words can silence a room, and get across the practical information the participants need to follow the proper experiment plan. In the preparation of the Trial an important lesson learned was that a strict line and defined approach is paramount.

Both XVR tools were not part of the Questionnaires for volunteers or teams and observers, therefore no results are presented for these tools.

4.3 Lessons Learned

As has been remarked when describing the methodology in section 3, one perspective that was to be investigated with the conduction of the experiment in The Hague is to reflect on organisational and methodological techniques regarding the setup and evaluation of the event, especially in light of upcoming DRIVER+ Trials. This section contains the lessons learned from Experiment 42's design and implementation in such a manner that they should provide insights for future Trials regarding design, organization, control and evaluation.

The experiment was set up so that, in one day, crisis management professionals went through both the preparation and response phase of dealing with the flooding event. Looked at it retrospectively, this was not enough time for the participants to fully adapt to the utilization of informal volunteers *and* the use of new software solutions (c.f. section 4.1.5). A wider timeframe, spanning two or more days and allowing for a real separation of preparation and response phase provides more time to adapt to new tools. Furthermore, it should be clarified a priori if and how much experience the participants have with the crisis management concepts used during the experiment, in order to avoid introducing both new concepts and new solutions.

Volunteers in the field were disproportionately affected by the crisis management professional's time taken to adapt to the DRIVER+ solutions. The "down time" they experienced in periods where participants at the command centre were otherwise occupied was exacerbated by the fact that they had nothing else to do. While crisis managers at the "headquarters" were actively engaged in coming to terms with the solutions, volunteers in the field had no other form of participation. This was more noticeable for some solutions compared to others. An experiment supporter for participant management in the field remarked in their feedback that "CrowdTaskers were jealous of GDACS'ers, because they had a lot of fun doing things" (GDACSmobile allows for continuous submission of reports, while CrowdTasker uses finite tasks). The supporter recommends groups consisting of mixed solution users so that the downtimes are less severe. Furthermore, it seems recommendable to request participants as volunteers only for a limited time windows, in which the crisis managers have already set up the solutions and potentially provided the information required for people "in the field" to take action.

Due to the nature of their duty, it is not unlikely that crisis management professionals that are scheduled to participate in a Trial become indisposed shortly before (or even during) the event. Therefore, it is recommended to: (1) plan with redundancies in personnel; (2) involve professionals from several geographic locations; and (3) minimize the training requirements, e.g. by letting the trained technicians operate or help operating the solutions rather than expecting the CM professionals to do so on their own.

Lastly, the observant reader will have noticed that mention of the results of the second debriefing session is missing in section 4.1.5. The second debriefing session regrettably yielded less substantial results and faced two main problems: firstly, the quantity and secondly the diversity of participants in the group discussion. While it is often considered best practice for group discussions to employ a diverse cluster of participants to elicit rich discussion, the moderator of the second session found that this method worked too well for the crisis management participants of the experiment. The number of participants, paired with the diversity of their professional background and the organisation they work with, resulted in a lively

discussion among crisis managers about their methods and workflows in each organisation and regarding inter-organisation cooperation, but yielded no viable qualitative context to the quantitative experiment data. For future debriefing sessions with similar goals, the experiment team advises to keep the number of participants in group discussions to a maximum of 8 participants per discussion to enable better moderation and adherence to guidelines.

4.4 Good Practices

The Survey questionnaire design that was used in EXPE42 (reproduced in Annex of this document) can be recommended as a "good practice" for the future Trials. The questionnaires are relatively complex, but the time needed to fill them out was measured in the design phase and does not exceed the attention span of the experiment participants. Also, a structure of the surveys yielded good results, with dedicated sections for their opinion on event organisation and information, then their assessments of the tools and finally their overall satisfaction with participation.

Keeping a summary presentation, accessible by all involved persons, with slides regarding the following things is recommended:

- Event objectives.
- Methodological approach.
- (Simulated) environment or premise of exercise.
- Event schedule.
- Contact person(s) for organisational, methodological and technical issues.

Such a portfolio of core information about the event was kept for EXPE42 and has proven a good practice. A fluctuation of personnel is to be expected for such a large event and everyone that participates needs to have the same understanding about these critical points. The slides should be created and finalised at least a week before the event to allow for dissemination.

Regarding the topic of dissemination, for future experiments regarding the interaction with citizens and participants in a realistic field environment, it is recommended to provide information on common channels such as blogs or social media networks. This concerns both information in preparation for the experiment (such as why and how it is conducted and what contribution participants are making), as well as current topical information on the progress during the event. As was remarked in the previous section, downtime and prolonged timeframes without updates via the tested solutions (the possibility for which is unlikely to be eliminated even by rigorous event planning) are not a positive experience for participants in the field. Providing them with a news source and assurance that work is indeed still ongoing behind the scenes may alleviate this.

For sufficient dissemination of this kind, it is recommended to deploy a dedicated team. Expe42 has shown that persons with administrative, organisational and technical duties during the experiment do not have time for such activity.

Another aspect that worked well in Expe42 and should be taken into consideration when conducting future Trials with many participants in a field environment, is to offer a responsive point of contact for questions during the event. Participants in the field are unlikely to have extensive knowledge about the event organisation and will have many questions while on-site. The field team for managing participants during Expe42 did an excellent job of being available for questions both online and on site. It is recommended to establish a central point of contact, such as an "info point", for participants in the field as well as disseminate contact information online communication and deploy a sufficiently large team. To provide a point of reference: 148 mails by participants were received and answered before, during and after Expe42. Ideally, representatives of the deployed (technical) solutions would also be present on-site to solve technical issues that participants in the field have (e.g. with smartphone applications). This was not done in The Hague, but would have been valuable support for the on-site participant management team.

5. Conclusion

Overall, EXPE42 on the evaluation of the usability and value of solutions and methods for the interaction of professional first responders with citizens was executed successfully. Two main targets were reached:

- The technical capabilities of the examined **solutions** for integration were tested, it was demonstrated that **a Common information Space** is a good approach for the purpose of ensuring interoperability. This demonstrates that the concept of the test bed of DRIVER+ is an adequate approach.
- The solutions **Crowdtasker, GDACSMobile, SafeTrip and DEWS** revealed their added value in **improving the interaction between CM professionals and citizens.** On the other hand, **LifeXCop** and **csWeb** demonstrated their potential to **improve the operational picture** of CM professionals. The **questionnaires** applied in order to analyse feedback of both volunteers and professionals turned out to be a **very suitable approach** and could be adapted for the Trials of DRIVER+.

Looking at the main actors involved in experiment, **EXPE 42 showed that volunteers** are more **satisfied** with the experiment organization if they are **strongly involved in the experiment execution**. This is an important aspect for the preparation of future Trials of DRIVER+. The level of information flow was depending on the type of tool they were using, they got more information about the experiment progress if they have used a tool like CrowdTasker or GDACSmobile. The overall **satisfaction of the volunteers was very good**. Nearly half of them would participate in a similar experiment again.

About 80% of the **professionals** involved in **EXPE 42 were interested in participating** in similar **experiments again**. More than half of the professionals are strongly interested in participating again. The **quality of information provided about the progress** of the experiment was the only point **rated low** by professionals. This is similar to the statement of the volunteers.

A major shortcoming of EXPE 42 were some limitations in the experiment execution, leading for instance to differences in the evaluation degree of the different tools. For instance, the **evaluation of DEWS was quite constricted**.

Focusing on the specific evaluation the tested tools, EXPE42 showed that the overall satisfaction with the **CrowdTasker** for **volunteers is very high**. Females rated some functionalities, for example the reliability of the tool, the understanding of the situation and the information on what to do in a specific situation, higher than men. **Professionals** see the **CrowdTasker as a very good tool**, only the functionality for documentation was rated rather low. Improvements for the professionals would be the possibility to have multilingual tasks and to assign meanings to reports.

GDACSmobile achieved also **very high** overall satisfaction of the volunteers, interestingly all functionalities were clearly better rated by men than by women. GDACSmobile was also rated quite well by the professionals, but the functionalities “Quality assuring” and “Documentation” were rated somewhat lower than the others. There were no improvements identified by the professionals that were judged as clearly needed.

EXPE42 showed that the **v**olunteers were not as satisfied with SafeTrip as with the CrowdTasker or GDACSmobile. There is a big age difference in the judgement of the solution. In the class 60+ all volunteers rated the tool better than the others. Professionals rated the tool a lot better than volunteers. The **multilingualism of the tool was rated** with more than 25% as a **nice and valuable improvement.**

LifeX COP was rated very positively by the professionals. Only “Learning ease” and “Documentation” are rated a bit low compared to the other categories. Some improvements, for example the visualization of data, the formulating of summaries and requests and the visualisation of the summary are wanted by the professionals.

Finally, csWeb is also rated good and has only the “Learning ease” and “Documentation” rated somewhat lower as the other functionalities. Professionals would like a “What-if analysis of the situation” as an improvement of the tool.

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Annexes

Annex 1 – DRIVER+ Terminology

In order to have a common understanding within the DRIVER+ project and beyond and to ensure the use of a common language in all project deliverables and communications, a terminology is developed by making reference to main sources, such as ISO standards and UNISDR. This terminology is presented online as part of the Portfolio of Solutions and it will be continuously reviewed and updated[10]. The terminology is applied throughout the documents produced by DRIVER+. Each deliverable includes an annex as provided hereunder, which holds an extract from the comprehensive terminology containing the relevant DRIVER+ terms for this respective document.

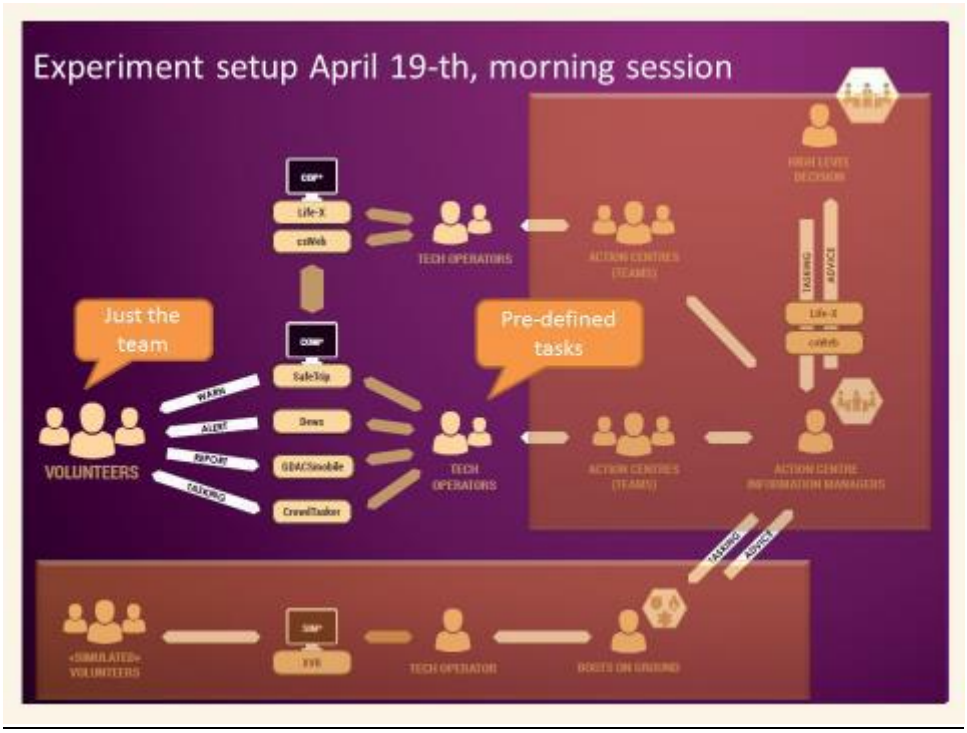
Table A1: DRIVER+ Terminology

Terminology	Definition	Source
Affiliated volunteer	Individual, who is affiliated with an existing incident response organization or voluntary organization but who, without extensive preplanning, offers support to the response to, and recovery from, an incident.	derived from ISO 22319:2017(en) Security and resilience — Community resilience — Guidelines for planning the involvement of spontaneous volunteers 3.1.
Crisis Management	Holistic management (3.135) process (3.180) that identifies potential impacts (3.107) that threaten an organization (3.158) and provides a framework for building resilience (3.192), with the capability for an effective response that safeguards the interests of the organization's key interested parties (3.124), reputation, brand and value creating activities (3.1), as well as effectively restoring operational capabilities. Note 1 to entry: Crisis management also involves the management of preparedness (3.172), mitigation (3.146) response, and continuity (3.49) or recovery (3.187) in the event of an incident (3.111), as well as management of the overall programme through training (3.265), rehearsals and reviews (3.197) to ensure the preparedness, response and continuity y plans stay current and up-to-date.	Source: ISO22300 (DRAFT 2017) 8.
Crisis management professionals	Persons with relevant knowledge or ability needed to effectively and timely respond to a crisis to in order to minimize damage to society.	D934.17.
Evaluation	Process of estimating the effectiveness (3.1.3.03), efficiency (3.1.3.04), utility and relevance of a service (3.1.1.59) or facility.	Source: ISO 5127:2017(en) Information and documentation —Foundation and vocabulary, 3.1.3.02.
Exercise	Process (3.180) to train for, assess, practise and improve performance (3.167) in an organization (3.158).	ISO22300 (DRAFT 2017) 11.

[10] Until the Portfolio of Solutions is operational, the terminology is presented in the DRIVER+ Project Handbook and access can be requested by third parties by contacting coordination@projectdriver.eu.

Terminology	Definition	Source
	Note 1 to entry: Exercises can be used for validating policies, plans, procedures (3.179), training (3.265), equipment, and inter-organizational agreements; clarifying and training personnel (3.169) in roles and responsibilities; improving interorganizational coordination (3.52) and communications; identifying gaps in resources (3.193); improving individual performance and identifying opportunities for improvement; and a controlled opportunity to practise improvisation. Note 2 to entry: See also test (3.257).	
Experiment	Purposive investigation of a system through selective adjustment of controllable conditions and allocation of resources.	ISO/TR 13195:2015(en) Selected illustrations of response surface method — Central composite design, 2.1.
Observer	Exercise participant who watches selected segments as they unfold while remaining separate from role player activities [DRAFT 22300: 2017-- observer participant (3.163) who witnesses the exercise (3.83) while remaining separate from exercise activities. Note 1 to entry: Observers may be part of the evaluation (3.81) process (3.180).]	ISO 22300:2012(en) Societal security — Terminology, 2.4.5 [addition in DRAFT 2017].
Scenario	Pre-planned storyline that drives an exercise; the stimuli used to achieve exercise objectives [pre-planned storyline that drives an exercise (3.83), as well as the stimuli used to achieve exercise project performance (3.167) objectives (3.153)].	ISO22300 (2015) 9 [DRAFT 2017, p 27].
Trial	An activity for systematically finding and testing valuable solutions for current and emerging needs in such a way that practitioners can do this in a pragmatic yet systematic way.	
Volunteer	SV [spontaneous volunteer] Individual, who is not affiliated with an existing incident response organization or voluntary organization but who, without extensive preplanning, offers support to the response to, and recovery from, an incident.	ISO 22319:2017(en) Security and resilience — Community resilience — Guidelines for planning the involvement of spontaneous volunteers, 3.1

Annex 2 – Day 1 - Tutorial script



„FLOOD AT THE OFFICE“ EXPERIMENT (1)

At April 19-th (morning), we will perform a demo experiment for crisis managers. Experiment scenario is „flood at the VRH office“:

- XVR simulator will show a flood in the last room on the 9-th floor

Coming next: someone needs to tell us about the flood

TOOL “GDACSMOBILE“ - BASIC INFORMATION

- Management Summary
  - GDACSmobile is a client-server application that supports the collection, processing and dissemination of crisis-related information via mobile devices and a web view.

