# Specification of Second Prototype User Trial

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**Deliverable nature:** Report

**Dissemination level:** PU

**Contractual delivery date:** 31/07/2013

**Actual delivery date:** 30/09/2013

**Suggested readers:** Third party service developers, trial organisers and participating staff, developers, integrators

**Version:** 2.6

**Total number of pages:** 36

**Keywords:** Services, user – trials, trial specifications, test-beds, user experience, performance logging and metrics, trial locations, user involvement, trial expectations, evaluation, research objectives

**Note on numbering** This deliverable was originally intended to be denoted as D8.6
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Impressum
[Full project title] Self Orchestrating Community Ambient Intelligence Spaces
[Short project title] SOCIETIES
[Number and title of work-package] WP8 Evaluation
[Document title] D8.7 Specification of Second Prototype User Trial
[Editor: Name, company] Patrick Robertson and Korbinian Frank, DLR
[Work-package leader: Name, company] Mark Roddy, TSSG
[Estimation of PM spent on the Deliverable] 3 PM

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Executive summary

A particular focus of the SOCIETIES project is the development of a robust, scalable and user-friendly platform and to evaluate through strong involvement of end users, the usefulness and acceptance of the developed SOCIETIES Platform and third party services via three user trials in all three user groups: the student community, disaster management and the enterprise user group.

In this deliverable we have identified the main key lessons that had been learned from deliverable D8.5 [2]. In particular, the consortium had been far too ambitious in its thinking about, and specification of the actual trials. This should not be regarded as negative because it did serve to set our sights and ambitions, albeit we failed to realise them in the envisaged form. The main aim of the SOCIETIES second round of trials is to perform a second evaluation of the innovations of the platform and in particular the notions of how pervasive and social media technologies can be combined to create like-minded, enjoyable and effective communities. We have argued that we have to be realistic about our aims and objectives. As in D8.2 and D8.3 we have still followed the goal of defining three user trials that should allow us to: Ask the right questions: (e.g. “Do you want to be invited to form a community?”), Observe the right behavior (based on placing users in a real or fictitious scenario, with suitable pre-conditions such as context attributes), Collect the right data (in a methodologically sound way), as well as React appropriately and flexibly in the run-up to (and during) the trial, including the possibility to pursue co-design when this offers new opportunities and helps mitigate risks.

The objective of the second Student (User) Trial is to evaluate the SOCIETIES platform and service innovations from the point of view of a student user community consisting of early adopters of new technology, as opposed to a group that was evaluating the third party application development process in the first Student (Developer) Trial. The trial participants will be a minimum of 20 Computer Science students, with whom the SOCIETIES team has been engaging since the project’s inception. The Trial will be “in the wild”, logging user activities automatically as they access the trial services and platform GUIs in an undirected manner. It will also be a longitudinal trial, lasting for 6 weeks, during which user histories can be acquired which will, in turn, improve the performance of SOCIETIES innovations such as learning and user intent. Users in the student trial will be interacting primarily with the trial services and only infrequently interacting directly with the SOCIETIES platform via its GUIs. In addition, many of the SOCIETIES innovations are necessarily working on behalf of the user in the background (in keeping with Weiser’s original vision of calm technology) and so will not be sufficiently “visible” for direct evaluation by the trial participants. Therefore an interpretive approach to analysis will be required in order to assess the efficacy of the platform and its innovations against the evaluation criteria of benefits, effectiveness and acceptability.

For the second Disaster Management trial we will focus on different user groups: on-site disaster assessment experts/professionals, off-site expert-pilots for pervasive remote control of micro aerial vehicles (quadrotors) and a number of offsite volunteers for answering questions given by the assessments experts and for performing more usability tests. The on-site users (disaster assessment experts) arrive at a major natural or man-made disaster site in order to assess damage, available resources and help to coordinate disaster relief efforts. The second trial use case (in contrast to the trial performed in the first half of 2013 and reported on and evaluated in D8.5) targets the connection and control of the physical on-site resources (such as quadrotors) to an expert from outside the disaster area and to evaluate the information gathered by such resources by crowd-sourced volunteers from outside the disaster relief area and the selection of users. The significant novelty is the selection/orchestration of the best available expert with the required equipment for pervasive remote control of the on-site resources as well as choosing the best set of offsite volunteers for the subsequent evaluation of the images and other data collected by the on-site resources. In addition we will perform acceptance tests of the concept of service sharing in communities (e.g. via the GeoFencing service). To that end we will employ the smart jacket. The users will be provided with Android smartphones and one will be equipped with the smart jacket. A first acceptance test will be conducted in conjunction with the ICT 2013 event in Vilnius. Then we will involve DM professionals, e.g. firemen and Civil Defense, in complementary tests in Trondheim.

The original objective of the second Enterprise User Evaluation was to return to the Enterprise user group with the next evolution of the SOCIETIES software platform and 3rd party services, and aim to perform an in depth user evaluation of the project’s innovations and key research questions through the available software services and infrastructure. Given certain changes in the project, we propose to modify a 3rd party service,
called the Event Herald App, which was originally intended for evaluation as a Student trial service, into an ICT Conference app for inclusion in this Enterprise trial. The ICT Conference service to be evaluated will be presented as a conference support service, where conference attendees can discover, connect and organise with relevant other attendees, relevant conference communities and available ‘things’ within the conference environment. This user evaluation will take place at an actual conference during the 4th quarter of 2013. The targeted user base for the trial will be the attendees at the ICT 2013 conference in Vilnius in November 2013 who possess an Android smartphone, and who will be actively encouraged to participate in the trial by downloading and using the service. The service is expected to be able to scale up to approximately 400 users (see Section 5 for details).

To summarize, all three trials will try to address aspects that have not been so well evaluated in the first trial:

- The Student trial will allow students to interact with a large and rich array of personalised services and intelligent SOCIETIES features over a much longer period of time.
- The Disaster Management trial will attempt to make better use of the trust concept of the project, as well as better control of pre-conditions, will include new user groups, and bring pervasive computing hardware into the picture (remote controlled UAVs, augmented reality, wearable computing - iJacket).
- The Enterprise trial will bring its conference service to a very large number of users, bringing many of the smart platform features to evaluation, especially those related to groups of people and connections and things/people of interest.
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1 Introduction

A particular focus and key selling point of the SOCIETIES project is the development of a robust, scalable and user-friendly platform coupled with strong involvement of end users in a series of trials across three application domains: the student community, disaster management and the enterprise user group. The intention was and is to go far beyond the typical “demo” stage of many research projects. Doing so requires a fundamentally different approach in terms of planning the trials and evaluating the outcomes.

The project was planned to perform two rounds of trials, so as to allow refinement of both the platform and also the evaluation methodology. The first trials, evaluated in Deliverable D8.5 [2], were the first deployment of the Platform and third party services; as a result a number of issues needed to be worked through in order to conduct three trials that provided sufficient material for evaluation. The platform had not been sufficiently integrated at a technical level to fully validate the Discover, Connect and Organise paradigms technically, but WP8 was able to evaluate these concepts at least from a pragmatic, user-based viewpoint.

D8.5 had concluded a number of issues that would set the scene for the second trial. It was seen as very important to be able to evaluate and test services with sufficient time so that they could be improved from a usability and stability point of view – including the user interfaces. This requires a degree of platform stability and scalability that should be improved with respect to the first trial. The user should have a much better experience, control and feeling for how the platform handles her privacy and trust relationships. The power of the context and related subsystems (including personalisation) should be better exposed, perhaps by more realistic control of context attributes and pre-conditions – to a large extent the value and “intelligence” of “Discover, Connect and Organise” is orchestrated and facilitated by these technical components. The Participatory Design approach applied in the first trial would again be suggested as a means of adapting rapidly to changes and opportunities during the second Disaster Management trial.

This deliverable presents the specifications of the second round of trials. As with the first trials we describe the human actors, temporal and hardware plans, as well as the 3rd party services. Also presented are the necessary methodologies and procedures (including logging, user observation, user questionnaires, etc.) that need to be in place or conducted for testing and evaluation. Each specific user domain section starts by presenting the lessons learnt from the first trial, and how that sets the scene for the final trials. A comparison with D8.2 [3] will reveal that this document specifies somewhat fewer details than the first trial specification. In contrast, D8.7 will expose more options, as well as a more realistic view on what can be evaluated realistically, and what is to be done to mitigate risks.