GDACSMOBILE

During a **crisis event**, first responders and **volunteers** can provide information supporting the **situational awareness**.

Focus of the tool and target group:

- Tool supports information exchange and coordination in the first phase after a major sudden-onset disaster
- Aims at supporting two main target groups having different rights and roles: people concerned with disaster relief (e.g. Command and Control Center) and the (affected) population

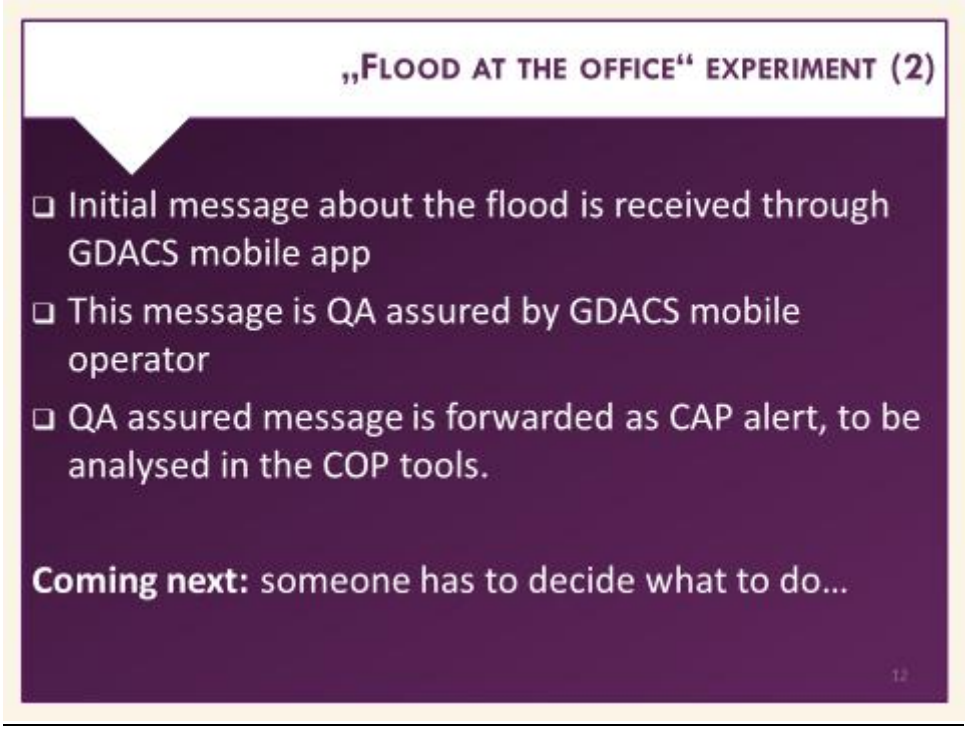
- **The core functionalities of the GDACSmobile client**
  - Differentiated visualization of information
  - Needs assessment
  - Integration of crowd-sourced information

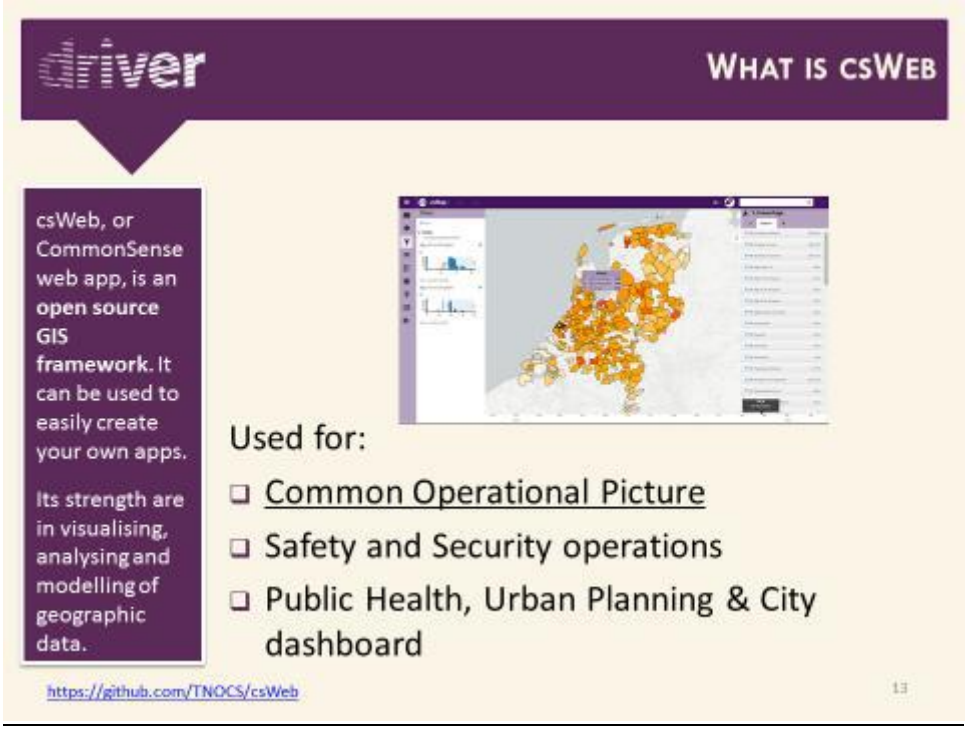
9

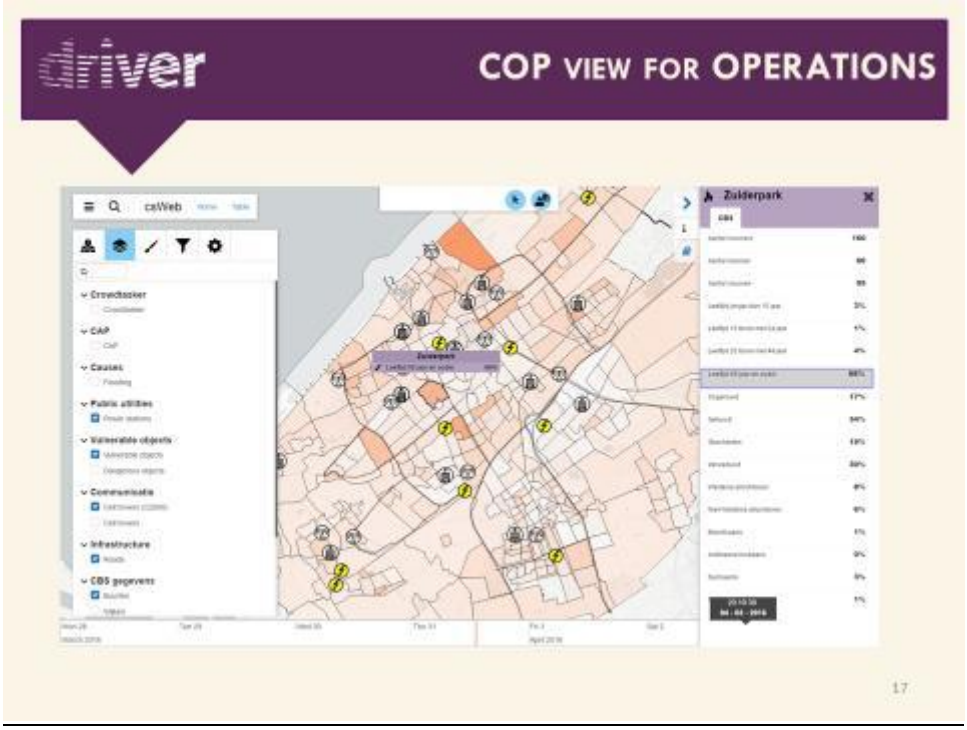
GDACSMOBILE: FLEXIBLE CATEGORIES

- Reports are structured in flexible categories
- Crisis managers set categories and can adapt them during an event
- Categories can be defined by further sub-categories etc.


driver
GDACSMOBILE - WORKFLOW
Volunteers
Report observation
Publish observations
Moderator
Coordinators (e.g. ROT)


„FLOOD AT THE OFFICE“ EXPERIMENT (2)
Initial message about the flood is received through GDACS mobile app
This message is QA assured by GDACS mobile operator
QA assured message is forwarded as CAP alert, to be analysed in the COP tools.
Coming next: someone has to decide what to do…


driver
WHAT IS CSWEB
csWeb, or CommonSense web app, is an open source GIS framework. It can be used to easily create your own apps.
Its strength are in visualising, analysing and modelling of geographic data.
Used for:
Common Operational Picture
Safety and Security operations
Public Health, Urban Planning & City dashboard
https://github.com/TNOCS/csWeb
13

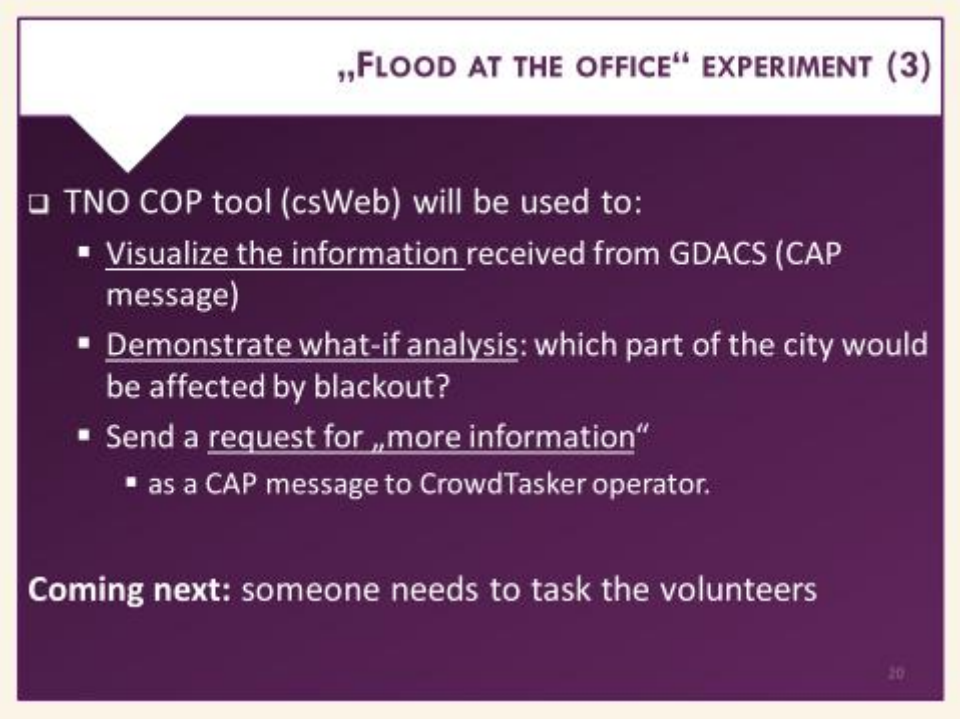

driver
COP VIEW FOR OPERATIONS
csWeb
Zuiderpark
17

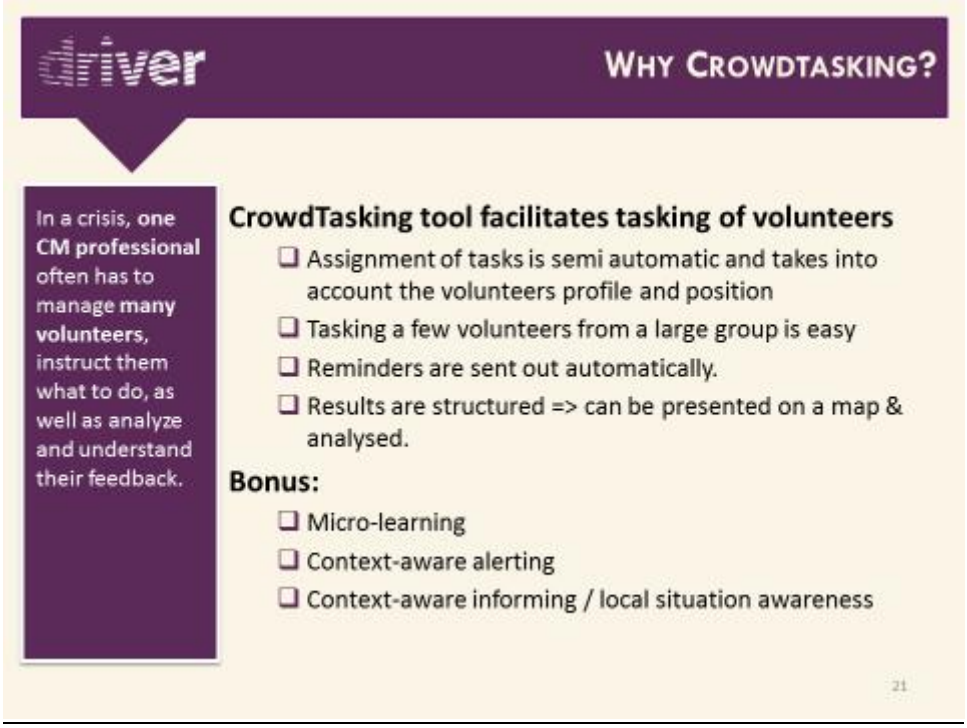
csWeb SIM view for PLANNING & PREPARATION

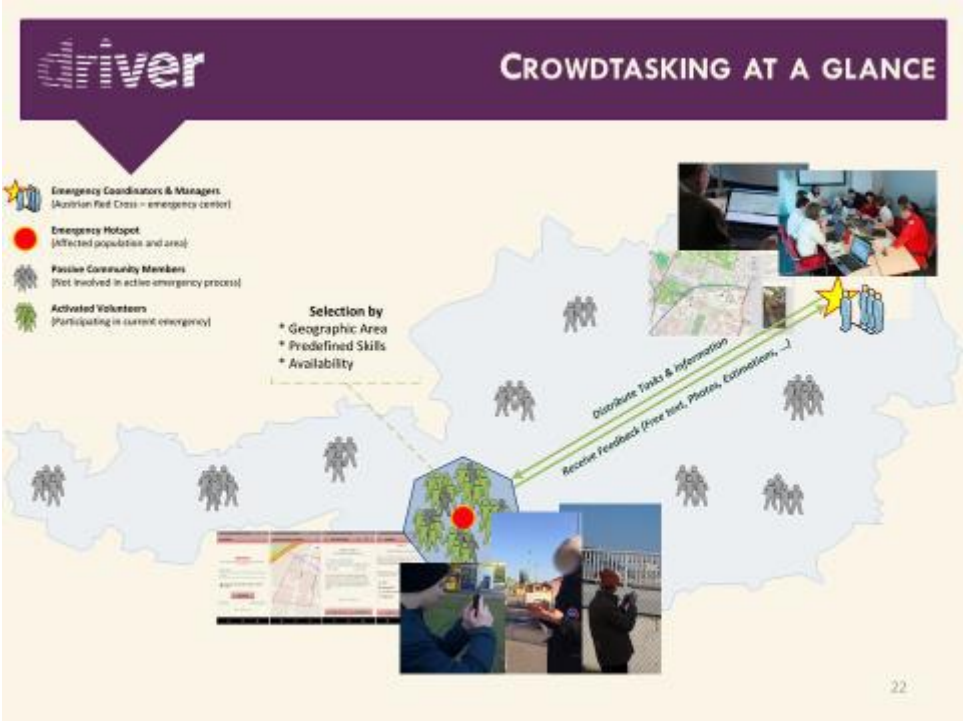
BEFORE	AFTER

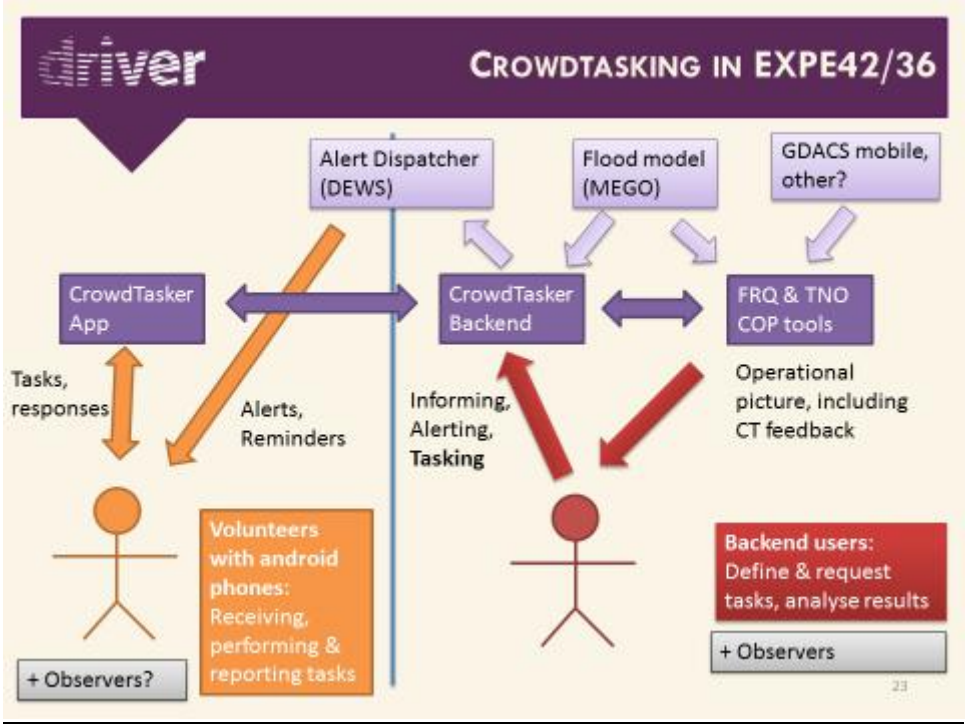
How to use csWeb in EXPERIMENT?

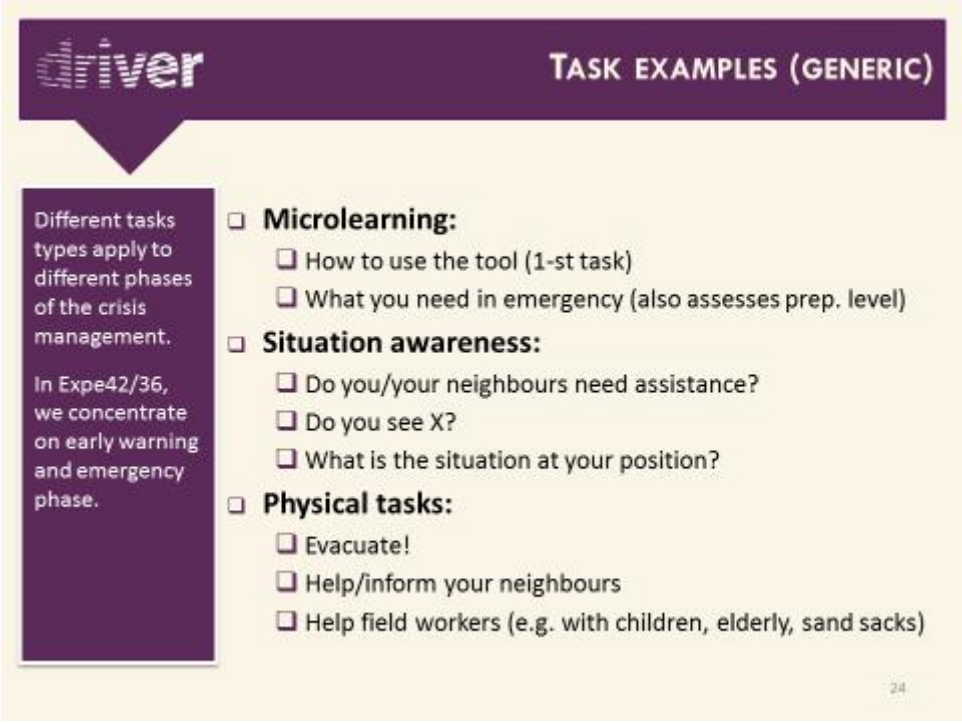
Planning & Preparation	Operations
❑ Analyse the situation by assessing the effects of a flooding on: ▪ Population ▪ Care and Cure institutions ▪ Effects of power failure ▪ Effects of communication failure ▪ Roads ❑ Prepare a map layer which contains your plans and observations	❑ To analyse and aggregate CrowdTasker & GDACS mobile results ❑ To send and receive CAP messages ❑ To analyse the local situation ❑ To report progress to others ❑ To consult your prepared plan

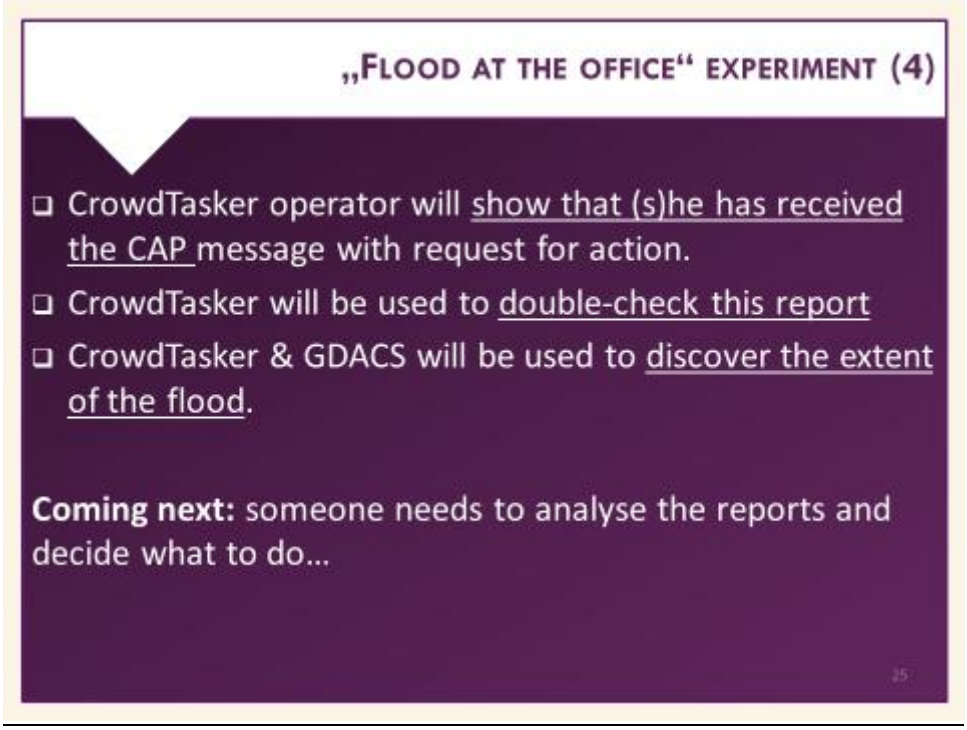

„FLOOD AT THE OFFICE“ EXPERIMENT (3)
TNO COP tool (csWeb) will be used to:
Visualize the information received from GDACS (CAP message)
Demonstrate what-if analysis: which part of the city would be affected by blackout?
Send a request for „more information“
as a CAP message to CrowdTasker operator.
Coming next: someone needs to task the volunteers

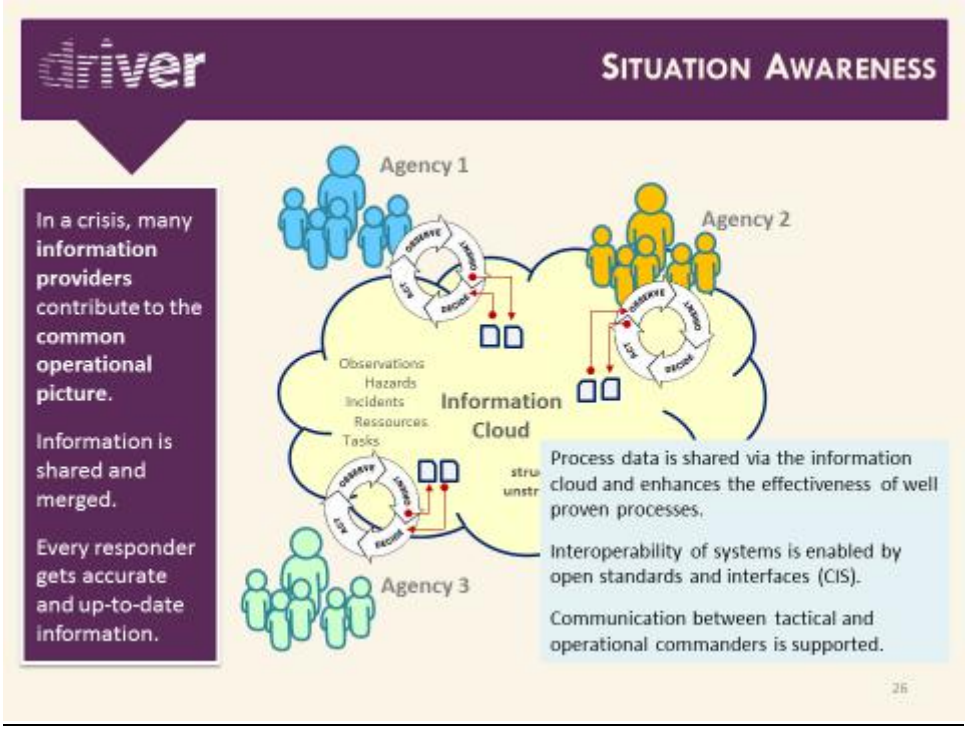

driver
WHY CROWDTASKING?
In a crisis, one CM professional often has to manage many volunteers, instruct them what to do, as well as analyze and understand their feedback.
CrowdTasking tool facilitates tasking of volunteers
Assignment of tasks is semi automatic and takes into account the volunteers profile and position
Tasking a few volunteers from a large group is easy
Reminders are sent out automatically.
Results are structured => can be presented on a map & analysed.
Bonus:
Micro-learning
Context-aware alerting
Context-aware informing / local situation awareness

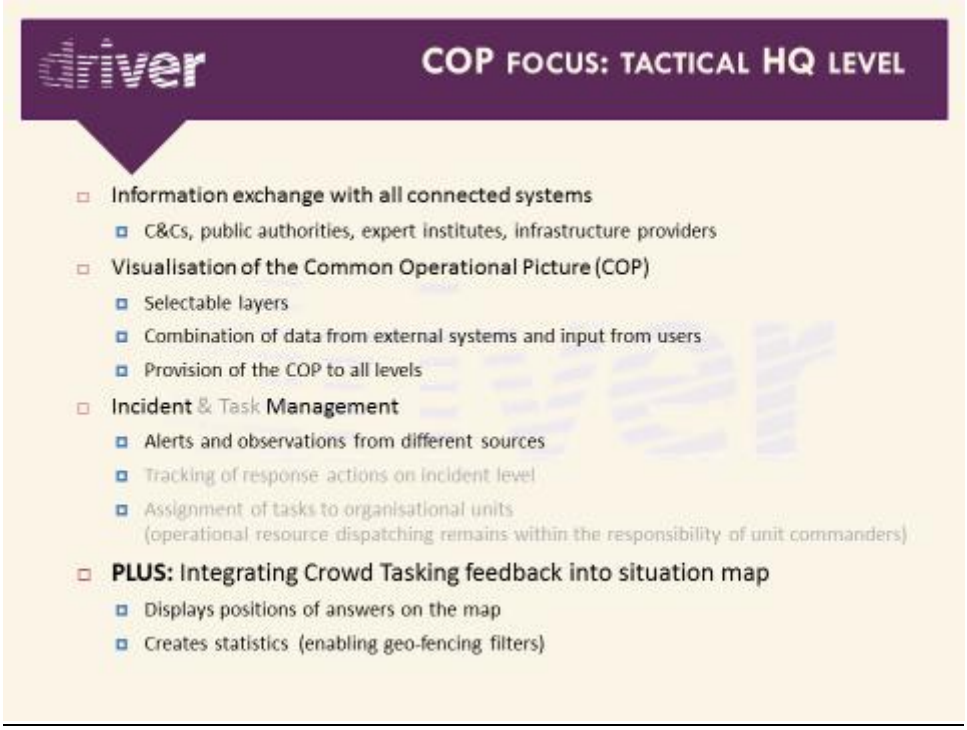

driver
CROWDTASKING AT A GLANCE
Emergency Coordinators & Managers
Emergency Hotspot
Passive Community Members
Activated Volunteers
Selection by
* Geographic Area
* Predefined Skills
* Availability
Distribute Tasks & Information
Receive Feedback (Free text, Photos, Estimations, ...)
22

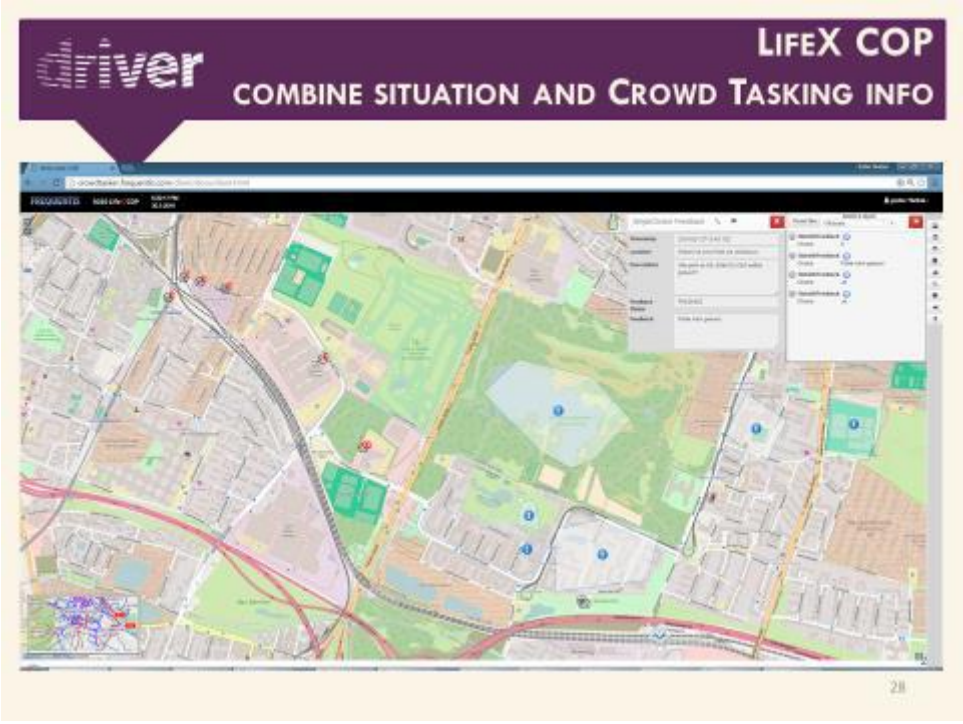

driver
CROWDTASKING IN EXPE42/36
Alert Dispatcher (DEWS)
Flood model (MEGO)
GDACS mobile, other?
CrowdTasker App
CrowdTasker Backend
FRQ & TNO COP tools
Tasks, responses
Alerts, Reminders
Informing, Alerting, Tasking
Operational picture, including CT feedback
Volunteers with android phones: Receiving, performing & reporting tasks
Backend users: Define & request tasks, analyse results
+ Observers?
+ Observers
23


driver
TASK EXAMPLES (GENERIC)
Different tasks types apply to different phases of the crisis management.
In Expe42/36, we concentrate on early warning and emergency phase.
Microlearning:
How to use the tool (1-st task)
What you need in emergency (also assesses prep. level)
Situation awareness:
Do you/your neighbours need assistance?
Do you see X?
What is the situation at your position?
Physical tasks:
Evacuate!
Help/inform your neighbours
Help field workers (e.g. with children, elderly, sand sacks)
24