The remainder of this document, as was D8.2 [3], is divided into 5 chapters:

- Chapter 2 describes in detail the methodology to use for the testing.
- Chapter 3 specifies the trials for the student community.
- Chapter 4 is devoted to the trials for the user groups involved in disaster management.
- Chapter 5 specifies the trials in the enterprise user group.
- Chapter 6, finally, concludes the findings of the first chapters.
2 SOCIETIES Second Prototype Trials Roadmap and Methodology

A number of key lessons have been learned from deliverable D8.5 [2], the first evaluation of the SOCIETIES platform. It was clear from the previous specification deliverables D8.2 and D8.3 that the consortium was far too ambitious in its thinking about the actual trials. This should not however be regarded as totally negative because it did serve to set our sights, albeit we failed to realise them. One should bear in mind that there was no prior development or deployment experience to draw on, and the time between completion of D82/D83 and the trials was longer than what we plan and expect for this second round of trials.

Drawing from the conclusions in D8.5:

1. In terms of **Aligning the Roadmaps** between WP8 and the Integration work-package (WP7) we expect that the experience from the first trial will help us better understand deployment complexities.

2. To enable **Planning and Preparation** of evaluation materials for the planned SOCIETIES trials, access to services (for testing by WP8 in this planning and preparation phase) should not be delayed by technical issues, in so far as is possible. We learned from this first prototype trial that limiting access to services solely to on-site deployments increases the risk for the trials, as it is so close to the trials there is little scope to improve usability of services, and testing deployment issues means there are continuous interruptions in access to the services which prevents free flow run-throughs of trial scenarios.

3. In terms of **Deployment** and **Scalability** the number of active users was limited by resource constraints in the first trial. Since we anticipate that there will be more users involved in the second trial, we expect that the number of supported containers needs significant improvement. The system has proven to be reasonably stable in the first trial, but we need to continue this level of **Stability** for the second trial.

4. Increasing **User Intelligibility** of the services through their interfaces, and the SOCIETIES platform interface, along with fine-tuned privacy controls for each sharing interaction, should provide affordances for perceived privacy and trust.

5. We should expect some degree of **Staged User Involvement** to test various elements of the system and services, which will be more complex than the first trial. More attention needs to be given to **Usability**, with the system in the first trial being so difficult to use that it was stifling the innovative capabilities.

6. To what extent the **Trust Model** provides real value is still open and needs to be addressed and evaluated.

7. Another question is that of the required **Depth of Integration with the SOCIETIES Platform**. We expect a richer and realistic set of context attributes to be used in orchestrating the user relevance. As in the first trial, a careful formulation and specification of **Preconditions** (context attributes, “lead-in-story”, preferences, etc.) needs to occur to ensure a smooth transition from the (artificial) state before the trial to the trial itself. However, we note that the limited user scale (both in terms of number of users and the length of time they spend using the services/platform) make it challenging to achieve the context richness required, despite the careful use of preconditions.

8. In the Disaster Management trials we recommend that the “**Participatory Design**” approach remain a driving force for the second trial. It has proven to be an effective way of galvanizing efforts to a common goal and for rapidly adapting services as well as expectations and the evaluation approach. Our “Participatory Design” approach will allow us to react flexibly to changes. Nevertheless, it is crucial that the system be deployed and ready according to the specified requirements.

9. The **User Interfaces**, user flows and front end designs of the utilised applications, caused considerable difficulty. They were not intuitive, or easily navigated. Achievable improvements to the service front-end designs, along with the SOCIETIES application would be likely to have considerable enhancement to the overall user experience.
The innovative concepts realised by the SOCIETIES platform could be used to provide added value to existing user domains, such as in Disaster Management. Examples of this include providing extended support for specifying roles in a community, community orchestration for the suggestion of teams, extension of the ‘activity feed’ concept for task assignment and follow-up. By playing out the scenarios in the immersive sense, these concepts can be tested and evaluated via our defined user domains.

The remainder of section 2 will be used to communicate how the methodology used for the final trial will map these lessons learned.

2.1 Aims and Objectives

The main aim of the SOCIETIES trials is to perform an evaluation of the innovations of the platform and in particular the notions of how pervasive and social media technologies can be combined to create like-minded, enjoyable and effective communities. We have learned from our first round of technical trials that we have to be realistic about our aims and objectives. We stated in D82 and D83 that the trials should allow us to:

- **Ask the right questions**: e.g. “Do you want to be invited to form a community?” Part of the planning of the trials is to find the precise list of research questions we want to ask, and design the trials in a way that will allow us to ask these questions and get answers from the users and by other means.

- **Observe the right behaviour**: We have defined three different user settings (i.e. Disaster Response, Student and Enterprise), and our requirements phase of the project allowed us to validate some initial scenarios that were used to generate and refine additional scenarios. These scenarios should allow us to put the users in situations that we consider as useful, and observe, through different means, what the users do (objectively) and think (subjectively). Putting users in the right situations means that the right technology needs to be developed and tested prior to the trials. Pre-trial group walk-throughs and interactions with the services and system could facilitate researchers in identifying at what points, after which interactions, the innovative and relevant aspects of the system become available to users, and open to evaluation. These points may then be selected as triggers for more detailed logging and observation.

- **Collect the right data**: Based on the research questions we want to ask, the trial planning objective should ensure that at the end of the trials we have collected the right data to evaluate and validate in a methodologically sound way.

- **React appropriately and flexibly** in the run-up to (and during) the trial to incorporate necessary but achievable changes and to navigate in an inherently risky environment.

The above is still valid for our second round of trials, but from the first user trial we have learned that we also have to work around a number of core constraints, whilst at the same time try and remain focused on our core aims and objectives.

The evaluation team are cognitive of our closeness to this evaluation process and the creation of experimental bias but as stated by Myers (2012)\(^1\) “Should we dismiss science because it has its subjective side? Quite the contrary: The realisation that human thinking always involves interpretation is precisely why we need researchers with varying biases to undertake scientific analysis. By constantly checking our beliefs against the facts, we restrain our biases. Systematic observation and experimentation help us clean the lens through which we see reality. Achieving experimental realism sometimes requires deceiving people with a plausible cover story”. Our evaluation process is still guided to varying degrees by our original scenarios, across all three user trials. Indeed, our closeness to the experimental material does risk the results being subject to Hindsight Bias but as the Danish philosopher Soren Kierkegaard\(^2\) said; “life is lived forwards, but understood backwards”.

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2.2 Conceptual framework for research design

As stated in deliverables D82 and D83 we have defined a conceptual framework for aligning the central concepts and the knowledge to be created by the project, and we feel that this conceptual framework is still valid for our research design. As a reminder, the following figure is worth repeating and provides an overall view of these concepts.

![Conceptual framework for aligning knowledge-related concepts](image)

Figure 1: Conceptual framework for aligning knowledge-related concepts

The top-most concept is used to accommodate for project-wide goals, objectives and value propositions. The input at this level is mainly from the description of work (DoW) and from an on-going discussion in the project about making project value propositions clearer. An example project objective is: "To facilitate the creation, organisation, management and communication of communities via CSS/CIS, where pervasive computing is integrated with social computing communities".

Based on the top level of project goals, the project has defined a set of research objectives. These research objectives are mainly topic areas that are covered by the objectives of the project. The project objective example above will have a research objective such as: "Develop a CSS/CIS platform to facilitate creation of communities".

Ideally each research objective should be decomposed to a set of research questions for each trial. These research questions will produce evaluation data for the developed technology, and will validate (or not) our assumptions. Examples of research questions related to the above research topic are: "What are the costs/risks for our users (in terms of privacy, system training, system errors,....)"? or "What are the best user interaction metaphors for representing our major concepts (e.g. CSS, CIS)?".

Having defined the research questions, the definition of tests, technical objectives and usability objectives will finalize the specification of each trial. These tests are mainly descriptions of functions that a user should be able to access. Each test will collect some data about a research question. E.g. if we want to know about a privacy mechanism, that mechanism needs to be testable by the user during the trials. Some tests are related to platform functionality while some are mediated through 3rd party services that the project has developed (WP6). For each trial we also have technical and usability objectives based on e.g. the type of users involved or the number of the users.
The duration of each trial will limit the scope and number of research questions which might feasibly be investigated, and pre-trial group walkthroughs will be required to filter these questions, to allow researchers condense efforts and focus on evaluation of the most interesting and important aspects of the trial.

2.3 Methodology for Creation of Evaluation Tests

The methodology used for the creation of our evaluation tests can be broken down into two distinct formats:

1) Quantitative testing
2) Qualitative testing

Because of the variance of deployment and evaluation methodology, each of the three user trials will have their own views about specific evaluation methodologies and techniques. In the case of quantitative testing, this is somewhat reflected by the nature of the trial itself. For example the student trial has planned for a more longitudinal study, whereby users will be provided with targeted devices and services. As such, device and service usage over an extended period will be a core platform activity, so by default the platform will be collecting this quantitative data. What is not clear at this time is how this data will be extracted and analysed as part of the final evaluation and this will be further elaborated upon in the specific trial sections.