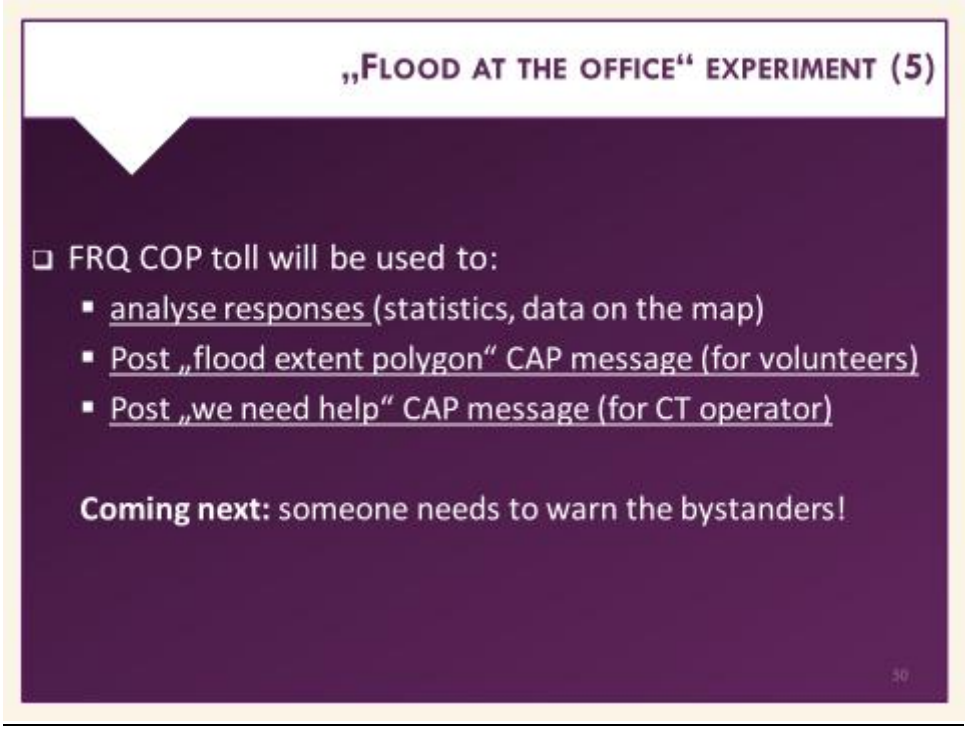

„FLOOD AT THE OFFICE“ EXPERIMENT (4)
CrowdTasker operator will show that (s)he has received the CAP message with request for action.
CrowdTasker will be used to double-check this report
CrowdTasker & GDACS will be used to discover the extent of the flood.
Coming next: someone needs to analyse the reports and decide what to do…
25

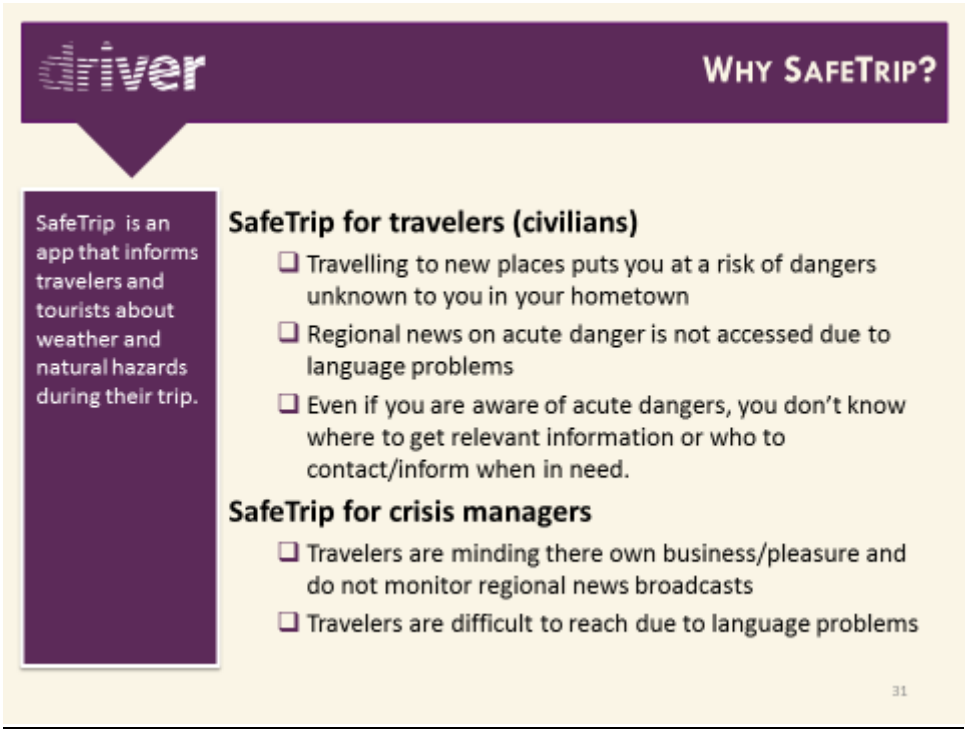

driver
SITUATION AWARENESS
In a crisis, many information providers contribute to the common operational picture.
Information is shared and merged.
Every responder gets accurate and up-to-date information.
Agency 1
Agency 2
Agency 3
Observations
Hazards
Incidents
Ressources
Tasks
Information Cloud
Process data is shared via the information cloud and enhances the effectiveness of well proven processes.
Interoperability of systems is enabled by open standards and interfaces (CIS).
Communication between tactical and operational commanders is supported.
26


driver
COP FOCUS: TACTICAL HQ LEVEL
Information exchange with all connected systems
C&Cs, public authorities, expert institutes, infrastructure providers
Visualisation of the Common Operational Picture (COP)
Selectable layers
Combination of data from external systems and input from users
Provision of the COP to all levels
Incident & Task Management
Alerts and observations from different sources
Tracking of response actions on incident level
Assignment of tasks to organisational units
(operational resource dispatching remains within the responsibility of unit commanders)
PLUS: Integrating Crowd Tasking feedback into situation map
Displays positions of answers on the map
Creates statistics (enabling geo-fencing filters)


driver
LIFEX COP
COMBINE SITUATION AND CROWD TASKING INFO
28


driver
LIFEX COP
CROWD TASKING STATISTICS


„FLOOD AT THE OFFICE“ EXPERIMENT (5)
FRQ COP toll will be used to:
analyse responses (statistics, data on the map)
Post „flood extent polygon“ CAP message (for volunteers)
Post „we need help“ CAP message (for CT operator)
Coming next: someone needs to warn the bystanders!
30


driver
WHY SAFETRIP?
SafeTrip is an app that informs travelers and tourists about weather and natural hazards during their trip.
SafeTrip for travelers (civilians)
Travelling to new places puts you at a risk of dangers unknown to you in your hometown
Regional news on acute danger is not accessed due to language problems
Even if you are aware of acute dangers, you don't know where to get relevant information or who to contact/inform when in need.
SafeTrip for crisis managers
Travelers are minding there own business/pleasure and do not monitor regional news broadcasts
Travelers are difficult to reach due to language problems
31

WHY SAFETRIP?

SafeTrip uses the phone's GPS location to present localized and detailed information about the actual risks and forecasts.

SafeTrip informs travelers about natural hazards

- ❑ Risk information is submitted by national governmental parties.
- ❑ Easy to use by travelers
- ❑ Small effort, potentially large effect.

Bonus:

- ❑ Alarm messages may be combined with requests to the foreigners (please do …)
- ❑ Context-aware informing / local situation awareness