We have outlined our methodologies for qualitative evaluation in a previous deliverable, D8.4, and the intention will be to update the details of our qualitative evaluation methodology as part of D8.7, which is due after the release of this deliverable.

Group Cognitive Walkthroughs will be conducted with SOCIETIES researchers and volunteers for pilot trials. Walkthroughs allow researchers to become familiar with the services specific to each trial site, in situ.

It is expected that these pre-trail group walk-throughs and interactions with the services and system could facilitate estimating at what points, after which interactions, the innovative and relevant aspects of the system become available or observable to users, and open to evaluation. These points may then be selected as triggers for more detailed logging and observation.

Participatory methods, such as cultural probes or exploratory role-play may be employed as supportive qualitative techniques to offer participants the opportunity to make explicit tacit information about their experiences with the SOCIETIES system and services, which may not otherwise be available through logging and interviews. "Only with a deep awareness of power at all times and at all levels can we use participatory processes effectively." [4]

2.4 Critical issues and Ethical approach

In relation to the ethics surrounding our experiments we have taken guidance again from Myers (2012)\(^3\), and the user trials will adopt the following ethical approach:

- Tell potential participants enough about the experiment to enable their informed consent
- Be truthful: Use deception only if essential and justified by a significant purpose and not “about aspects that would affect their willingness to participate”. Note though that achieving experimental realism sometimes requires deceiving people with a plausible cover story
- Protect participants from harm and significant discomfort
- Treat information about the individual participants confidentially
- Debrief participants. Fully explain the experiment afterward, including any deception. The only exception to this rule is when the feedback would be distressing.

3  Student Group Trials

3.1  Summary of each trial

The objective of the 2\textsuperscript{nd} Student (User) Trial is to evaluate the SOCIETIES platform and service innovations from the point of view of a student user community consisting of early adopters of new technology. This group is effectively an independent collection of participants who are neither employees of companies that are involved in the development of the SOCIETIES platform nor will their participation contribute to the marks for their degree. Since they will not be receiving any direct credit for participating, the challenge will be to maintain their interest.

The trial participants will be a minimum of 20 Computer Science students of Heriot-Watt University in Edinburgh, with whom the SOCIETIES team have been engaging since the project’s inception. This cohort of students took part in the brainstorming contributions to the scenario specification and participatory design of D2.1 and D2.2, when they were in Year 1 of their studies; the immersive “Wizard of Oz” trial of D8.2, when they were in Year 2 of their studies; were further engaged via social media and other activities when they were in Year 3 of their studies and will be in Year 4 of their studies when they participate in the 2\textsuperscript{nd} Student (User) Trial. This is not the same cohort of students who participated in the 1\textsuperscript{st} Student (Developer) Trial (reported in D8.5), although the demographics of the two groups are indistinguishable.

The 2\textsuperscript{nd} Student (User) Trial will be “in the wild”, logging user activities automatically as they access the trial services and platform GUIs in an undirected manner. It will also be a longitudinal trial, lasting for 6 weeks, during which user histories can be acquired which will, in turn, improve the performance of SOCIETIES innovations such as learning and user intent.

3.2  Review of past work

The 1\textsuperscript{st} Student (Developer) Trial aimed to evaluate SOCIETIES support for open source and third party service developers (see D8.5). Many valuable lessons were learned from this trial and these will feed into the design and planning of the 2\textsuperscript{nd} Student (User) Trial which is targeted at student users of SOCIETIES, as opposed to student developers.

3.3  Expectation from Second Trial

The expectations for the 2\textsuperscript{nd} Student (User) Trial are to evaluate the benefits, effectiveness and user acceptability of the SOCIETIES platform and its 8 key innovation areas (see SOCIETIES Magazine [1]). Users will be interacting primarily with the trial services and only infrequently interacting directly with the SOCIETIES platform via its GUls. In addition, many of the SOCIETIES innovations are necessarily working on behalf of the user in the background (in keeping with Weiser’s original vision of calm technology) and so will not be sufficiently “visible” for direct evaluation by the trial participants. Therefore an interpretive approach to analysis will be required in order to assess the efficacy of the platform and its innovations against the evaluation criteria of benefits, effectiveness and acceptability.

3.3.1  Research Objectives of second trial

In all of the following research questions, the SOCIETIES value proposition will provide a triplet of subheadings to permit evaluation of the key concepts of Discover, Connect and Organise.

- SOCIETIES benefits
  - Subjective analysis of the perceived advantages resulting from unification of the digital and physical worlds of the participants
  - Objective analysis of the frequency with which participants access the system
  - Objective analysis of the actual use which the participants make of the system
- SOCIETIES effectiveness
Subjective analysis of the usability of the system as perceived by the participants
Objective analysis of the accuracy and timeliness of system behaviour/performance
Objective analysis of the accuracy and speed of participants’ actions/reactions

- SOCIETIES acceptability
  Subjective analysis of problems/shortcomings of the system identified by the participants
  Objective analysis of specific features/functions used heavily, or avoided, by the participants

- Specific usage of SOCIETIES features/functions/services
  Subjective analysis of which features/functions/services participants felt they used most
  Objective analysis of which features/functions/services participants used most

- “In the wild” usage of SOCIETIES features/functions/services (for unintended purposes)
  Inspired uses which participants made of features/functions/services

The subjective analyses will be based on questionnaires given to the participants at one or more points during the trial. The objective analyses will be based on data captured during the trial, partly from logging information captured throughout the trial (see 3.10.3) and partly from data from each individual user’s smart phone at the end of the trial.

### 3.3.2 First Trial User Feedback influence on Second Trial

- The 1st Student (Developer) Trial revealed that there is much scope for misconceptions amongst individuals unfamiliar with the SOCIETIES paradigm, resulting from pre-conceived ideas deriving from prior use of social media and mobile apps in particular.
  - It is hoped that the participants in the 2nd Student (User) Trial will have fewer misconceptions as a result of their continuous engagement with the project over the past 3 years but it will be important to provide some formal induction to present the novel features of SOCIETIES.

- Lessons learned from the 1st Enterprise Trial will inform the planning and conduct of the 2nd Student (User) Trial.
  - The 2nd Student (User) Trial plan includes schedules for individual service deployment and testing (WP6 & WP7), combined (concurrently operating) service testing (WP6 & WP7), formal handover from WP7 to WP8, and a one month trial preparation period (WP8)
  - The concept of a cognitive walkthrough during pre-trial testing will be adopted.

### 3.4 Temporal aspects

The trial is planned as a longitudinal one and is targeted for a period of six weeks from Monday 21st October to Friday 29th November 2013. It will be focused on the Learning Zone of the School of Mathematical and Computer Sciences at Heriot-Watt University, Edinburgh, UK, which has been specially set up as a smart space equipped with sensors and displays. However, some activity by trial participants outside of this space is also expected and will be monitored. No cognitive walkthroughs are planned for the student trial.

### 3.5 Physical / location aspects

The Learning Zone is an open area within the School of Mathematical and Computer Sciences adjacent to two of the main lecture rooms used by students participating in the trials. It is furnished with chairs and tables for students to work at as well as comfortable seating for relaxation. It has three large plasma screens with XBOX Kinect units beneath them which will be used in the trials. It has also been specially equipped with RFID readers and wakeup units as well as Sniffer PCs to provide location information. A plan of the Learning Zone which will be the focus for the trial is presented below –
### 3.6 Third party services

The trial will incorporate the following third party services to be implemented by WP6. The first 5 have High priority because they form part of the original trial plan. The last 3 have lower priorities because they are not essential but would be nice to include. The infrastructure for the Context Aware Wall has already been installed and tested at the trial site.

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Priority</th>
<th>Service Description</th>
<th>First trial feedback taken into account</th>
</tr>
</thead>
<tbody>
<tr>
<td>MyTV</td>
<td>High</td>
<td>This service displays personalised content to the user, according to his/her interests and preferences. The service provides 4 different channels to the user each with a different topic; news, sports, music and comics.</td>
<td>N/A</td>
</tr>
<tr>
<td>Collaborative Quiz</td>
<td>High</td>
<td>This service is a team-based quiz based on student users’ lecture content. After a lecture, students can go to the Learning Zone and form teams to answer multiple choice quiz questions.</td>
<td>N/A</td>
</tr>
<tr>
<td>Crowd Tasking</td>
<td>High</td>
<td>This service allows users to discover problems they would like to help to solve and to find people who are able to solve problems which a user might have.</td>
<td>N/A</td>
</tr>
<tr>
<td>NearMe</td>
<td>High</td>
<td>This service shows information on nearby users (e.g. name, nationality, interests, etc.). The user list can be grouped based on this information, and one can send messages or request a face-to face meeting with any of them (the service suggests a place to do so).</td>
<td>N/A</td>
</tr>
<tr>
<td>CoBrowsing</td>
<td>High</td>
<td>This service allows different students to collaboratively browse the web for information related to their subjects. They can synchronize the web pages they are viewing, fill form data together or ask questions in a chat about the currently viewed content.</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### 3.7 User aspects

#### 3.7.1 Number of users

The plan is to obtain between 20 and 50 participants for the trial. However, as participation in the trial is voluntary and will not count towards any assessment for degree purposes (this will help to mitigate the potential influence of the power-relationship that might have been an issue in the first student developer trials), the exact number of participants is not yet known. Students will be given presentations on the trials and volunteers enlisted. These volunteers will be registered for the trial and issued with Android devices for their sole use during the trial.