32

SAFETRIP IN THE EXPE42/36

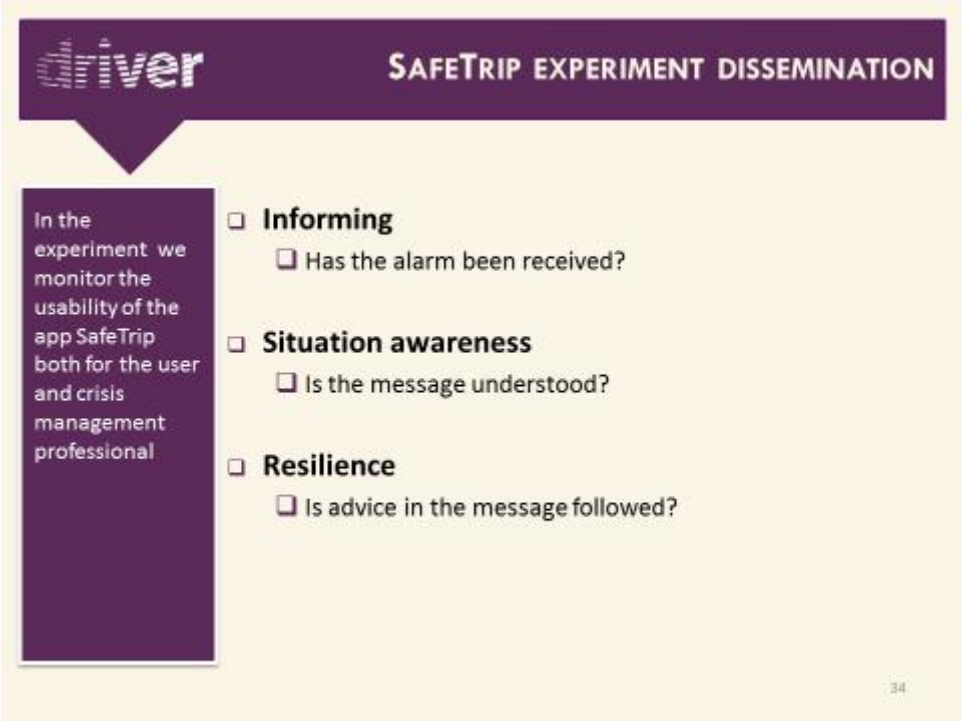
IM

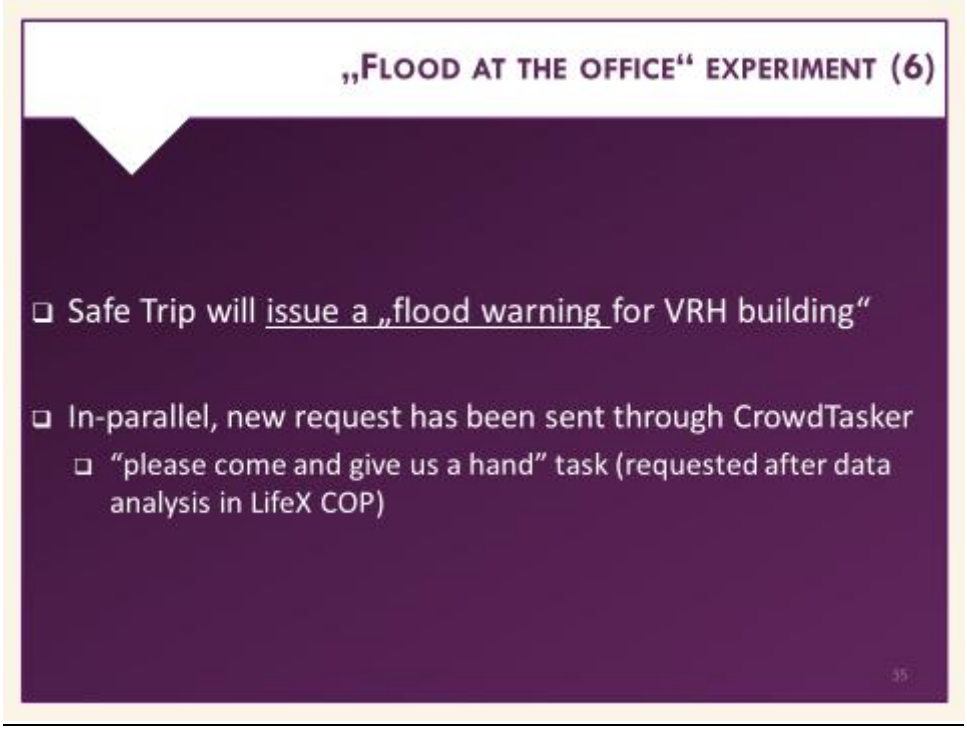
Communication manager

Alarm issued on the 'official' website

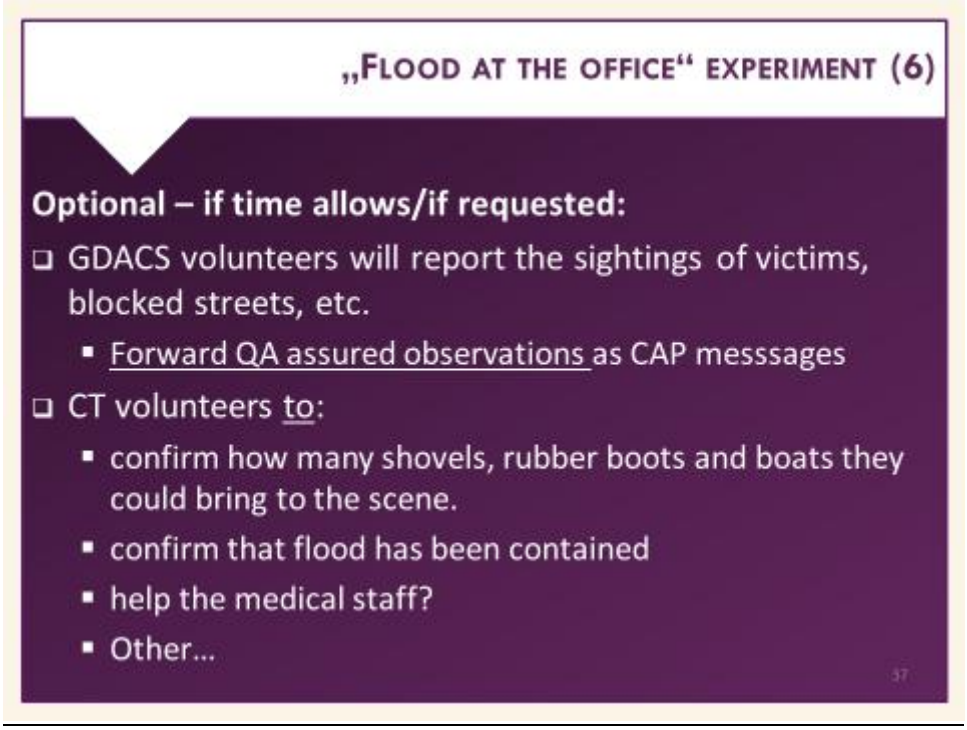
V

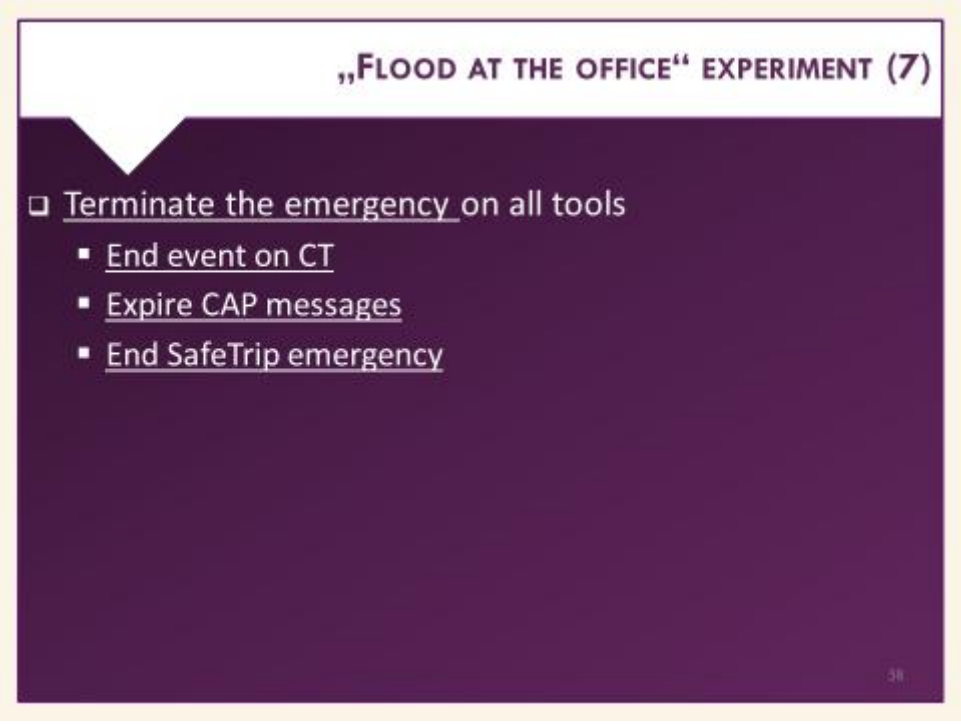
33

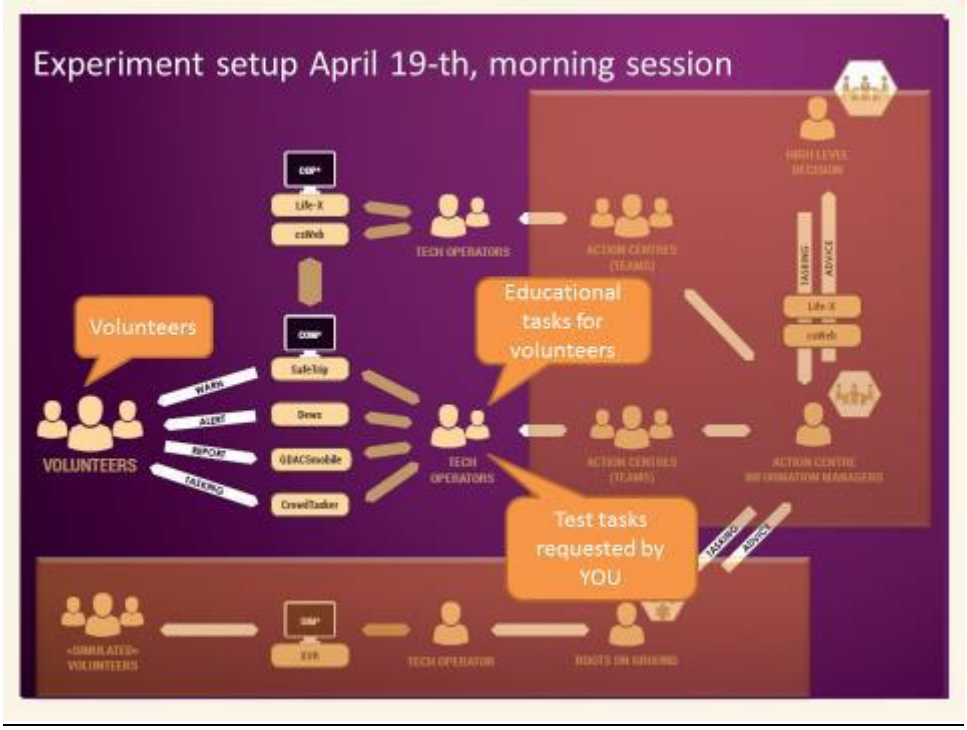

driver
SAFETRIP EXPERIMENT DISSEMINATION
In the experiment we monitor the usability of the app SafeTrip both for the user and crisis management professional
Informing
Has the alarm been received?
Situation awareness
Is the message understood?
Resilience
Is advice in the message followed?
34


„FLOOD AT THE OFFICE“ EXPERIMENT (6)
Safe Trip will issue a „flood warning for VRH building“
In-parallel, new request has been sent through CrowdTasker
“please come and give us a hand” task (requested after data analysis in LifeX COP)
35


driver
CT – TASK 2
Event: Flood at the office!
"We have received reports about flood at the VRH office. Please help us to resolve this issue"
Task: Let's contain the flood
"Please come to the simulation room and help us to contain the flood. Bring helpers with you if you can."
Step1: No volunteers (numeric)
Instructions: Please indicate how many volunteers have you brought to the scene. 1 == only you.
Step2: team photo
Instructions: Please send us a photo of yourself and your friends helping to contain the flood.
36


„FLOOD AT THE OFFICE" EXPERIMENT (6)
Optional – if time allows/if requested:
GDACS volunteers will report the sightings of victims, blocked streets, etc.
Forward QA assured observations as CAP messsages
CT volunteers to:
confirm how many shovels, rubber boots and boats they could bring to the scene.
confirm that flood has been contained
help the medical staff?
Other…
37


„FLOOD AT THE OFFICE“ EXPERIMENT (7)
Terminate the emergency on all tools
End event on CT
Expire CAP messages
End SafeTrip emergency


Experiment setup April 19-th, morning session
Volunteers
Educational tasks for volunteers
Test tasks requested by YOU
VOLUNTEERS
TECH OPERATORS

Annex 3 – Agenda for Observers on April 20th, 2016 (10th floor)

Time	Topic	Speaker
10:00 – 10:30	Arrival, Coffee & Tea	André de Rond, VRH staff
10:30 – 10:35	Welcome to premises	VRH
10:35 – 10:55	Tour and presentation of VRH	Tjeerd Neumann
10:55 – 11:15	Introduction to DRIVER project	Martijn Boosman, Maurice Sammels
11:15 – 12:00	Joint Introduction to experiment 42 and video connection to 9th floor strategic management meeting	Martijn Boosman, Maurice Sammels
12:00 – 13:00	*Lunch Break with experiment participants*	
13:00 – 14:00	Transport to volunteer briefing location in the field and participation	All
14:00 – 14:30	Transport to VRH via two data collection points in the field	All
14:30 – 15:30	Observation of data collection and 3D simulation	VRH
15:30-15:55	Video connection to observe 9th floor strategic management meeting and debriefing of experiment	Denis Havlik, André de Rond
15:55 – 16:00	Conclusions	Tjeerd Neumann
16:00 -	Closing and invitation to stay for drinks	

Annex 4 – List of Experiment Supporters (9th floor)

List of (mostly DRIVER internal) experiment supporters, who were supporting the whole experiment execution from the 9th floor. The different types of roles are explained in more details in section 2.3.4.

Name	Organisation	Role in EXPE42
Denis Havlik	AIT	Experiment leader
Jasmin Pielorz	AIT	Organizer + Co-leader experiment
Andre de Rond	VRH	Project leader
Lex Vroling	VRH	Scenario lead
Silvia ten Bosch	VRH	Volunteer management field
Kelly van Duivenvoorde	Dutch Red Cross	Volunteer management field
John Lassche	VRH	Volunteer management field
Petra ter Veer	VRH	Film/photo
Erik Vullings	TNO	Information management
Maurice Sammels	XVR	XVR simulation lead and technics
Hanneke Vreugendhil	HKV	Tool support SafeTrip
Cor-Jan Vermeulen	HKV	Tool support SafeTrip
Rinze Bruining	TNO	Tool support csWeb
Tom van de Berge	TNO	Tool support csWeb
Peter Petiet	TNO	Tool support csWeb
Michael Middlehof	WWU	Tool support GDACSmobile
Ekatarina Dobrokhotova	WWU	Tool support GDACSmobile
Sandra Lechtenberg	WWU	Tool support GDACSmobile
Adam Widera	WWU	Tool support GDACSmobile
Miguel Angel Esbri	ATOS	Tool support DEWS
Gerard Zuba	Frequentis	Tool support CrowdTasker COP
Richard Draxelmayr	Frequentis	Tool support CrowdTasker COP
Christoph Ruggenthaler	AIT	Tool support CrowdTasker Mobile
Annika Nitschke	THW	Support 10th floor
Niels Lelieveld	Dutch Red Cross	Blog communication
Daniel Auferbauer	AIT	Group Discussions
Julia Zilles	DLR	Evaluator

Name	Organisation	Role in EXPE42
Monika Höglinger	ARC	Evaluator + Organisation
René Lindner	DIN	Evaluator
Jaime Martin Perez	ATOS	Evaluator
Chaim Rafalowski	MDA	Evaluator
Jose Kerstholt	TNO	Evaluator
Christof Ramage	ARTTIC	Evaluator
Isabelle Frech	Fraunhofer INT	Evaluator
Michael Löscher	Fraunhofer INT	Evaluator

Annex 5 – List of Observers (10th floor)

List of mostly external observers that were following the experiment remotely via video teleconference from the 10th floor.

Name	Organisation
Ingrid Alsemgeest	Dutch Red Cross
Marcel Mathijsse	National Research program water and evacuation
Jan Willem Tanis	Hoogheemraadschap Midden Delfland
Niels Ligthart	Ministerie van Veiligheid en Justitie
Biagio Lanziani	REGOLA
Jean Guilhem Cailton	VISOV
Mirian Orcutt	King's College London
Thomas Peter	UN Emergency Services Brand
Ludwig Karstner	DRIVER Leader JE1
Francesco Mugnai	JRC
Stephanie Albiero	DRIVER SP7
Laurent Dubost	DRIVER SP4
Monika Höglinger	Austrian Red Cross
Guillaume Lapeyre	Project officier DRIVER EU
Fernando Kraus	PMC DRIVER
Marcel van Berlo	TNO
Martijn Boosman	XVR
Tjeerd Neumann	VRH
Rob de Wijk	Advisory Board DRIVER
Roy Harold	Advisory Board DRIVER
Mike Griffin	Advisory Board DRIVER
Dr Chiara Cardaci	Reviewer DRIVER
Prof Duncan Shaw	Reviewer DRIVER
Col. Christian van de Voorde	Reviewer DRIVER
Dr Teija Mankkinen	Reviewer DRIVER
Esther Lieben	Safety Board VRH
Martin Evers	Fire Brigade Haaglanden
Hans van der Vet	Safety Board VRH
Caren Frentz	Chief GHOR VRH

Annex 6 – CrowdTasker detailed information

Concept and Workflow

As mentioned above, the tool "CrowdTasker" is an implementation of the concept of crowdtasking, first published in 2013 (9). The concept of crowdtasking intends for a request for concrete actions by participants to be undertaken in a limited temporal and spatial scope. This is done through the performance of micro-tasks that do not entail any further obligations for the participant. In the present field of Crisis and Disaster Management, this is used by CrowdTasker to connect crisis managers and unaffiliated volunteers by letting the former address a subset of the latter, optionally restricted by the volunteer's abilities, attributes and current location, by issuing well-described and self-contained tasks. A simplified representation of the crowdtasking workflow for Crisis and Disaster Management is shown in Figure A1.

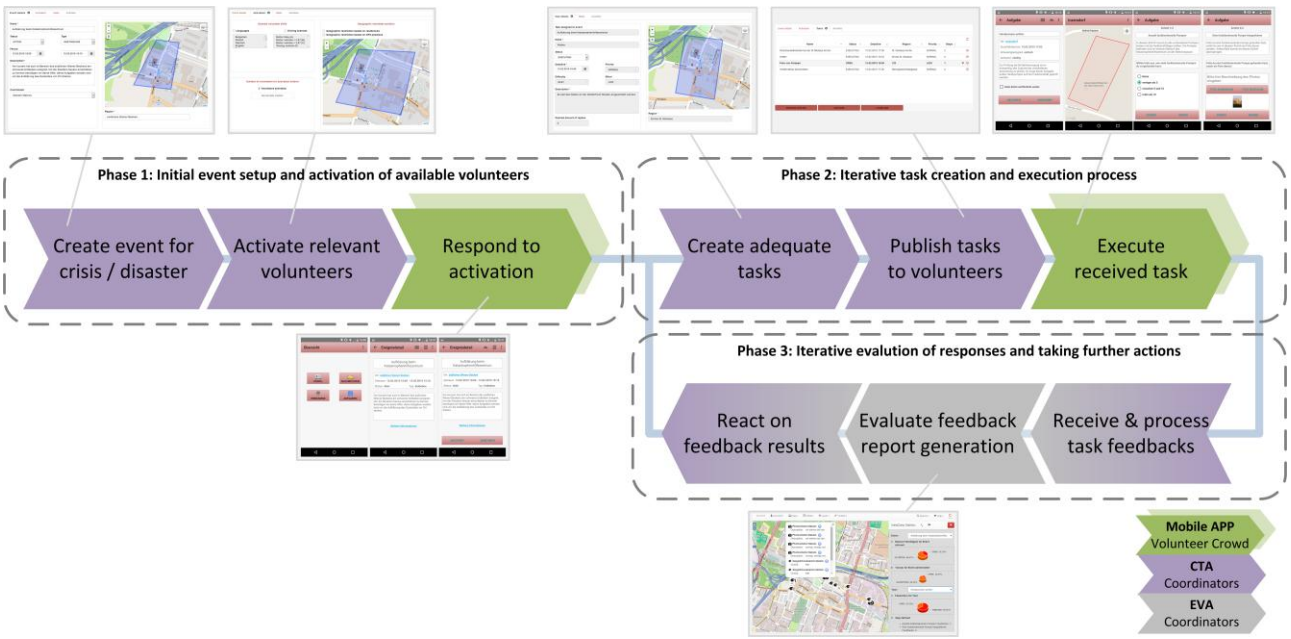


Figure A1: Crowdtasking Workflow for Crisis and Disaster Management

The steps for tasking volunteers and evaluating feedback are as follows:

1. Create an event for crisis / disaster: the person responsible for managing volunteers via CrowdTasker, henceforth referred to as "coordinator", creates a so-called "event", which represents any cause (distinct through place, duration and subject matter) for which the coordinator might want the support of volunteers.
2. Activate relevant volunteers: the coordinator selects a subset of all registered volunteers by declaring conditions pertaining to the volunteer's skill (e.g. medical training) or current position. Thereby, the coordinator selects those volunteers that he needs, e.g. because they are in the area or have skills that are required (or both).
3. Respond to activation: Volunteers that meet the criteria for activation receive a notification about the new event on their smartphones and can react by either accepting the request or declining to participate. Those volunteers that accept the request are now eligible for tasks.
4. Create adequate tasks: The coordinator now creates tasks for the event, as suits his or her need. Each task consists of one or more steps, each of which has a well-defined result type. Possible result types in the CrowdTasker version fielded in The Hague include: multiple choice selection, exclusive choice selection, a photo, an integer value, or a free text. The coordinator can freely choose from these types of task steps to create new tasks.

5. Publish tasks to volunteers: Once the coordinator has created tasks sufficient for his or her needs, he can publish them to volunteers. All volunteers that have accepted the participation request for the event will receive each task for this event, as published by the coordinator.
6. Execute received task: The volunteers can choose to decline or accept each task individually. Should they accept to participate in a task, they are guided through each task step (as defined by the coordinator) sequentially, until they are done with all (required) task steps, at which point they submit the data.
7. Receive and process task feedbacks: Data submitted by volunteers is received by the CrowdTasker system and processed. As we now in advance the data type for each step of each task, it is possible to aggregate, analyse and visualise information in the next step.
8. Evaluate feedback and report generation: this step is intended to be done by a Common Operational Picture (COP) tool, of which there where two fielded in The Hague: LifeX COP and csWeb (see sections 0 and 0, respectively). CrowdTasker provides structured data submitted by volunteers which can be visualised and used to generate situation reports. If no external COP tool is present, CrowdTasker also provides an integrated option to visualise and analyse results.
9. React on feedback results: Lastly, the coordinator is likely to react to the feedback he or she has received from volunteers and will create further tasks based on this new knowledge. In this way, the workflow will continue until the coordinator deems the situation resolved and closes the CrowdTasker event.

Implementation and Technology

On the technological level, CrowdTasker, as it was deployed in The Hague, consists of three distinct components:

1. *APP* - a mobile front-end for volunteers in the form of a smartphone application which provides a sign-up process, situational information and options to participate in, and contribute to, tasks.
2. *CTA* - a web front-end for defining new tasks and selection of appropriate volunteers; A back-end, which handles volunteer registration, profiles, task assignment, report collection and data exchange.
3. *EVA* - for visualising and analysing data received from volunteers, CrowdTasker is connected to a Common Operational Picture (COP) situation map, which presents data on a GIS based interface.

These three components and their relations are depicted in Figure A2. The components CTA and APP, which in The Hague were the two aspects of the crowdtasking workflow provided by CrowdTasker itself, will be described in more detail on the following pages. For a description of the EVA component, the Common Operational Picture tools LifeX COP and csWeb were used in this deployment – they are described in their respective sections (4.2.6 and 0).

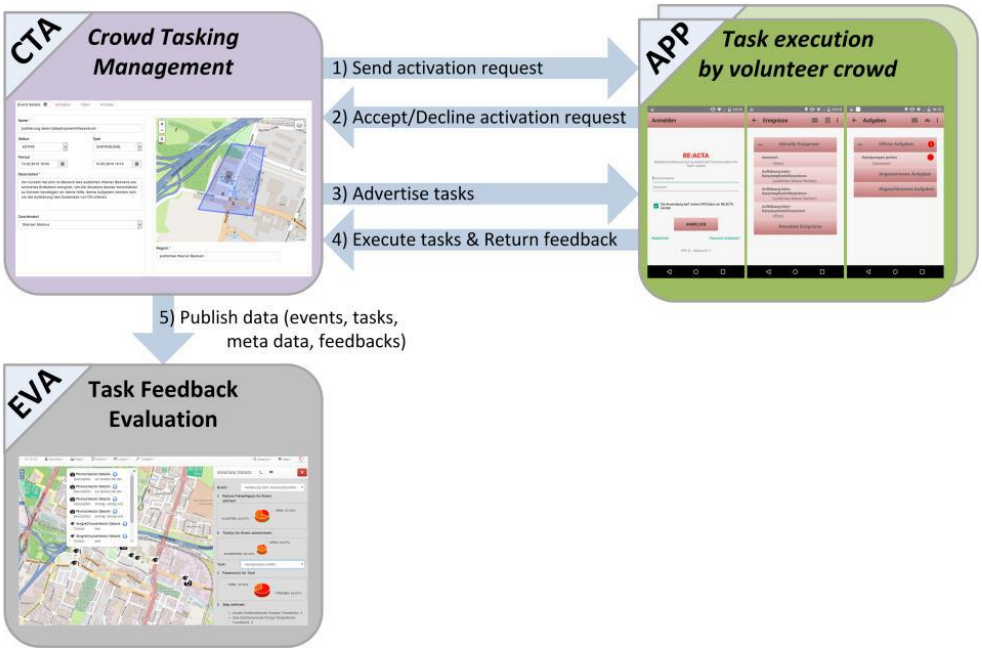


Figure A2: Technological Components of CrowdTasker as used in The Hague

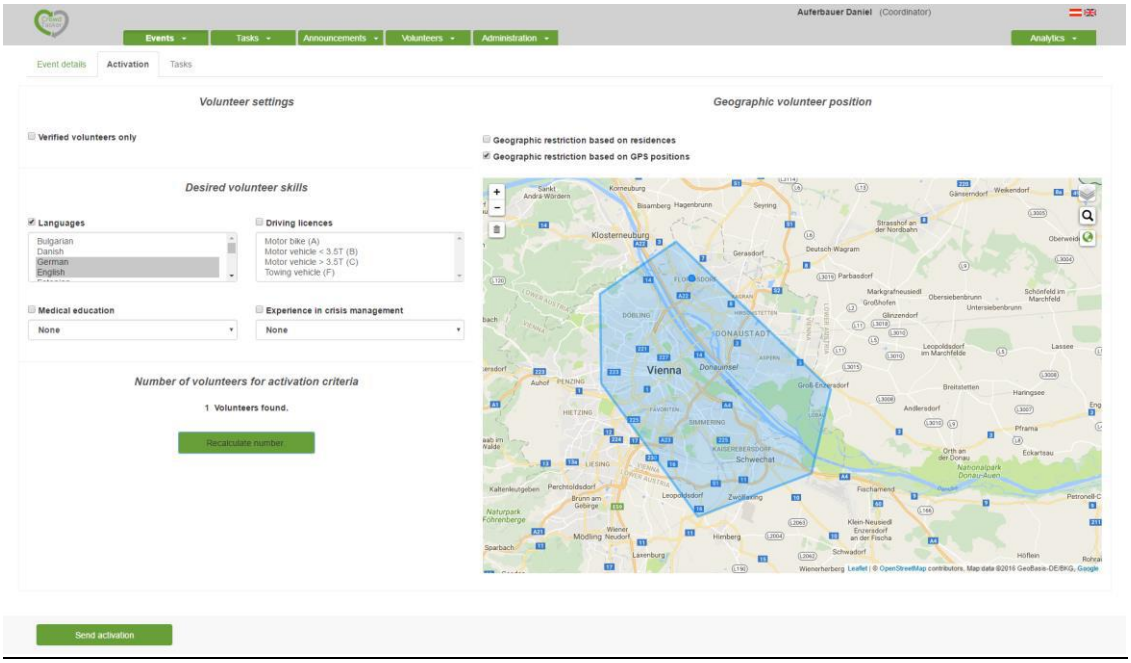


Figure 0.3: Screenshot of CrowdTasker's CTA Component

CTA is the central tool used by the crowdtasking coordinator for interaction with volunteers that are using the CrowdTasker smartphone application. The coordinator(s) can transmit tasks and information to a select group of volunteers based on their location or set of skills. In the current setup of the workflow, all communication between the crisis managers and volunteers passes CrowdTasker and is managed by the coordinator(s). The main functions provided by the CrowdTasker Tool are:

- Defining new crisis events: once a new crisis is identified, the coordinator creates a new event in the CrowdTasker system – every artifact (information, task or hazard warning) concerning the crisis will be tied to this event.

- Activation of pre-registered volunteers: after having defined a new event, the coordinator starts to "recruit" volunteers. He or she will select a crowd through criteria such as their current location, home address or skill set. All volunteers fulfilling these criteria then receive an activation request. Figure 0.3 shows a screenshot of the activation screen, where language skills and current location of volunteers within the drawn polygon are used as selection criteria.
- Defining and distributing Tasks: For each event, the coordinator may define an arbitrary number of tasks. Each task consists of one or more steps to be carried out by the volunteers in their given order. Once the definition is completed, the coordinator uses CrowdTasker to relay the task to all activated volunteers.
- Collecting and storing volunteer's CT reports: once a volunteer has completed all the steps of a task, the results are transmitted from the smartphone application to the CrowdTasker Tool. They are stored for later use with other components; visualization of feedback to enhance situational awareness is not part of CTA.

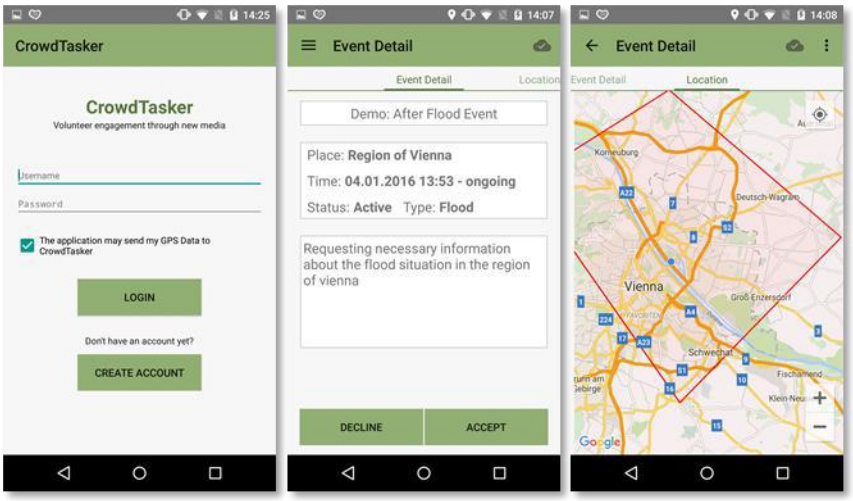


Figure A4: Screenshots of Three Different CrowdTasker APP Views

APP is the component functioning as front-end of CrowdTasker towards volunteers. It is a smartphone application that displays information about current events, activation requests for relief efforts as well as tasks related to active events. The volunteers use it to execute tasks one step at a time. It also offers the option to register a new account as well as manage existing ones. The following are the features provided by CrowdTasker Mobile Application:

- User account management: Volunteers can register a new account via the mobile application. After logging in, they can edit their profile (e.g. home address or skills) directly through APP. Should they decide to quit their volunteer activities for CrowdTasker altogether, the application also offers the option for complete de-registration of the account. The rightmost image of Figure A4 shows the login screen, which also provides an option for the rapid creation of a new account.
- Information consumption: the CrowdTasker Mobile Application can display information regarding current events. This includes hazard warnings for potentially dangerous areas.
- Volunteering: users of the CrowdTasker Mobile Application are treated as potential volunteers – they will receive requests for participation in events This is handled interactively through the app, whereby users have the option to accept or decline requests for participation in the app. Figure A4 (middle image) shows the view for accepting or declining to participate in an event, including detailed geographical information (leftmost image).
- Task execution: APP provides information on task execution and guides the user through each of the steps of any tasks. The inputs are designed in such a way that the type of feedback corresponds to the requests of the CrowdTasker coordinator. Lastly, the app handles the transmission of task data on completion.

Figure A5 shows the interaction and workflow between CTA and APP with examples from various views of each tool. This is the technological implementation of the crowdtasking workflow as realised with the CrowdTasker tool in The Hague.

Figure A5: Technological Implementation of Crowdtasking

Tasking results

During the experiment, several different types of tasks were issued to participants in the field, some of preparatory nature and others designed with crisis management practitioners on the spot in the live part of the event. **Over the course of the exercise, CrowdTasker has received a total of 714 responses to these tasks and no major technical problems were encountered**. To give an adequate impression of what CrowdTasker was used for in The Hague, several examples of tasks that were issued are described below:

1. **Introductory tasks explaining how to use the CrowdTasker.** With the exercise in The Hague, the CrowdTasker team has started experimenting with **automated introductory tasks that guide volunteers through their first use of the application**. Most notably, the "Task reporting test" was the first task that all volunteers should have received as soon as they set up the account. This did not work 100% correctly at first, because some volunteers did not enter their language preferences in the profile. This was resolved by sending a reminder as a special "Taal invullen in profiel!" event request.
   During the experiment, the **English version of this task was answered by 26 volunteers and the Dutch version by 40 volunteers**. Figure A6 shows the results of this task in CrowdTasker's own interface.

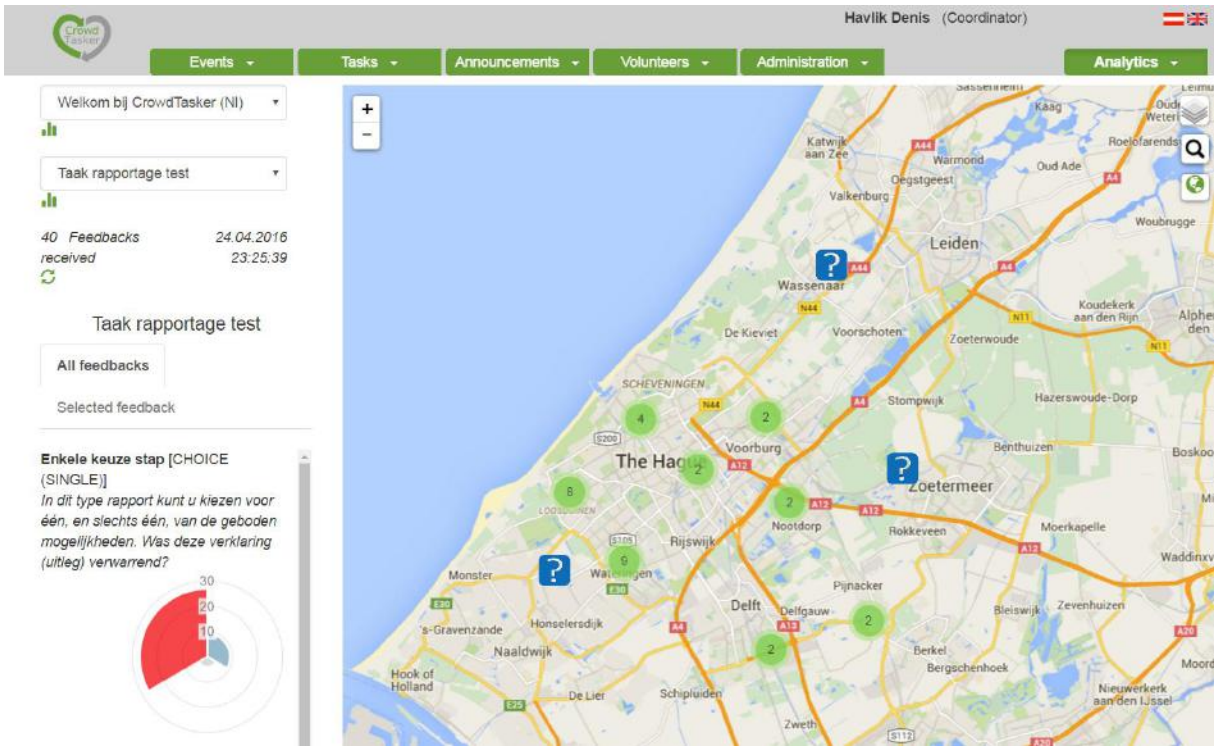


Figure A6: Results of the Introductory Task

2. Another introductory type task, is a type of **microlearning** - explaining who we are, why we are organizing the field exercise, how the experiment is organized and what we expect from you. One example of such task is shown in Figure A7.