### 3.8 Trial Options / Contingency Planning

The ideal for this trial is continuous running of the SOCIETIES platform and services for a period of 6 weeks with participants allowed complete freedom to do whatever they wish, whenever they wish “in the wild”. Two obvious risks could prevent this ideal being achieved –

1. The platform and/or its services might not be robust enough for continuous operation over such an extended period.

2. Participants may not use the platform and/or its services in a way that facilitates the evaluations required by the research questions.

To mitigate issue one, discrete running of the trial, with scheduled down-times for the platform and its services, would provide opportunities for maintenance and recovery. Persistence of user details and histories from one trial episode to the next will be required. It is anticipated that the trial would start in this discrete operation mode in order to address teething problems at the start of the trial and only move to continuous operation mode if, or when, the trial team become sufficiently confident that disruption to the trial will not ensue.

To mitigate issue two, a plan for selective interventions by the trial team in the “in the wild” nature of the trial will be developed. Interventions will take various forms, from the withdrawal of services or provision of new services to encourage participants to explore different features/facilities, to the offering of incentives to...
participants to undertake specific tasks, the achievement of whose goals will enable required trial evaluations to be completed.

3.9  Co-Design

Interventions by the trial team, whether in the form of scheduled down-times, or other actions which they may undertake to aid with the evaluations will constitute the co-design activities for this trial.

3.10  Requirements towards WPs 4-7

3.10.1  Requirements for pre-conditions

The user trial will include a CSS that is representing the University as an organisation which will be providing services such as location sensing and access to the displays in the Learning Zone area. A CIS for the user trial will be created and all the student CSSs will be made members of that CIS. The University CSS will be sharing some services already within that CIS that students can install on their own CSSs.

Some profile information that will be pre entered in the system includes the names of the students and their RFID tag so that the RFID system can monitor their location when they are in the Learning Zone.

3.10.2  Deployment

The plans for deployment before the trial starts are as follows:

(1) The user devices will be Samsung Galaxy SIII Smart phones. Each phone will need to be set up with the Android software.

(2) Two servers will provide the back-end cloud nodes. These will be set up with one Virgo container for each user.

(3) Other infrastructure includes the indoor location system (RFID and WiFi sniffers), fixed displays, Kinect cameras. Most of the software for these is in place – the remainder will be in place before the trials start.

3.10.3  Logging and Evaluation

In order to ensure that the platform is evaluated properly both in terms of usability and performance, the system must log information about system actions and user interactions and the context in which they occurred. The following table lists the most important system and user actions that will be logged during the user trial. However, in addition to this logging, the system will also monitor the user’s behaviour with the system in more detail, building large user behaviour histories which are then used to perform user preference learning, user intent discovery and context inference. These user histories will also be taken into account during the final evaluation stage.

<table>
<thead>
<tr>
<th>Social Interactions</th>
<th>Service Management</th>
<th>Personalisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Student creates CIS</td>
<td>• Student shares service in CIS</td>
<td>• New preference is learnt</td>
</tr>
<tr>
<td>• Student joins CIS</td>
<td>• Student removes shared service from CIS</td>
<td>• User preference is updated through automatic learning</td>
</tr>
<tr>
<td>• Student deletes CIS</td>
<td>• Student installs a service shared in a CIS</td>
<td>• User intent is discovered</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• User intent model is updated through further discovery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Context triggers automatic personalisation</td>
</tr>
<tr>
<td>Deliverable D8.7 SOCIETIES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>© SOCIETIES consortium 2013 Page 19 of (36)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Context-Awareness</th>
</tr>
</thead>
<tbody>
<tr>
<td>• User Action triggers automatic personalisation</td>
</tr>
<tr>
<td>• User confirms or stops system from personalising a service automatically.</td>
</tr>
<tr>
<td>• Service changes behaviour due to context trigger</td>
</tr>
<tr>
<td>• Platform changes behaviour due to context trigger</td>
</tr>
<tr>
<td>• User context information is received, processed and appropriate context event listeners are notified</td>
</tr>
<tr>
<td>• Community context is created.</td>
</tr>
<tr>
<td>• User Context is inferred</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Privacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• A privacy policy negotiation succeeds</td>
</tr>
<tr>
<td>• A privacy policy negotiation fails</td>
</tr>
<tr>
<td>• User Privacy preferences are used for aiding the user in Privacy Policy Negotiation</td>
</tr>
<tr>
<td>• User Privacy preferences are used to perform data access control without user intervention</td>
</tr>
<tr>
<td>• System performs data obfuscation</td>
</tr>
<tr>
<td>• Identity selection is performed with the use of user privacy preferences</td>
</tr>
</tbody>
</table>

Other forms of data collection and activities to be used for evaluation purposes include asking the students to fill in questionnaires and performing on site monitoring during the initial discreet operation of the user trials. During the ‘in the wild’ phase of the user trial, any questions either in person or via electronic media will also be logged to form a comprehensive view of what the students experienced in the trial.
4 Disaster Management Group Trials

The following chapter will present the details of the second user trials for the disaster management user group. It will relate back to the first trials, show the temporal, physical and personal implications of the trials and give a detailed overview over the trial set-up.

4.1 Summary of each trial

For the second disaster management trial different users groups: on-site disaster assessment experts/professionals, off-site expert-pilots for pervasive remote controlling micro aerial vehicles (quadrotors) and a number of offsite volunteers for answering questions given by the assessments experts and for performing more usability tests. The on-site users (disaster assessment experts) arrive at a major natural or man-made disaster site in order to assess damages, available resources and help to coordinate disaster relief efforts.

The second trial use case (in contrast to the trial performed in the first half of 2013 and reported on and evaluated in D85) targets the connection and control of the physical on-site resources (such as quadrotors) to an expert from outside the disaster area and to evaluate the information gathered by such resources by crowd-sourced volunteers from outside the disaster relief area and the selection of users. The significant novelty is the selection/orchestration of the best available expert with the required equipment for pervasive remote controlling the on-site resources as well as choosing the best set of offsite volunteers for the subsequent evaluation of the images and other data collected by the on-site resources.

Figure 4: Overview of the second disaster management trials once all users are in place. This figure does not show the important user selection process.

The following use-case describes a conceptual scenario for the second trial:

- A very recent earthquake has damaged a large area of a major Asian city. It has led to extensive damage to the region’s communication infrastructure making access difficult for rescue teams. The coordination centre is managing the rescue operations with support of the SOCIETIES services. Several civilians on site also make use of SOCIETIES Apps following a public preparedness
campaign, and can then get alerts and contribute with status information during disaster assessment and release.

- In order to evaluate the level of damage in the affected area, the coordination team decides to start a mapping operation using micro aerial vehicles (quadrotors) that can be remotely controlled. A request is sent to quadrotor pilots to acquire pictures of the areas using the RemotePiloting service. The pictures are sent to a selected volunteer group which use the AnalyseThis service to select images, discard redundant or uninformative images, and to identify areas with particular levels of damage.

- Based on that information, the coordination team sets up a number of disaster zones using the GeoFence creation tool (a module of a Web-based App). The persons located in one of these zones and equipped with the SOCIETIES GeoFencing Android App are automatically invited to join a community associated to the zone (when a Geo-Fence is created, the Web-based App checks the location from SOCIETIES context information and if this falls with the geo-fence then that user is added at once). The coordination team can thus, using the GeoFence visualisation tool, retrieve the number of people located in each zone. In order to have a better understanding of the damage, the coordination team also asks people on site to provide information about the general situation in their zones, e.g. the number of injured people and the level of panic. The GeoFencing App also trigger alerts for any civilians that accidently enter into areas marked as dangerous and makes the rescuers aware of the civilians’ presence.

- The coordination team has already assembled rescue and other supporting teams and can now assign them to different zones. Each assessment expert team can now join the zones under their responsibility. When entering the zone, the GeoFencing App application automatically adds them to the assessment expert community associated to the zone. This serves as an additional level of verification and ensures that the rescue operation is executed in accordance with the plan. In particular it avoids a situation where coverage of some zones is neglected (the coordinator can verify if the geo-fence was actually visited by checking who is in it or in case it is empty if the Activity Feed recorded the visit). The assessment experts’ team leader is equipped with an iJacket (a smart jacket) releasing him from the burden of having to follow the notifications sent by the coordination team on his smart phone. The iJacket is equipped with a number of actuators (an LCD display, a vibrator and a loudspeaker) that can be triggered by a coordinator to draw the attention of the team leader on new information and commands.