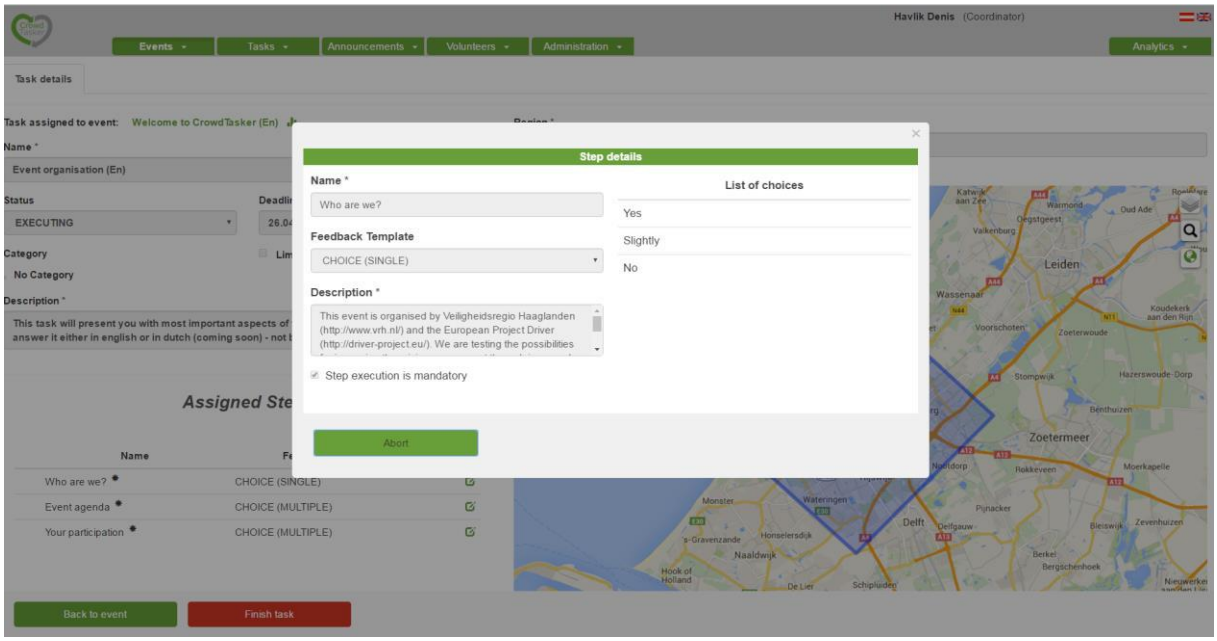


Figure A7: Introductory Task for Volunteers, Explaining Exercise Context

3. **Statistics collection** on the use of the tools and participant's satisfaction with experiment. Unsurprisingly, the volunteers that answered this question turned out to be biased towards use of CrowdTasker. Asking a question about an investigated tool through the tool itself introduced a form of "survivor's bias", where only those participants who could handle it correctly were able to respond. Gathering feedback in such a manner was first tried in The Hague and subsequently filed

under “lessons learned”. Figure A8 shows that the majority of participating volunteers thought favorably of the usability of the CrowdTasker app.

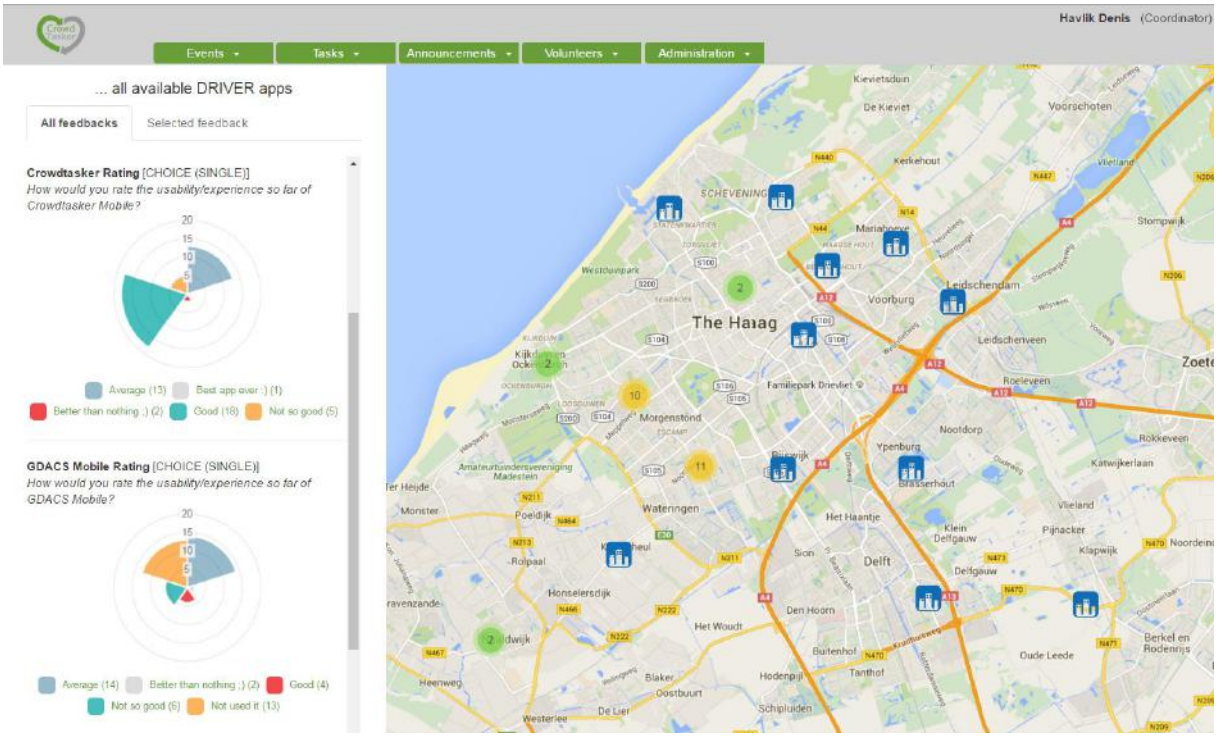


Figure A8: Results of a Satisfaction Survey Done with CrowdTasker

4. **Crisis preparation tasks**, explaining what volunteers need to know with regards to potential hazards (**microlearning**) and querying information about potentially dangerous things and situations (**situation awareness - preparatory phase**). Examples of such tasks are requests to report sightings of animals and items that might become dangerous in a crisis.

5. **Crisis assessment tasks (situation awareness)**, asking participants in the field to report what they see in a crisis situation. This includes questions about estimated water height, towels hanging out of windows (signaling need for help), availability of electricity and the request to report houses that are on sale (substituting e.g. collapsed houses).

6. **Requests to translate some texts from English to Dutch (auxiliary tasks)**. This worked well and allowed the CrowdTasker team to quickly translate nine tasks and blog posts without waiting for the availability of the Dutch-speaking DRIVER members on site.

Annex 7 – Questionnaire for volunteers and questionnaire for team and observers

Questionnaire for Volunteers

This questionnaire is pertinent to DRIVER experiment on crisis communication (April 19-20 2016, The Hague). Please answer it if you have participated in the experiment as a volunteer.

There are 25 questions in this survey

Profile

Following questions will help us to figure out whether your background and role in experiment are influencing the answers or not.

1 []What is your gender?

Please choose **only one** of the following:

- ○ Female
- ○ Male

2 []How old are you?

Only an integer value may be entered in this field.

Please write your answer here:

[ ]

years

3 []Do you have prior experience in volunteering, either as volunteer or as organiser of volunteers?

Please choose **all** that apply:

- ☐ I volunteered as part of a formal organisation (e.g Red Cross)
- ☐ I volunteered as part of a loose organisation (e.g. Burgernet)
- ☐ I volunteered as part of a self-organised group (e.g. organising help with your neighbours after a flooding)
- ☐ I helped on my own and was not part of a larger group
- ☐ Other: [ ]

.

4 []Where and how did you participate in experiment? *

Please choose the appropriate response for each item:

	I was at Wateringse Veld	I was elsewhere in The Hague	I followed the blog or watched a video stream online	I did not participate
April 19th	○	○	○	○
April 20th, morning	○	○	○	○
April 20th, afternoon	○	○	○	○

5 []Which type of smartphone do you have?

Please choose **all** that apply:

- [ ] Android phone
- [ ] Apple iPhone
- [ ] Windows phone
- [ ] Other:

Experiment Organisation

This group of questions is meant to help us improve the organisation of the future experiments

6 []How did you hear about this experiment? *

Please choose **all** that apply:

- [ ] I received an email invitation
- [ ] I read about it on the DRIVER homepage
- [ ] I heard about it on the radio or TV
- [ ] Through social media
- [ ] I was told by an acquaintance
- [ ] Other:

7 []Please assess the quality of information provided to you before and during experiment. Rate how well you were informed on a scale of 1 to 5, with 1 being the worst and 5 being the best possible option.

Please choose the appropriate response for each item:

	1	2	3	4	5
Who organised the experiment	○	○	○	○	○
Purpose of the experiment (why it was conducted)	○	○	○	○	○
What was expected of you	○	○	○	○	○
Purpose of the apps and how to use them	○	○	○	○	○
Progress of experiment	○	○	○	○	○
Code of conduct for the experiment (e.g. what you should / should not do during the experiment)	○	○	○	○	○
How your data will be handled (e.g. what we are going to do with the data that we have collected)	○	○	○	○	○

1 is worst, meaning you had no information at all about the topic. 5 is best, meaning all your questions on the topic were answered to full extent.

8 []Please indicate which sources of information you used during the experiment. *

Please choose **all** that apply:

- [ ] Web blog
- [ ] E-Mail
- [ ] Flyers, posters or physical information sheets on site
- [ ] Word of mouth
- [ ] Social media
- [ ] Other:

9 []Is there anything you would like to see improved for future exercises?

Please write your answer here:

Volunteering and Concepts

This group of questions is meant to help better understand how you approach volunteering.

10 []How important do you consider the following aspects of volunteering to be in a crisis situation? Please rate them on a scale of 1 to 5, where 1 means that you do not care about it at all and 5 means that it is extremely important.

Please choose the appropriate response for each item:

	1	2	3	4	5
Knowing how the situation develops (i.e. receiving up-to-date, contextual and relevant information about what is going on)	○	○	○	○	○
Reporting what I see (i.e. being able to submit information that you consider important)	○	○	○	○	○
Helping others (i.e. being able to immediately improve the situation for others with your actions)	○	○	○	○	○
Working in an organised, formal group (e.g. serving as fireman or paramedic)	○	○	○	○	○
Receiving instructions about how to help on my own (i.e. getting information about how you, as an individual, can help)	○	○	○	○	○
Deciding what to do in self-organised group (e.g. you and your neighbours agree on how to help)	○	○	○	○	○
Making independent decisions on how to help (i.e. you decide how to help without input from others)	○	○	○	○	○
Knowing the effort (e.g. time, difficulty) in advance	○	○	○	○	○
Volunteering is a long term engagement (e.g. voluntary fireman)	○	○	○	○	○
Opting in and out at any time (i.e. you can choose to participate or leave whenever you want)	○	○	○	○	○

1 = not important at all; 3 = I would like to have this; 5 = I consider this extremely important

11 []Which (if any) of the following activities would you volunteer for in case of an emergency?

Please choose **all** that apply:

☐ Screening information off-site (e.g. quality assurance of other's virtual contributions on your computer at home)

☐ Situation reports at current location (e.g. reporting the situation and needs for assistance at your current location)

☐ Situation reports in the field (e.g. taking pictures or measuring water levels at specified locations)

☐ Light physical work at current location (e.g. helping elderly neighbours when at home)

☐ Light physical work off-site (e.g. sorting or dispensing commodity donations)

☐ Physical work in the field (e.g. clearing debris or filling sand bags)

☐ Other: [ ]

12 []Which of the following functions would you like to have available through a smartphone application during a crisis?

Please choose **all** that apply:

☐ Receiving personalized alarms (e.g. about imminent danger at own location)

- [ ] Learning how to deal with the current situation (e.g. how to stay safe, how to help neighbours, how to help crisis managers, what to avoid)
- [ ] Receiving information updates for my current location (e.g. about hazards, needs for help,)
- [ ] Receiving information updates for other locations (e.g. home, work, school, relatives)
- [ ] Receiving specific assignments (e.g. to report local situation or help neighbours)
- [ ] Reporting unspecified things of interest (e.g. anything dangerous or suspicious that you see)
- [ ] Sharing information with other volunteers (e.g. see who else is volunteering in your area or warn other volunteers about hazards)
- [ ] Other:

Tool Specific Questions

This group of questions helps us to understand your opinion about the concrete application that you have used during the exercise. The questions will only be posed for the apps that you used during the excercise.

13 []Which smartphone application(s), if any, did you use during the excercise?

Please choose **all** that apply:

- ☐ CrowdTasker
- ☐ GDACS mobile
- ☐ SafeTrip
- ☐ none
- ☐ Other: [ ]

14 []Please indicate why you did not use any app during the exercise

Please choose **only one** of the following:

- ○ I don't have an Android phone
- ○ I could not install the app
- ○ The app did not work
- ○ I did not know where to find the app online
- ○ Other [ ]

15 []If you have used any other apps during the exercise, please indicate why

Please choose **all** that apply:

- ☐ To communicate with friends and family (e.g. e-mail, WhatsApp)
- ☐ To advertise my participation at the event (e.g. Twitter, Facebook)
- ☐ For orientation (map apps)
- ☐ To receive information about the exercise (e.g. e-mail, web-browser)
- ☐ Other: [ ]

16 []Please assess the following statement for the *CrowdTasker* smartphone application. Rate the statements on a scale of 1 to 5, where 1 means that you completely disagree and 5 means that you fully agree.

Please choose the appropriate response for each item:

	1	2	3	4	5
Learning how to use the app was easy	○	○	○	○	○
Using the app during the exercise was easy	○	○	○	○	○
The app worked reliably durign the excercise	○	○	○	○	○
The app helped me to better understand the situation	○	○	○	○	○
The app helped me to avoid dangerous areas and activities	○	○	○	○	○
The app provided sufficient information on what to do in a crisis situation.	○	○	○	○	○
The app helped me to convey the information to the authorities	○	○	○	○	○

I would like to use this app in a crisis situation	○	○	○	○	○

1 = completely disagree; 2 = somewhat disagree; 3 = neutral; 4 = somewhat agree; 5 = fully agree

17 []CrowdTasker app tries to assure that you are aware of your tasks. Please indicate which of these alerting mechanisms (if any) worked well for you during the exercise.

Please choose **all** that apply:

- ☐ Notifications within the application
- ☐ Android notifications (app turned off)
- ☐ E-mail notifications
- ☐ SMS notifications

18 []Which (if any) of the following aspects of the CrowdTasker application should be improved?

Please choose **all** that apply:

- ☐ User Interface Design
- ☐ Introduction on how to use the app
- ☐ Presentation of situational information
- ☐ Description of assignments
- ☐ Tasking Workflow
- ☐ Other: [ ]

19 []Please assess the following statements for the *GDACS* mobile application. Rate the statements on a scale of 1 to 5, where 1 means that you completely disagree and 5 means that you fully agree.

Please choose the appropriate response for each item:

	1	2	3	4	5
Learning how to use the app was easy	○	○	○	○	○
Using the app during the exercise was easy	○	○	○	○	○
The app worked reliably during the excercise	○	○	○	○	○
The app helped me to better understand the situation	○	○	○	○	○
The app helped me to submit information to the authorities that I considered important	○	○	○	○	○
I would like to use this app in a crisis situation	○	○	○	○	○

1 = completely disagree; 2 = somewhat disagree; 3 = neutral; 4 = somewhat agree; 5 = fully agree

20 []Which (if any) of the following aspects of the GDACS mobile application should be improved?

Please choose **all** that apply:

- ☐ User Interface Design
- ☐ Introduction on how to use the app
- ☐ Presentation of situational information
- ☐ Description of assignments
- ☐ Information submission workflow

☐ Other: [ ]

21 []Please assess the following statements for the SafeTrip smartphone application. Rate the statements on a scale of 1 to 5, where 1 means that you completely disagree and 5 means that you fully agree.

Please choose the appropriate response for each item:

	1	2	3	4	5
Learning how to use the app was easy	○	○	○	○	○
Using the app during the exercise was easy	○	○	○	○	○
The app worked reliably during the exercise	○	○	○	○	○
The app helped me to better understand the situation	○	○	○	○	○
The app helped me to avoid dangerous areas and activities	○	○	○	○	○
The app provided sufficient information on what to do in a crisis situation.	○	○	○	○	○
I would like to use this app in a crisis situation	○	○	○	○	○

1 = completely disagree; 2 = somewhat disagree; 3 = neutral; 4 = somewhat agree; 5 = fully agree

22 []Which (if any) of the following aspects of the SafeTrip application should be improved?

Please choose **all** that apply:

☐ User Interface Design

☐ Introduction on how to use the app

☐ Presentation of situational information

☐ Description of assignments

☐ Other: [ ]

Final words

This group of questions finalized the survey. Thanks for staying with us until the end.

23 []In a few days, we will delete from our servers all personal information about volunteers that participated in this exercise. If you would like to stay in touch with us, please enter your contact details below, to receive information on lessons learned from this event or to receive invitations for future exercises.

Please write your answer(s) here:

Name

e-mail

24 []

Would you participate in another experiment like this in the future?

Please choose **only one** of the following:

- ○ Yes
- ○ Maybe
- ○ No

25 []Please use the following field for any comments, requests and suggestions you might have regarding this exercise, crisis communication, volunteering or our applications.

Please write your answer here:

Submit your survey.
Thank you for completing this survey.

Questionnaire for team and observers (short)

This questionnaire is pertinent to DRIVER experiment on crisis communication (April 19-20 2016, The Hague). Please answer it if you have participated in the experiment as a volunteer.

There are 30 questions in this survey

Profile

Following questions will help us to figure out whether your background and role in experiment are influencing the answers or not.

1 []What is your professional background? *

Please choose **all** that apply:

- ☐ Crisis management (e.g. red cross, fireman)
- ☐ Medical
- ☐ Industry
- ☐ Research
- ☐ ICT
- ☐ Other: [ ]

2 []

Do you have prior experience in volunteering (either as volunteer or as organiser of volunteers)?

Please choose **all** that apply:

- ☐ As part of a hierarchic organisation (e.g Red Cross)
- ☐ As part of a loose organisation (e.g. Burgernet)
- ☐ As part of a self-organised group
- ☐ On your own
- ☐ Other: [ ]

3 []Which type of smartphone do you have?

Please choose **all** that apply:

- ☐ Android
- ☐ iPhone
- ☐ Windows
- ☐ Other: [ ]

Comment: We are trying to figure out the relative importance of smartphone platforms among crisis managers and would-be volunteers.

Volunteering and Concepts

This group of questions is meant to help better understand how you approach volunteering.

4 []In your opinion, how do crisis management professionals see following types of volunteer organisation today?

Please choose the appropriate response for each item:

	1	2	3	4	5
Institutional volunteers (e.g. in red cross, fireman)	○	○	○	○	○
Loosely controlled volunteers (like in our experiment)	○	○	○	○	○
Self-organised volunteer groups (no integration in established organisations)	○	○	○	○	○
Individual volunteers working on their own.	○	○	○	○	○

1= strongly negative; 3=neutral; 5= strongly positive

5 []

Please indicate the importance of following factors for (improved) crisis management.

Please choose the appropriate response for each item:

	1	2	3	4	5
Integrate non-institutional volunteers in crisis management	○	○	○	○	○
Individually inform the citizens. (That is, “one size does not fit all)	○	○	○	○	○
Assign (micro-)tasks to non-institutional volunteers	○	○	○	○	○
Micro-educate(*) the citizens	○	○	○	○	○
Receive reports and observations from citizens	○	○	○	○	○
Visualize and analyse the information received from the citizens	○	○	○	○	○

1 = not important at all; 5=extremely important

(*) micro-learning is a process of learning in very small units, e.g. right before the knowledge is needed.

6 []Which (if any) of the following activities would you <u>entrust to non-institutional volunteers</u> in case of an emergency?

Please choose **all** that apply:

- ☐ Screening information off-site (e.g. quality assurance of other’s virtual contributions on your computer at home)
- ☐ Situation reports at own location (e.g. reporting the situation and needs for assistance at own location)
- ☐ Situation reports in the field (e.g. taking pictures or measuring water levels on site)
- ☐ Light physical work at own location (e.g. helping elderly neighbours)
- ☐ Light physical work off-site (e.g. sorting or dispensing commodity donations)
- ☐ Physical work in the field (e.g. clearing debris or filling sand bags)
- ☐ Other: [ ]

Participation in experiment

This group of questions is meant to help us understand your role in experiment and the level of your involvement.

7 []

What is your role in this experiment *

Please choose **all** that apply:

- ☐ Part of the DRIVER team
- ☐ Part of the review team
- ☐ Observer
- ☐ Evaluator (if unsure, cross “observer”)
- ☐ Tool owner
- ☐ Experiment support (platform owners, scenario models, …)
- ☐ Other: [ ]

8 []Where and how did you participate in experiment? *

Please choose the appropriate response for each item:

	Wateringse Veld	VRH office	elsewhere in The Hague	watched event stream	not
April 19th, morning	○	○	○	○	○
April 19th, afternoon	○	○	○	○	○
April 20th, morning	○	○	○	○	○
April 20th, afternoon	○	○	○	○	○

Please cross the first option that applies, for each time slot.

9 []Please assess the quality of information provided to you before and during experiment on the scale of 1-5.

Please choose the appropriate response for each item:

	1	2	3	4	5
Why the experiment was organised	○	○	○	○	○
What is expected from the volunteers in experiment	○	○	○	○	○
Purpose of each DRIVER tool	○	○	○	○	○
How to use the tools	○	○	○	○	○
Progress of experiment	○	○	○	○	○

1 is worst, 5 is best

10 []Please indicate which parts of the experiment you witnessed. *

Please choose **all** that apply:

- ☐ Experiment presentation by DRIVER team
- ☐ Live demonstration of the tools
- ☐ Online Informing of volunteers (Web Blog, E-Mail)
- ☐ Offline informing of volunteers (flyers, posters or physical information sheets on site)
- ☐ DRIVER tools use in experiment (backend tools)
- ☐ DRIVER tools use in experiment (mobile apps)
- ☐ Broadcast of the experiment on the web
- ☐ Other: [ ]

11 []

Please indicate your level of experience with the DRIVER tools used in experiment.

Please choose the appropriate response for each item:

	1	2	3	4	5
CrowdTasker (CT)	○	○	○	○	○
GDACS mobile	○	○	○	○	○
SafeTrip	○	○	○	○	○
lifeX COP tool	○	○	○	○	○
csWeb COP tool	○	○	○	○	○

1 = no experience, 2 = seen presentation; 3 = seen live demonstration; 4 = seen used in experiment; 5 = worked with the tool

CrowdTasker

This groups contains questions that are pertinent to CrowdTasker

12 []

Please assess the following statement for CrowdTasker application

Only answer this question if the following conditions are met:
Answer was greater than or equal to '4' at question '11 [WhichTools]' (Please indicate your level of experience with the DRIVER tools used in experiment. (CrowdTasker (CT)))

Please choose the appropriate response for each item:

	1	2	3	4	5
Learning how to use CT is easy	○	○	○	○	○
Tasking volunteers with CT is easy	○	○	○	○	○
CT worked reliably during the exercise	○	○	○	○	○
CT is well documented	○	○	○	○	○
CT can be used for micro-educating and informing the volunteers	○	○	○	○	○
CT can be used for individualized alerting of the volunteers	○	○	○	○	○
CT reports can improve situational awareness of crisis managers	○	○	○	○	○
CT should be used in a crisis situation	○	○	○	○	○

1=fully disagree, 5 = fully agree

13 []Which (if any) of the following aspects of the CrowdTasker should be improved?

Only answer this question if the following conditions are met:
Answer was greater than or equal to '4' at question '11 [WhichTools]' (Please indicate your level of experience with the DRIVER tools used in experiment. (CrowdTasker (CT)))

Please choose **all** that apply:

- ☐ Introduction on how to use the app
- ☐ Multi-lingual tasks (not possible today)
- ☐ Choosing the most appropriate volunteer(s) for a task
- ☐ Tasks that can be reported more than once by the volunteer (not possible today)
- ☐ Presenting and analysing reports
- ☐ Assign meanings to reports (e.g. Water depth > 50cm = bad; “no help needed” = good, we are drowning = urgent, etc.)
- ☐ Automated triggering of tasks (e.g. interpreting or quality assurance of information)
- ☐ Other: [ ]

14 []

Please leave your comments and suggestions (if any) on CT below.

Please write your answer here:

[ ]

Optional

GDACS mobile

This group contains questions thaat are pertinent to GDACS monile

15 []Please assess the following statement for GDACS mobile application.

Only answer this question if the following conditions are met:
Answer was greater than or equal to '4' at question '11 [WhichTools]' (Please indicate your level of experience with the DRIVER tools used in experiment. (GDACS mobile))

Please choose the appropriate response for each item:

	1	2	3	4	5
Learning how to use GDACS mobile is easy	○	○	○	○	○
GDACS mobile is well documented	○	○	○	○	○
Reporting observations with GDACS mobile is easy (for volunteers)	○	○	○	○	○
GDACS mobile worked reliably during the exercise	○	○	○	○	○
GDACS app can improve volunteers' situation awareness	○	○	○	○	○
GDACS allows volunteers to convey information to the crisis responders	○	○	○	○	○
Quality assuring GDACS mobile observations is easy	○	○	○	○	○
GDACS mobile should be used in a crisis situation	○	○	○	○	○

1=fully disagree, 5 = fully agree

16 []Which (if any) of the following aspects of the GDACS mobile should be improved?

Only answer this question if the following conditions are met:
Answer was greater than or equal to '4' at question '11 [WhichTools]' (Please indicate your level of experience with the DRIVER tools used in experiment. (GDACS mobile))

Please choose **all** that apply:

- ☐ Introduction on how to use the app
- ☐ Reporting Workflow
- ☐ Quality assuring the observations
- ☐ Presenting and analysing observations
- ☐ Other: [ ]

17 []

Please leave your comments and suggestions (if any) on GDACS mobile below.

Please write your answer here:

[ ]

Optional

SafeTrip

This group contains questions that are pertinent to SafeTrip

18 []Please assess the following statement for SafeTrip application

Only answer this question if the following conditions are met:
Answer was greater than or equal to '4' at question '11 [WhichTools]' (Please indicate your level of experience with the DRIVER tools used in experiment. (SafeTrip))

Please choose the appropriate response for each item:

	1	2	3	4	5
SafeTrip is easy to use	○	○	○	○	○
SafeTrip worked reliably during the exercise	○	○	○	○	○
SafeTrip app provides "need to know" information for tourists in a crisis situation.	○	○	○	○	○
SafeTrip can help tourists to signal their position and needs to the authorities	○	○	○	○	○
Formulating and triggering SafeTrip warnings is easy	○	○	○	○	○
SafeTrip app should be used in a crisis situation	○	○	○	○	○

1=fully disagree, 5 = fully agree

19 []Which (if any) of the following aspects of the SafeTrip should be improved?

Only answer this question if the following conditions are met:
Answer was greater than or equal to '4' at question '11 [WhichTools]' (Please indicate your level of experience with the DRIVER tools used in experiment. (SafeTrip))

Please choose **all** that apply:

- ☐ Formulation of warnings
- ☐ Triggering of warnings
- ☐ Multi-lingual warnings (not possible today)
- ☐ Feedback to authorities
- ☐ Integration in the Common Information Space
- ☐ Other: [ ]

20 []

Please leave your comments and suggestions (if any) on SaveTrip below.

Please write your answer here:

[ ]

Optional

lifeX

This group contains questions that are pertinent to lifeX COP

21 []

Please assess the following statement for lifeX COP

Only answer this question if the following conditions are met:
Answer was greater than or equal to '4' at question '11 [WhichTools]' (Please indicate your level of experience with the DRIVER tools used in experiment. (lifeX COP tool))

Please choose the appropriate response for each item:

	1	2	3	4	5
Learning how to use the lifeX COP is easy	○	○	○	○	○
Visualization of the data is well done	○	○	○	○	○
Analysing the responses from volunteers is easy	○	○	○	○	○
Formulating summaries and requests for new actions is easy	○	○	○	○	○
LifeX COP helps to improve situational awareness	○	○	○	○	○
LifeX COP helps to plan actions	○	○	○	○	○
LifeX COP works reliably.	○	○	○	○	○
LifeX COP is well documented	○	○	○	○	○
LifeX COP should be used in crisis management	○	○	○	○	○

1=fully disagree, 5 = fully agree

22 []

Which (if any) of the following aspects of the lifeX COP should be improved or added?

Only answer this question if the following conditions are met:
Answer was greater than or equal to '4' at question '11 [WhichTools]' (Please indicate your level of experience with the DRIVER tools used in experiment. (lifeX COP tool))

Please choose **all** that apply:

- ☐ User Interface Design
- ☐ Visualization of the data from volunteers
- ☐ Analysis of the data from volunteers
- ☐ Formulating summaries and requests
- ☐ Visualization of the summary information
- ☐ Integration in the Common Information Space
- ☐ Other: [ ]

23 []

Please leave your comments and suggestions (if any) on LifeX COP below.

Please write your answer here:

[ ]

Optional

csWeb

This group contains questions that are pertinent to csWeb COP.

24 []

Please assess the following statement for csWeb COP

Only answer this question if the following conditions are met:
Answer was greater than or equal to '4' at question '11 [WhichTools]' (Please indicate your level of experience with the DRIVER tools used in experiment. (csWeb COP tool))

Please choose the appropriate response for each item:

	1	2	3	4	5
Learning how to use the csWeb COP is easy	○	○	○	○	○
Visualization of the data is well done	○	○	○	○	○
Analysing the responses from volunteers is easy	○	○	○	○	○
Formulating summaries and requests for new actions is easy	○	○	○	○	○
csWeb COP helps to improve situational awareness	○	○	○	○	○
csWeb COP helps to plan actions	○	○	○	○	○
csWeb COP works reliably.	○	○	○	○	○
csWeb COP is well documented	○	○	○	○	○
csWeb COP should be used in crisis management	○	○	○	○	○

1=fully disagree, 5 = fully agree

25 []

Which (if any) of the following aspects of the csWeb COP should be improved or added?

Only answer this question if the following conditions are met:
Answer was greater than or equal to '4' at question '11 [WhichTools]' (Please indicate your level of experience with the DRIVER tools used in experiment. (csWeb COP tool))

Please choose **all** that apply:

- ☐ User Interface Design
- ☐ Visualization of the data from volunteers
- ☐ Analysis of the data from volunteers
- ☐ Formulating summaries and requests
- ☐ Visualization of the summary information
- ☐ What-if analysis of the situation
- ☐ Integration in the Common Information Space
- ☐ Other: [ ]

26 []

Please leave your comments and suggestions (if any) on csWeb COP below.

Please write your answer here:

[ ]

Optional

Final words

This group of questions finalized the survey. Thanks for staying with us until the end.

27 []

In a few days, we will delete all personal information about volunteers that participated in this exercise from our servers. Please enter your contact details (at least e-mail) if you wish to stay in touch with us, to receive information on lessons learned from this exercise or to receive invitations for the future exercises.

Please write your answer(s) here:

Name

e-mail

28 []Please use the following field for comments, requests and suggestions related to crisis communication, volunteering or our applications.

Please write your answer here:

Optional

29 []

Please use the form below for comments and suggestions concerning the (possibility to improve) the experiment organisation.

Please write your answer here:

Optional

30 []

Would you participate in a similar experiment in the future?

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

1=certainly not; 5 = certainly yes

Submit your survey.
Thank you for completing this survey.