- The coordination team has identified the need for an off-site expert in structural engineering to evaluate the condition of primary structures of a building. They send a request for assistance (assuming conventional communications channels or other services that might be developed) for quadrotors to the community associated to the zone where the building is situated. Upon that request, they get a number of responses from on-site civilians equipped with quadrotors. A structural expert who is suggested by the SOCIETIES system and who is willing to support the relief efforts accepts to remotely control the operations with the RemotePiloting service. Using his augmented reality goggles he positions and directs three of the on-site quadrotors around the area of interest. The expert gives a first textual estimate on the conditions towards the on-site assessment experts, outlining that perhaps other structural engineers with specific knowledge on ferro-concrete constructions could also assist. The on-site disaster assessment experts decide to issue another request including the images taken by the quadrotors, which is answered by the off-site volunteers using the AnalyseThis service.

We expect from the second trial to be able to validate the technical advances of the platform and the additional research questions derived from the first trial. Apart from this we want to extend and enhance the service spectrum and allow users to be immersed in a pervasive experience.
4.2  Review of past work

4.2.1  Iterative Group Cognitive Walkthrough

In the first user trials, in a process that included 2 cognitive walkthroughs and one final experiment with external users, eight volunteers have been presented a scenario where they were fictionally placed in the same train and registered to a service that gave them tasks to assist with the relief of an earthquake in Asia. The most important findings were the following:

1. The platform and services operated without any technical problems for the duration of the three trials, hosting up to 8 platform containers over several hours. This included all third party services and systems. The infrastructure and users were distributed across several countries.

2. Some of the platform innovations could only be shown conceptually: these related to the community orchestration of the ad-hoc volunteer group. Other innovations (Trust, Context and Privacy) were shown in the trials. Context related in particular to the relevancy of users to requests. The Trust ratings provided by the experts were visible to the users per response.

3. The interaction increased over time, as was evident from the Chat Log data. The users also created more requests while breaking down tasks into sub-tasks.

4. The user feedback became increasingly refined (even though there were new users) by the third trial phase. This can be seen as an indication that the users were able to relate to their experience.

5. The user experience in the chat tool will have to be improved in terms of information distribution to different chat rooms and reduction of information duplication to the necessary minimum.

6. Socio/technical aspects of the trial regarding workflow were also significant.

4.2.2  Mobile and pervasive services

Complementary to this experiment with volunteers, an initial evaluation of tangible interfaces and their sharing for on-site crisis release was performed. This evaluation involved a new group, the Norwegian Red Cross. Since the Red Cross had not been involved in SOCIETIES earlier, and thus did not provide us with requirements, the proposed solutions did not fulfill several critical needs. In particular, the lack of 3G coverage in most areas of action is a blocking issue. We are not able in the remaining time of the project to make enhancements in the platform that handle the most critical needs from the Red Cross. We will therefore concentrate on two elements that were flagged during the evaluation:

1. Usability: the user applications and devices should be easy to install and configure.

2. Awareness: the users in the field should be able to concentrate on their activities and not be disturbed by the system.

4.3  Expectation from Second Trial

A number of research questions will be answered during the second trials. The objectives defined in D8.2 Section 4.2 are adapted and redefined towards new priorities. The following list ranks the overall goals (highest priority first):

1. Strengthen and validate the pervasive computing aspects of the trials; these are:
   a. to provide people remote access to physical resources on the ground,
   b. to provide ubiquitous alarm and notification features by definition of relevant physical areas and wearable computing prototypes.

2. Flexible and community orchestrated data sharing and evaluation, including more refined evaluation of the trust model.

3. Evaluate whether the “train scenario” or other user configurations discussed and introduced in the first trial really offers a better user experience than pure remote co-operation. This will serve to evaluate the SOCIETIES value propositions of CSS Orchestration (in the creation of the “train CSS”) at least at the conceptual level, but based on real experimental results. Actually, there are three
distinct variants to remote response: The individual working alone, the dispersed community (auto defined by SOCIETIES according to relevant attributes and skills) and the co-located ‘train’ community. The research questions could include whether the short lived collocated community, sharing context (train) by chance, are more trustworthy or effective than the more familiar, possibly more permanent, online “community of ‘shared’ interests/skills”.

4. Provide involvement of volunteer and expert communities.

5. Collect user feedback for definition of service enhancements for possible dissemination and further developments.

6. Provide material for relevant publication of the trial results.

4.3.1 Research Objectives of second trial

Formulated as questions, the second trial will attempt to answer:

- What added value is seen by the extensive and technically elaborate platform connecting to a social network?
- Are the intelligent features of the platform helpful?
- What privacy or ethical concerns remain?
- Is the integration as seamless as it should be for a pervasive computing system?
- Is remote interaction between people and physical pervasive computing resources in real-time possible and is the quality sufficient? Is it useful in the DM context? How is the remote interaction experienced by the offsite expert user?
- Do volunteers collaborate differently when physically located together vs. co-operating remotely?
- Do the trust learning and evaluation features of SOCIETIES help to identify suitable individuals and is the existing trust model sufficient?
- Do the DM experts believe that the combination of the innovative platform features in conjunction with the human volunteers and the on-site pervasive computing elements provide trustworthy and dependable support in DM situations?
- What are the main usability issues for configuring tangible interfaces and sharing them in a community?

These trial evaluation questions will be addressed with the same methodology as was applied in the first trial and as reported in D8.5: Evaluation of logfiles, questionnaires, interviews, review of cognitive walkthroughs, and direct observation. In terms of logfiles we will have available the logfiles from the pervasive computing elements that will allow qualitative and quantitative evaluation of the human-system interaction, such as response times, control accuracy.

4.3.2 System improvements of components and interfaces already used in the first trial

In addition to the second trial being more elaborate and spanning further user domains than the first trial, we suggest these improvements to existing components / interfaces to be considered:

- YouRNotAlone / Chat Tool: improved message summarization (remove duplicated messages, do not display all information related to a request or answer).
- Improve and maintain a concise user interface for chat service (remove unused functionalities).
- Improve chat channel usage (displaying message into related channel - according to skills - rather than all in the public channel. This may also reduce the notification messages posted in one channel.
- Improved usage of the SOCIETIES Trust Model. The trust established between users should be used to select the appropriate volunteers.
4.4 Temporal aspects

The second trial will address three groups of users: the end-user professionals in the field with physical resources, the remote expert-pilot using the physical resources through pervasive interaction and the volunteers assisting the data evaluation process.

Firstly, we incorporate the end-user professional on the ground and the remote expert-pilot in a variety of experiments to validate the connection of remote resources (flying quadrotors) and the controlling hardware (motion capture system) through requesting assistance using the CSDM (Crowd Support for Disaster Management) platform developed within the first prototype user trial. The iterative development and evaluation will be spread over the course of several weeks. Secondly, the request for assistance for evaluating the information acquired (images taken by the flying quadrotor) towards the volunteer is incorporated into the CSDM. This development is basically covered by the prototype result from the first trial, but needs to be adapted for the specific requirements of the second trial. Thus the temporal horizon for this development is in between a few weeks. The trials will begin with cognitive walkthroughs in October based on visual material gathered on existing infrastructure (e.g. during the real disaster evaluation in Cyprus carried out using UAVs). The outdoor (UAV control) trials will be held in November over a course of 2 to 3 days. The subsequent evaluation by the off-site volunteers will take another 1 to 3 days.

In addition we will perform acceptance tests of the concept of service sharing in communities. To that end we will employ the smart jacket. The users will be provided with Android smartphones and one of them equipped with the smart jacket. A first acceptance test will be conducted in conjunction with the ICT 2013 event in Vilnius. Then we will involve DM professionals, e.g. firemen and Civil Defense, in complementary tests in Trondheim.

4.5 Physical / location aspects

The trial will take place both in real and in virtual world simultaneously. The areas of interest are the following:

1. **Augsburg, Germany “Lechwerke”** (LEW; http://www.lew.de/), a regional power electric utility company belonging to RWE: The On-Site disaster assessment experts/professionals will simulate a disaster assessment mission to evaluate the structural integrity of an electricity power pylon. This is where the “disaster” will be enacted.

2. **DRL, Institute of Communications and Navigation**: Here we use the indoor tracking system for a selection of off-site expert-pilots that will remote control the physical resources (quadrotors) which are with the on-site disaster assessment experts/professionals at the “disaster” site (see previous bullet point).

3. **“Cyberspace” / Virtual**: A selection of off-site volunteers (i.e. people at home or at their work location).

Users will be provided with the following devices, corresponding to the trial location as described above:

1. **Services installed on two to three notebooks, Android phones and quadrotors**: On-site assessment experts are equipped with several notebooks. In addition, there will be a fleet of 3-4 autonomous aerial vehicles to assess the building or bridge, which will be operated remotely by an expert-pilot through pervasive interaction. The Android phones can be used to define areas of impending danger or to interact with functional clothing provided.

2. **Motion Tracking System, AR goggles and notebook**: The remote expert-pilot is equipped with augmented reality (AR) goggles for overlaying information (on-site camera feedback or first-person perspective of the quadrotor) onto the real world view within a motion tracking system (DLR Oberpfaffenhofen) to acquire accurate position for controlling the remote quadrotors.

3. **Standard (home/office) PC**: Off-site volunteers in the “Cyberspace”, (i.e. at home or in their office) use their standard home or office PC to answer request given by the on-site assessments experts/professionals. We plan to evaluate two main “configurations” of users: a group located together versus a group working together remotely, so as to validate the “train scenario” introduced in the first trial.
In addition, acceptance tests will be conducted in Vilnius and Trondheim (see section 4.4).

## 4.6 Third party services

The trial will incorporate the following third party services to be implemented by WP6.

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Service Description/ Functionality</th>
<th>First trial feedback taken into account</th>
<th>Compelling Points/ Improvement Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>iDisaster</td>
<td>- Register disaster&lt;br&gt;  - Upload disaster data&lt;br&gt;  - Register tasks, specify requirements for a tasks&lt;br&gt;  - Assign tasks to volunteers&lt;br&gt;  - Specify answering inspection mode (related to crowdsourcing method)</td>
<td>The system should be easy to use and tailored to their needs. The concept of “service sharing” is not well understood.</td>
<td>Improve user interface with focus on the configuration of tangible interfaces and their sharing.</td>
</tr>
<tr>
<td>iJacket</td>
<td>- Pervasive application interfacing a smart jacket. It provides a less intrusive and more suitable interface to alert disaster field workers.&lt;br&gt;  - The iJacketClient allows to share data with the iJacket. It basically offers the user an interface to an iJacket that has been shared with him and allows him to send commands to those iJackets.</td>
<td>People in the field, except the team leader, should keep focus on their activities (essentially search of missing persons) and not be disturbed by any sound or message. The team leader is the only person who needs to communicate with the leaders in the coordination centre.&lt;br&gt;  The system should be easy to use. The participants were also worried that the system would not work when they need to use it.</td>
<td>The first issue is easily tackled: only the team leader is equipped with a smart jacket. The user interface will be improved. In particular the configuration of the physical interface will be decoupled from the selection of communities.</td>
</tr>
<tr>
<td>Integrated AnalyzeThis ServiceSuite</td>
<td>- Register users as a volunteer.&lt;br&gt;  - Register expertise and interests.&lt;br&gt;  - Receive alerts about interesting support requests.&lt;br&gt;  - Chat rooms for volunteers.&lt;br&gt;  - Propose user to be joined into some specialized groups (e.g. “I know Greek” for sign translation).&lt;br&gt;  - Crowd-sourcing functionality integrated with on-site services.&lt;br&gt;  - Interacts with CIS joining core service.&lt;br&gt;  - Get notified about new responses.&lt;br&gt;  - View data.&lt;br&gt;  - Annotate data.&lt;br&gt;  - Send data to volunteers.</td>
<td>The last version of this service suite, used for the third walkthrough of user trials one, we conclude that the Chat-Tool is sometimes too busy when answers are posted intensively, which probably bothers volunteers. Summarized notification messages have been suggested, as well as shorter messages with links to the platform instead of a complete repetition of events. More subgroups in the chat tool would be welcomed, too.</td>
<td>Design of CSDM should be adapted to promote a feeling of helping. Maybe show the results, badges, etc. CSDM platform needs to be extended by the functionality to inject images (taken by the quadrotor).</td>
</tr>
<tr>
<td>RemotePiloting</td>
<td>- Integrating quadrotor control with the service&lt;br&gt;  - Share control&lt;br&gt;  - Provide quadrotor feedback to the remote user</td>
<td>New Service, no feedback so far.</td>
<td></td>
</tr>
<tr>
<td>GeoFencing</td>
<td>- Disaster Management Center: visualizes the placement of geofences by polygons on a topological map. For each geofence the tool provides details about users that are currently within the geofence and displays activity feed associated with corresponding CIS. Operator of Disaster Management Center may modify information about the CIS, read and post to activity feeds of CISs.&lt;br&gt;  - Geofence creation tool: allows the operator to create new geofence and to annotate it.</td>
<td>New Service, no feedback so far.</td>
<td></td>
</tr>
<tr>
<td>Service Name</td>
<td>Service Description/ Functionality</td>
<td>First trial feedback taken into account</td>
<td>Compelling Points/ Improvement Potential</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------------</td>
<td>---------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>- Geofencing Android application: allows mobile users to be notified upon entering geofences which mark a disaster. Upon entering the CSS will join the corresponding CIS on behalf of the user.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4.7 User aspects

The inclusion criteria for the trial participants, along with the demographics of the users shall be decided in the upcoming weeks, closer to the actual trials when the availability of the specific experts/professionals can be ensured better.

The trial participants will be involved in planning the trials to some extent. We expect some involvement of the expert-pilots, by allowing them to experiment with pre-trial versions of the services and devices (in analogy to the Cognitive Walkthroughs of the first trial).

#### 4.7.1 Number of users

We suggest the following numbers of users:

- On-site disaster management experts/professionals: 2-3
- Off-site remote expert-pilot for quadrotor control: 1-2
- Off-site volunteers for data evaluation: 6-10
- Acceptance testing of service sharing in communities (using the smart jacket): general public at least 20, and professionals at least 8.

#### 4.7.2 Privacy Aspects

The privacy aspects permission form developed and used during the first trial will be given to users (who are not part of the SOCIETIES consortium) for signing before the trial. As for the first DM trial we will issue temporary user names and we will not store the association between real people and these names.

### 4.8 Trial Options / Contingency Planning

In the case of changes in platform performance, availability and/or user availability, we consider splitting the temporal aspects described in Section 4.4 into two separate phases, in order to mitigate risks and to also provide more flexibility in the selection of volunteers in phase 2:

**Phase 1:** Carry out all trials regarding the end-user professional on the ground and the remote expert-pilot through requesting assistance using the CSDM (Crowd Support for Disaster Management) separately. As a result we gather a sample dataset which will then be used as input during phase 2.

**Phase 2:** Incorporate the request for assistance (sampled dataset) from the professional end-users and the volunteer data evaluation process and carry out the trial using the sampled datasets gathered during phase 1. This phase can also be used to test the same input data applied to two groups of volunteers: physically co-located versus remotely co-operating. An open point is whether or not we can have any involvement of the professional end users in providing feedback to the offsite volunteers during the trial, regarding quality of answers.

The number of users, in particular of volunteers, can be adapted on short notice to the capacities of the Societies platform and the available server hardware. We can also evaluate different modes of the SOCIETIES trust model in this selection process without having to repeat phase 1.
Optionally, the Societies 3P services for disaster relief experts may also be trialed with the Red Cross of Norway in a separate usage scenario to collect their feedback, similar to the approach during the first user trials.

In case, few participants are willing to participate in the usability tests organised during the ICT 2013 event in Vilnius, additional tests will be conducted in Trondheim.

### 4.9 Co-Design

Members of Societies WP8 who are not involved in the development of the used 3P services and some external lead users will get access to the services, some weeks before the day of the final user trials (see also section 4.4 Temporal Aspects). Their feedback will be incorporated in the service evaluation, similar to the “walk-through” approach from the first user trials. This feedback however shall be taken into account and improve the services for the final user trials.

### 4.10 Requirements towards WPs 4-7

#### 4.10.1 Platform Components and Features

The trial will make use of these platform features, which must be stable and tested before final deployment. Additionally, we require that the platform reliably and efficiently supports the targeted number of simultaneous users of max. 15 (see below).

- CSS creation
- Trust Learning
- Trust Broker
- Context Broker
- Activity Feed
- CIS Orchestration

#### 4.10.2 Requirements for pre-conditions

There needs to be a predefined set of skills from which the volunteer users can select. This reduces the freedom of usage, but guarantees to find suitable candidates in the user selection process. It will emulate the real-world conditions where users will have provided skills, or that these skills have been inferred by other means.

It has to be made sure that there are registered volunteers with piloting skills and appropriate profiles. Furthermore these profiles need a previously defined trust profile, so that users can see effects of the trust learning process even during one day of the user trials.

#### 4.10.3 Deployment

**Number of required containers:** 9-15 (one cloud node for every crowd volunteer, expert and pilot)

Number and kind of **required end user devices:** one pair of AR goggles, 2-3 Android phones for the experts, 2-3 laptops for disaster assessment.

**Hosting of other services** such as third party services: a server to host 3P services and cloud nodes.

#### 4.10.4 Logging and Evaluation

Monitoring during trials will be based on the life logging application embedded in the CSS devices, as well as the logging of the cloud node servers and the CSDM servers.

This includes full logs of the SOCIETIES users’ (volunteers’ and experts’) actions in the SOCIETIES platform, the requests and answers in the CSDM platform and in chats.
Monitoring during trials will be provided by supportive staff at DLR and other partners. In addition, there is the option for encompassing a wide-angled Full-HD video and audio recording. After the trial, volunteers and experts will be interviewed about their experience during the trial.

Additional observation and documentation will include still photographs, screenshots (auto-generated from the applications at specific actions), log files (auto-generated from the applications, pervasive computing components, and the Societies platform at specific actions).

4.11 General Human Computer Interaction Research Questions for Evaluation of user experience of SOCIETIES

The objective of this section is to list and summarize research questions from the stance of the DM trial, and what means will be incorporated to gather the required material (e.g. logs, questionnaires). This table is not necessarily complete, but it does give a feeling for the scope of the DM trial and the kind of questions it is addressing (and which it is not).

<table>
<thead>
<tr>
<th>Questions</th>
<th>Relevancy yes/ no; DM Data Collection Approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does accessing the SOCIETIES platform give members/users/participants access and capability to discover, connect and organise with relevant people and services which enhance their everyday activities? Does SOCIETIES support people in discovering, and connecting with relevant others?</td>
<td>Yes. Interviews.</td>
</tr>
<tr>
<td>2. Does SOCIETIES support communities in sharing information, and organizing activities?</td>
<td>Yes. Interviews.</td>
</tr>
<tr>
<td>3. ... (i.e. Does the user experience demonstrate the value proposition to “discover, connect and organize across real and virtual worlds”)</td>
<td>See 2.</td>
</tr>
<tr>
<td>4. Do the participants feel confident to share data with the SOCIETIES system? Or a particular service?</td>
<td>Yes. Interviews.</td>
</tr>
<tr>
<td>5. Do participants believe that their data is safe and secure?</td>
<td>Yes. Interviews.</td>
</tr>
<tr>
<td>6. Can participants clearly and easily manage and control what data is collected and used by the system?</td>
<td>Partially.</td>
</tr>
<tr>
<td>7. Do the participants want to use the system? Once or on an on-going basis?</td>
<td>Yes. Interviews.</td>
</tr>
<tr>
<td>8. What attracts participants to the SOCIETIES system initially?</td>
<td>Partially, as far as participants can put themselves in this hypothetical situation. Interviews.</td>
</tr>
<tr>
<td>10. How does the average user experience change over time?</td>
<td>No (limited, due to limited time).</td>
</tr>
<tr>
<td></td>
<td>Question</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>11.</td>
<td>Do participants have any concerns about using this system?</td>
</tr>
<tr>
<td>12.</td>
<td>Do they understand how much data the system is generating based on monitoring their activities?</td>
</tr>
<tr>
<td>13.</td>
<td>Are they comfortable about being monitored by a computer system?</td>
</tr>
<tr>
<td>14.</td>
<td>Are the benefits offered experienced by participants? As expected? Otherwise?</td>
</tr>
<tr>
<td>15.</td>
<td>Do the participants think that those benefits are worth their efforts to interact with the system (e.g. set up, sharing, accessing services) and worth being monitored by the system? How does the transaction of sharing data compare with other popularized social network transactions?</td>
</tr>
<tr>
<td>16.</td>
<td>Do they think they have altered their behavior because they have been monitored by the system?</td>
</tr>
<tr>
<td>17.</td>
<td>How does the participants' use of the system affect their existing social networks (offline and online)?</td>
</tr>
<tr>
<td>18.</td>
<td>Do they underline existing connections through use of the system?</td>
</tr>
<tr>
<td>19.</td>
<td>Do they make new connections through use of SOCIETIES?</td>
</tr>
<tr>
<td>20.</td>
<td>Are the right mix of participants in the trial group to facilitate the type of information sharing that is usual for that context?</td>
</tr>
<tr>
<td>21.</td>
<td>Does SOCIETIES support facilitators in organizing events - finding suitable venues, offering relevant services and specific deals, directing invitations and messages to the right people?</td>
</tr>
<tr>
<td>22.</td>
<td>Does the pervasive and social platform that is SOCIETIES facilitate the creation of useful and interesting applications for communities?</td>
</tr>
<tr>
<td>23.</td>
<td>Is the system easy to use?</td>
</tr>
<tr>
<td>24.</td>
<td>Do participants feel that they have to work to perceive benefits? Is that work worthwhile?</td>
</tr>
</tbody>
</table>
5 Enterprise Group Trials

5.1 Summary of trial

The original objective of the 2nd Enterprise User Evaluation was to return to the Enterprise user group with the next evolution of the SOCIETIES software platform and 3rd party services, and aim to perform an in-depth user evaluation of the project’s innovations and key research questions through the available software services and infrastructure. With the departure of two of their key personnel, Intel has concluded that this will not now be possible. WP8 has been working with the management team to decide the best way forward and has decided to conduct a scaled down version of the Enterprise trial.

TSSG has been scoping out the possibility of modifying a 3rd party service, called the Event Herald App, which was originally intended for evaluation as a Student trial service, into an ICT Conference app for inclusion in this Enterprise trial. The ICT Conference service to be evaluated will be presented as a conference support service, where conference attendees can discover, connect and organise with relevant other attendees, relevant conference communities and available ‘things’ within the conference environment. This user evaluation will take place at an actual conference during the 4th quarter of 2013. Building on the findings from the project’s engagement with the Enterprise user group, which included: the initial user research of conference users (documented in D2.1); the early storyboard evaluations (as documented in D8.1) and 1st prototype user evaluation of two different conference services Networking Zones and Context Aware Wall, this 3rd party service will be deployed to Android devices. The targeted user base for the trial will be the attendees at the ICT2013 conference in Vilnius in November 2013 who possess an Android smartphone, and who will be actively encouraged to participate in the trial by downloading and using the service. To allow users to experience ‘community relevance’ the service requires a minimum scale of users to use the service and indeed it is important that this minimum is exceeded for the evaluation of service ‘relevance’. Platform scalability issues remained as a key constraint, so to fully measure and evaluate these ‘relevancy’ algorithms the service had to be designed as a standalone service that scaled up to approximately 400+ users, while at the same time emulating the required platform functionality.

5.2 Review of past work

Reflecting back at the conclusions reached from the first Enterprise trial in D8.5, we have learned that limiting access to services solely to on-site deployments increases the risk for the trials, as it limits the scope to improve usability of services. In the build up to the ‘live’ deployment for the next trial there will be a continuous rapid iterative testing and design stage, all at the same location and incorporating usability expertise into the process. In the last trial, the SOCIETIES platform and applications were immature in terms of stability and user interface design, resulting in the participants being jolted out of a smooth and passive user experience. The User Interfaces, user flows and front end designs of the applications utilised, caused considerable difficulty for all of the participants. They were not intuitive, or easily navigated. The services offered were not essential to the conference scenario, and the benefits were not immediately obvious, so some users questioned whether accessing the system would be worth the effort.

The next trial will involve real users, with real identities so we could have an opportunity to evaluate user concerns around privacy, trust and automation. Participants in the last trial were clearly willing and inspired to the potential for the types of services made feasible by a system such as SOCIETIES, which linked social networks, relevant contacts and communities with pervasive services.

Participants offered several ideas for design enhancements or alternative services, which can help inform the design of the ICT Conference app:

- The potential to discover relevant connections, while still protecting ones identity from others, was considered very useful.
- Suggestions for extended services and features using the SOCIETIES technologies were also given.
- One participant requested both pre and post conference organisation services.
If the future SOCIETIES platform and services are to be developed to the stage where they would be acceptable to end users, we expect that a great deal of effort should have to be focused on realising objectives around privacy, trust, and user intelligibility.

5.3 Expectation from Second Trial

The expectation for the 2\textsuperscript{nd} Enterprise user evaluation is to evaluate with a larger user base, the potential usefulness of the SOCIETIES platform in a small to medium sized conference. Due to the larger number of potential end-users, this trial should be conducted as an “in-the-wild” trial, since micro-managing tasks for a large scale end-user base is impractical.

5.3.1 Research Objectives of second trial

- Discovery of relevant people (conference attendees), communities (groups) and things/events (conference sessions, informal meetings on a given topic).
- Pervasive integration of physical and social interactions (tracking trending topics for people attending the conference sessions).
- Evaluate the effectiveness of the Intelligent Community Orchestration algorithms in identifying common interests and potentially interesting conference delegates.
- Scalability to large numbers of users.

5.3.2 First Trial User Feedback influence on Second Trial

- Usability and usefulness. In order to more effectively evaluate the usability and usefulness of the application, a larger number of end-users would be required. In phase 1, usage of the enterprise applications was limited to a controlled environment with a small limited set of end-users. These end-users were given a set of tasks to complete and evaluation feedback was solicited on the usage of the three applications. The larger number of end-users makes this type of evaluation almost impossible. So to allow for a larger number of end-users, an “in-the-wild” trial format was selected.
- Privacy was cited as a potential concern at the first user trial. Default “personas” were created for people, without personal information of the end-user. In order to explore the privacy impact of a real deployment, in the second phase real end-users will have to register their own personal data. (thus end-users are now aware that the app is acting on their behalf, and using their personal data)
- Privacy and Trust: The overall amount of information gathered from each end-user is minimised. For example, only their name, organisation and interests are solicited. In addition, as much public information as possible is used to support the trial. For example, using public twitter feeds for conference trend analysis.
- Trust and Automation was also cited as a potential concern at the first user trial. In order to investigate this further two contradictory approaches are suggested, and can be compared in post conference analysis.
  - Reduce automation on location tracking, and give end-users explicit check-in functionality. This gives the end-user fine grained control over where their location is recorded, and if it is recorded. The end-user has total control with no automation.
  - Offer more automation on the formation of potential informal meetings and suggested networking sessions. While these still take the form of “suggestions” in is intended to make these prominent when browsing conference network sessions or when creating informal meetings. This way the end-user is aware of the potential automation but has a high degree of control, and obvious automation.
• Trust: Inspectfulness of the system. The application will exploit the “activity feed” concept of the platform to allow post action inspections. With this in mind the application will contain a “My conference” screen, which will list the end-users impact on the conference. e.g. “Accepted invite to informal session on exascale computing”. This allows two suggestions to be addressed.
  o Clearly explains the “footprint” of the end-user's activities for wider conference.
  o Allows post conference, audit trail for end-users to consult after the conference has completed. (See suggestion from trial phase 1, for post conference functionality.)

5.4 Temporal aspects

• 1-3 day event during conference/workshop
• Targeted for Nov/Dec 2013
Location targeted as ICT2013 in Vilnius

5.5 Physical / location aspects

TBD further with event organisers

5.6 Third party services

The trial will incorporate the Conference app third party service.

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Service Description</th>
<th>Evaluation Points</th>
<th>First trial feedback taken into account</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conference app</td>
<td>Provides a basic conference application with some additional features supporting informal meetings, group suggestions, and trending topics.</td>
<td>Algorithms and implementation are suitable for a large conference deployment. Some quantitative metrics will be recorded as detailed in logging.</td>
<td>Described in section on impact of the first user trial.</td>
</tr>
</tbody>
</table>

5.7 User aspects

Number of users

• 4000+ users using Android devices
• Users will register for trial at the event. (This allows end-users to opt-in)

5.8 Trial Options / Contingency Planning

It should be noted at this point that this application itself represents a contingency action (i.e. it is a replacement third party service for the second phase of the Enterprise trial). As such, detailed contingency
planning has not been fully completed for a full conference deployment. However the following risks have been identified and a mitigation action proposed.

- **Risk:** Third party service does not work on all mobile devices.
  Mitigation: Limit the range of devices to a small number support one mobile OS. (Android)

- **Risk:** Not many end users actually use the third party service.
  Mitigation: Promote use of the application from the SOCIETIES booth, and announce its availability on-site.

- **Risk:** WLAN or Internet connectivity issues.
  Mitigation:
  a. Enable some offline activities (from example, browsing sessions and speakers information)
  b. Limit number of end-users (to a first come basis), in case of degraded connectivity. For example, limit to the first 500 end-users who register.

- **Risk:** Application is not ready for deployment at ICT2013.
  Mitigation:
  Trial will consist of usability evaluation using role play.

### 5.9 Co-Design

Co-design featured quite heavily in the first trial, in particular for the DM and Enterprise trial, but also for the Student trial.

The Conference application will undergo corridor usability testing and cognitive walkthroughs with the development team and WP8 on site in TSSG prior to deployment at the main conference event.

### 5.10 Requirements towards WPs 4-7

#### Platform Components and Features

The service makes heavy use of the Intelligent Community Orchestration components from Task 5.1. In particular, the near real time group formation enabled by Intelligent Community Organisation, trending analysis, and Context Similarity Evaluation.

#### Requirements for pre-conditions

List of the required pre-conditions:

1. Conference session and schedule information is made available.
2. End-users opt-in, enter some profile information, and use the application.
3. WLAN connectivity is sufficient to support the end-users using the application.
4. Internet connectivity exists to the cloud services and the backend services hosted at TSSG.
5. Conference Organiser has suitable algorithms for suggesting new community formation.
5.10.1 Third Party Service

ICT Conference App main capabilities/features:

- Ability to display the conference schedule for end users.
- Ability to register, and specify a personal profile.
- Ability to browse the speaker profiles.
- Ability to bookmark as "interesting" events in the schedule as browsing.
- Ability to “check-in” at conference sessions.
- Ability to “bookmark” sessions and people, for follow-up activities such as creating contacts, reading related material, web-sites etc., or organising informal meetings at the conference.
- Ability to propose an informal meeting with others.
- Ability to receive invites to informal meetings from others.
- Ability to receive suggestions of people who may be of interest to the attendee.
- Ability to receive trending topics and links to the corresponding sessions, or informal meetings, demonstrations etc.

5.10.2 Deployment

User devices: Android smartphone

Cloud deployment options: Service will use some cloud hosted services. (PubNub and Parse are candidates)

Infrastructure: Backend services will be deployed to a server hosted at TSSG. This server will be accessible via HTTP and HTTPS.

5.10.3 Logging and Evaluation

The system will record the following quantitative information:

1. Number of informal meeting created (invites send, and accepted).
2. Number of click through on exhibition URLs.
3. Number of Suggested Groups which result in invite generation.
4. Number of check-ins done.

More qualitative methods may also be used. For example, interviews with conference attendees to gather their impressions on using the application. It is also envisioned that at least one conference speaker will be interviewed, to see how useful they found the application in managing the informal meeting opportunities generated by having a speaker role at the conference.

The system will record the following qualitative information:

- The System Usability Scale standardised questionnaire will be offered to all participants, who agree to use the application.
- A lead participant will be sought who would be willing to allow a SOCIETIES researcher shadow him/her for a morning or afternoon during the Vilnius event, with particular focus on the usage and interactions with the ICT Conference Application. This activity is dependent on willingness of suitable participant.
- Informal interviews and discussions with willing participants using the application will be recorded.
6 Conclusions

In this document we have presented guidelines and expectations towards the second and final SOCIETIES user trials in the three user groups. The document has been written directly after completing D8.5, and as such reflects the same “spirit” in the sense of realistically assessing which research questions can be addressed given the status of the platform and the limitations that are anyhow faced when evaluating technologies that are expected to expose their real value when they have entered the lives of many people, and across many aspects of those people’s lives. After outlining common methodologies to be used across all three trial groups, each specific section begins with a critical lessons learnt section based on the first trial.

All three trials will try to address aspects that have not been so well evaluated in the first trial:

- The student trial will allow students to interact with services and intelligent SOCIETIES features over a longer period of time – this will try to let us discover how people feel about these services, what fears and reservations they might have, and how they value a world where electronic systems are acting on our behalf “in the background”.

- The DM trial will include users from the DM expert field, as well as more people from outside the project. The trial will attempt to make better use of the Trust Concept of the project, as well as bringing pervasive computing hardware into the picture (remote controlled UAVs, augmented reality, Wearable Computing - iJacket).

- The Enterprise trial will bring its service to a very large number of users, bringing specific smart platform features. These will include discovery of relevant people, groups and events, as well as pervasive integration of physical and social interactions, including Intelligent Community Orchestration algorithms to identify common interests and potentially interesting conference delegates.

Each chapter also describes temporal, physical, user and third party service aspects for that user group, including hardware devices, as well as the research objectives that are the focus of the trial.

It should be said that the project faces a much clearer situation before the second trial than it did before the first. Expectations are more realistic, research questions have been focused, and many of the teething problems of the platform have been addressed. D8.5 has summarized valuable feedback from the real users involved in the first trial. Evaluating this feedback has allowed us to address the issues that are perceived to really matter – ranging from the perceived emotional user experience, to UI details and the importance of stability.
References:


