Deliverable 2.1

CONCEPT FOR IMPACT ASSESSMENT

Final

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WP 2

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# Glossary

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<tr>
<td>DFID</td>
<td>Department for International Development</td>
</tr>
<tr>
<td>DOW</td>
<td>Description of Work</td>
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<tr>
<td>ECHO</td>
<td>EU Humanitarian Aid and Civil Protection Department</td>
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<td>EmerGent</td>
<td>Emergency Management in Social Media Generation</td>
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<td>EMC</td>
<td>Emergency Management Cycle</td>
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<td>EMS</td>
<td>Emergency Management Services</td>
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<td>EU</td>
<td>European Union</td>
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<td>IA</td>
<td>Impact assessment</td>
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<td>ICTs</td>
<td>Information and Communication Technologies</td>
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<td>IG</td>
<td>Information Gathering</td>
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<td>Information Quality</td>
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<td>IPTS</td>
<td>Institute for Prospective Technological Studies</td>
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<td>IR</td>
<td>Information Routing</td>
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<td>IT</td>
<td>Information Technology</td>
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<tr>
<td>IUS</td>
<td>Innovation Union Scoreboard</td>
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<td>MEPIN</td>
<td>Measuring public innovation in the Nordic countries</td>
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<td>MIREIA</td>
<td>Measuring the Impact of eInclusion Actors</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
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<tr>
<td>OED</td>
<td>Oxford English Dictionary</td>
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<tr>
<td>RCT</td>
<td>Randomised Controlled Trial</td>
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<td>SM</td>
<td>Social Media</td>
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<tr>
<td>SROI</td>
<td>Social Return on Investment</td>
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<tr>
<td>UNISDR</td>
<td>United Nations International Strategy for Disaster Reduction</td>
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<tr>
<td>WARM</td>
<td>Wellbeing and Resilience Measure</td>
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<td>WP</td>
<td>Work Package</td>
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1 Introduction

1.1 Abstract

This Deliverable focuses on providing a concept for measuring the impact of social media in emergencies both on citizens and on Emergency Management Services (EMS) as part of the EmerGent project – as such it focuses both on measuring the impact of social media in general and, more specifically, on the impacts of the EmerGent outputs. It firstly provides in section 2 an over-arching methodological framework for conducting the research required to fulfil the objectives of WP 2: Impact of Social Media in Emergencies. Section 3 of the Deliverable provides an overview of impact assessment methodologies in the social sciences – starting from a general point of view and focussing in on methods used to study issues of direct relevance to this project: the use of social media in emergencies. The next section (section 4) explores some of the key EmerGent concepts of relevance to the impact measurement. Section 5 presents the proposed concept for the EmerGent impact assessment, using an overarching theory of change methodology.

1.2 Purpose of the document

This Deliverable contributes to Objective O1 of EmerGent – Analyse the impact of social media for citizens and for EMS in the whole Emergency Management Cycle (EMC) today and tomorrow. The specific objective of this Deliverable is to prepare the ground for Tasks 2.2, 2.3, 2.4 and 2.5, by setting out an overarching concept as well as more specific methods for measuring impact in relation to social interventions such as EmerGent.

1.3 Target audience

The direct target audience for this Deliverable is the EmerGent project partners. Additional target audiences are the European Commission and other FP7 projects.
# Methodology for WP 2

## 2.1 WP 2 in the context of EmerGent

WP 2 – Impact of Social Media in Emergencies – provides the foundations for building the EmerGent conceptual model and tools that aim to reinforce better communication between citizen communities and EMS. In order to understand what kinds of tools are needed, for whom and in which situations, we need to know more about how emergencies develop and what their characteristics are and the ways in which the use of social media can make a difference to EMS and citizens in such emergencies. This is the central focus and challenge of WP 2.

As the project proposal put it: “In order to understand the impact of social media in emergencies and formulate guidelines for enabling and encouraging users of social media to contribute to public safety and security a huge amount of fundamental and applied research in interdisciplinary fields has to be conducted”.

*Figure 1: Position of WP 2 within overall EmerGent work programme*
2.1 Concept for Impact Assessment

The proposal also observes that “the heart of the project EmerGent is the assessment of Impact of Social Media in Emergencies (WP2). In the WP, a continuous study of citizens and EMS will be conducted to assess the impact resulting from the results and outcomes of the project.” So as Figure 1 shows, the activities carried out in WP 2, and the outputs it produces, are crucial for the successful evolution of the project and feed into all the other tasks.

2.2 Objectives of WP 2

Within this context, this WP focuses on the impact of social media in emergencies both on citizens and on EMS, with reference to historical and ‘live’ emergency situations. This need to apply to all four phases of the EMC, which, as stated in the proposal, include: Prevention, Preparedness, Response and Recovery: "Prevention" and “Preparedness” are conducted before an emergency occurs in order to eliminate or reduce the probability of an emergency and to build emergency management capacities. "Response" activities provide emergency assistance to save lives, preserve property and protect the environment during an emergency. "Recovery" is the process of returning systems to normal levels after an emergency.

In doing this, the WP will need to problematize and clarify concepts such as ‘emergencies’ and ‘impact’ in order to develop an impact measurement methodology to inform the development of the EmerGent concept, platform and tools.

As such, the objectives of this WP are to:

- Develop and refine a methodology for measuring the impact of the use of social media in emergencies (T2.1)/(D2.1)
- Conduct a realist review and desk-based case studies of the impact of historical and live emergencies on EMS and citizens using this methodology (T2.2 & T2.3)
- Summarize the findings of the review and initial case studies (D2.2)
- Collect primary case-study evidence of the impact of the use of social media in emergencies on EMS and citizens in relation to historical or recent emergencies (T2.2 & T2.3; D2.3 & D2.4)
- Engage citizens and EMS continually, through social media, in the development of the EmerGent concept, model, tools and practices, particularly in the development of software components, using a systematic user co-creation approach integrating research and innovation processes (T2.4; D2.3, 2.4, 2.5).
- Critically review the results of the WP activities with groups of experts and stakeholders (T2.5 & D2.6).

2.3 Methodological framework for WP 2

The over-arching methodological approach that shapes how the objectives of WP 2 are addressed is pitched at two levels: the individual level (focusing on the project partners and researchers, as well as the stakeholders participating in the project) and the institutional level (focusing on the project and the project as a ‘learning environment’).

At both levels, the methodological approach reflects four key challenges:
• The heterogeneity of the EmerGent target users: The potential EmerGent users represent a diverse constituency. There are a range of stakeholder groups, with very different interests, needs and experiences (researchers from different disciplines; citizens with diverse demographic, social and cultural profiles; EMS from different sectors and with different roles; commercial actors; policy-makers). There are also big differences in terms of EMC ‘scenarios’ – different types of emergency; different aspects of the EMC; different timescales; different populations affected and different locations.

• The lack of an evidence base on ‘what works’ in the use of social media in emergency situations. This field is dynamic, fast-moving and lacks an established ‘evaluation culture’.

• The need to involve all stakeholders in the learning process as ‘co-producers of knowledge’, ensuring that the different voices and different perspectives of stakeholders are reflected in the research.

• The need to support ‘thinking outside the box’ to enable EmerGent innovative practices to develop.

The approach proposed at both the individual and organizational levels to address these challenges is to develop a ‘blended learning environment’ for EmerGent through WPs 2 and 3 which is able to support the subsequent design, development and validation of technologies and practices that are based on “value embedded action systems” [CuCo06]. This emphasises the early involvement of users in the entire iterative cycle of development of EmerGent, from early research, through technical specification, design and implementation. A key aim is to establish the ‘sense of purpose’ of the technologies and practices that EmerGent will develop through continuing engagement and use of them. Figure 2 shows this process schematically.
As Figure 2 shows, the overall aim of the proposed approach is to generate ‘iterative feedback loops’ within and outside the project in order to support ‘organizational learning’ [ArSc96]. Using this approach, the expectation is that the core concept of EmerGent – or to describe it another way the EmerGent ‘theory of change’ [PaTi97] – is progressively established within the project and in the practices through which it interacts with external actors, and becomes progressively refined through stakeholders working together in the co-production of knowledge, and sharing a common vision for the project.

The methodology can thus be seen as an ‘action research’ and ‘action learning’ exercise that endeavours to achieve an improved understanding “of a practice, improved understanding of a situation and the improved revision of practice .... through collaboration between researchers and practitioners” [CaKe86] and via a cycle of empirical enquiry that is both grounded in theory and supported by evidence [ReBr01]. By embedding iterative feedback loops within the research and knowledge production process, the approach also aims to combine the ‘formal knowledge’ embedded in the EmerGent research activities (carried out by professional researchers) with the ‘tacit’ and experiential knowledge of the stakeholders and practitioners involved. This ‘adaptive systems’ design aims to ensure that the innovations developed in EmerGent are grounded both conceptually and through experiential learning [NoKr09]. This in turn requires embedding in the EmerGent conceptual approach mechanisms for collaborative knowledge production.

In practice, the implementation of this over-arching methodology integrates five interconnected tasks, as shown in Figure 3.
Figure 3: Implementation of the over-arching methodology

- **T2.1: Concept**
- **T2.2 IA for EMS**
- **T2.3 IA for citizens**
- **T2.4: Continuous involvement**
- **T2.5: Stakeholder Review Panels**

- Months 1-3
- Months 4-36
- Months 6-36
As Figure 3 shows, the structure and sequencing of WP 2, and the relationships (dependencies) between the five constituent tasks are as follows:

- The WP starts with Task 2.1 – developing the WP2 concept for impact assessment (months 1 – 3). This Task is reported on in this Deliverable (Deliverable 2.1 – Concept for Impact Assessment). This Deliverable sets out the overarching methodology for WP 2; explores the potential methodologies and methods applicable to social media in the field of emergency situations and develops the overarching concept of this methodology for EmerGent (Task 2.1);

- The next phase of WP 2 (months 4-34) focuses on applying the methodology developed in this Deliverable (D2.1) via a Realist review of the literature and both desk-based and in-the-field case-studies of historical or live emergencies in order to research the impact of social media on how EMS respond and interact (Task 2.2), and, in parallel, researches how citizens construct and make sense of emergency situations, how they interact with each other and with EMS and how they use social media (Task 2.3)

- Running alongside Tasks 2.2 and 2.3 (months 4-36), but continuing over the life cycle of the whole EmerGent project, Task 2.4 – Continuous citizens and EMS involvement by social media – will involve citizens and EMS in the impact analysis research carried out in Tasks 2.2 and 2.3. Beyond this research phase, Task 2.4 will engage citizens and representative of EMS in the review of EmerGent concepts, tools and practices as they develop.

- Finally, Task 2.5 (months 6-36) will set up a Review Panel comprised of domain experts and key stakeholders in the field; civil authorities and the commercial sector – with a particular focus on technology providers. The Panel will take part in a series of workshops to gather feedback on the outputs and outcomes of EmerGent concepts, tools and practices.

Table 1 shows the Deliverables associated with these tasks.

### Table 1: EmerGent WP 2 Deliverables

<table>
<thead>
<tr>
<th>Task</th>
<th>Deliverable</th>
<th>Date due (Month)</th>
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<tr>
<td>Task 2.1: Concept for impact assessment</td>
<td>D2.1 Concept for Impact Assessment</td>
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<tr>
<td>Task 2.2: Impact assessment of social media in emergencies for EMS</td>
<td>D2.2 Impact of Social Media for EMS and citizens</td>
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<td>D2.3 Impact of Social Media for EMS and citizens using EmerGent concepts, Version 1</td>
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<td>D2.4 Impact of Social Media for EMS and citizens using EmerGent concepts, Version 2</td>
<td>34</td>
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2.4 Implementation of the approach

Implementing this over-arching methodology entails a multi-dimensional approach that entails different combinations of research methods, according to the demands of a particular Task. These methods are briefly summarised in Table 2. This Deliverable focuses on the approach used in Task 2.1 – concept for impact assessment – and the methodology adopted to implement this Task. Details of the approaches for the remaining tasks are covered in future deliverables.

Table 2: Implementation of WP2 research methodology by task

<table>
<thead>
<tr>
<th>Task</th>
<th>Research methods</th>
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| Task 2.1: Concept for impact assessment | Scoping review of literature (using Realist Review approach)  
Review and synthesis of impact assessment methodologies in general  
Review and synthesis of impact assessment methodologies of relevance to EmerGent project |
| Task 2.2: Impact assessment of social media in emergencies for EMS | Desk research using ‘Realist Review’ approach and content analysis of documentation  
Desk-based and in-the-field case studies of examples of historical and live emergency situations, reflecting the concept developed in Task 2.1 |
**2.5 Methodology for Task 2.1**

The main focus of this Task is to start to develop a conceptual model for assessing the impact of social media in general and, more specifically, of the main products or outcomes of the EmerGent project, including:

- One or more social media applications to help citizens to share information with EMS more effectively before, during or after emergencies
- An IT-system for the Novel Emergency Management in Social Media Generation for Information Gathering (IG), Information Mining (IM), establishing Information Quality (IQ), and Information Routing (IR)
- Guidelines on social media use in emergencies by EMS and citizens; as stated in the proposal the guidelines include:
  - recommendations for citizens and EMS, how to publish and how to find information via social media before, during and after emergencies (see EMC);
  - recommendations for EMS, how to react on information from social media in order to avoid the aggravation of situations
  - recommendations, how to avoid information overload
  - recommendations, how to develop/adopt systems for social media use.

This involved four stages:

**Stage 1: Methodological review**

- Reviewing impact assessment methodologies used in social sciences in general and with reference to ICTs and social interventions more specifically
- Checking evaluation approaches used to date to assess impact of use of social media in emergencies and in relation to other fields such as education and health
2.1 Concept for Impact Assessment

- Assessing the types of impacts and outcomes identified in previous studies, and which were not
- Reviewing strengths and weaknesses of the approaches used in terms of quality of data generated
- Identifying an approach best suited to the needs of EmerGent.

This was done via a review of the relevant literature using a scientific realist review approach (see section 3).

Policy and practice reviews in fields characterised by complex social issues typically come up against three main problems – the potentially vast body of evidence that needs to be collected and assessed; the variability of the evidence base in terms of relevance and quality; the problem of ‘attribution’ – establishing ‘what works’ in environments that are highly contextualised. Applying traditional systematic ‘Cochrane-type’ reviews in this type of field – hardly ever produces good results, because social interventions are too complex, too contextualised, too embedded in open systems, and too prone to change. The scientific realist review [PGHW05] is a way of addressing these problems. Realist review allows researchers and policy-makers to take context into consideration when making decisions and sharing knowledge. The process looks at how something is supposed to work, with the goal of finding out what strategies work for which people, in what circumstances, and how.

The review starts with identification and clarification of the research purposes, focusing on the key questions it needs to address. Subsequent stages of the review entail an iterative process of:

- Mapping the key ‘drivers’ that shape policy and practice
- Searching the field for ‘evidence’, including ‘grey’ literature
- Applying quality criteria to the material identified, based on relevance and rigour
- Extracting data from the final shortlist of material to uncover evidence in support or contradiction of the drivers identified
- Synthesising the results of the data extraction and analysis to re-assess the original ‘map’ of the field, and to produce conclusions and recommendations on ‘what works, for whom and under what circumstances’.

As [PGHW05] put it, doing a realist review entails “feeling your way” through the available literature to find out how to do something that may involve many different ways, depending on the complex and changing social systems that surround a particular question. It is essential, therefore, that the research starts with a systematic and robust scoping exercise that specifies the parameters and boundaries of the research, and that subsequent mapping and data analysis procedures follow rigorous procedures that ensure that the material used shows a consistent ‘goodness of fit’ with the research questions.

One of the main outcomes of Task 2.1 will be the identification of the most suitable impact assessment methodology. At this stage, our assumption is that theory-based impact assessment will be most suitable to meet the information needs of partners and stakeholders and also is best suited given the knowledge base that exists on the use of social media in emergencies in general. Developing the impact assessment approach for EmerGent will be done as part of the following stages.
**Stage 2: Conceptual review – clarification of key concepts**

Developing a concept for impact assessment needs to start with a clarification and definition of some of the key concepts of relevance to the field of social media in emergencies. The findings of such a review are presented in section 4 – this includes a review of the difference between emergencies and disaster, and emergencies and catastrophes, as well as an exploration of different typologies to classify different types of emergencies, the emergency management cycle (EMC) and the emergency management services (EMS).

**Stage 3: Developing the EmerGent logic model**

This is an important early step in the impact assessment design as it will tease out the implicit logic of EmerGent impact currently held by project partners, whilst at the same time working with the results of the literature scoping undertaken in Task 2.1. Articulating this will help: identify gaps in understanding or knowledge of how impact is going to be achieved (or where inconsistencies are); highlight potential areas where data collection should be focused on and support the construction of evaluation questions.

The starting point was an initial conceptualisation of the logic model (see sections 5.1 and 5.2), based on the proposal, review of the literature and input from other project members. This initial draft will then be shared with project partners, allowing them to suggest changes or additional details (Developing the EmerGent logic model will be a continuous task throughout WP 2).

The logic model will broadly follow the format below:

*Figure 4: Core components of an intervention logic*
Stage 4: Developing the impact tools and techniques to be used

The development of the logic model as part of Stage 3 will help to elaborate the types of impacts and outcomes project partners are hoping to achieve as part of the EmerGent project – this will be used to formulate more specific ‘impact assessment questions’ to guide the design of the overall impact assessment strategy and particular (qualitative or quantitative) evaluation tools or techniques as part of that (sections 5.3 and 5.4).

It is possible to ask different kinds of impact questions, starting from simply exploring “does use of social media in emergencies work?” to asking more differentiated questions on why or in which circumstances social media can result in particular impacts or outcomes. The choice of impact questions is crucial for making the decision on the method to use.
3 Overview of Impact Assessment in Social Sciences: Methodologies and Methods

3.1 Introduction: Scope of this Section

The focus of Task 2.1 is to identify the most suitable impact assessment methodology to apply to the products and outcomes of EmerGent. Assessing the impact of EmerGent outcomes as work progresses will be important to ensure deliverables are fit for purpose (i.e. meet the needs of the target audiences). Understanding what does and does not work when using social media in emergencies (through the ongoing citizen and EMS engagement in the project) will therefore provide an opportunity to continuously improve EmerGent outputs and help to inform the production of guidelines for the use of social media in emergencies (see section 5).

This section provides a review of impact assessment (IA) approaches, methodologies and methods. The review begins with an overview of IAs, set within the broader context of evaluation within the social sciences (section 3.2). The second part considers ‘technological’ IA, with a particular focus on assessment of initiatives using ‘Web 2.0’ and social media (section 3.3). The third part of this section (section 3.4) reviews state of the art in IA of social innovations, because at the heart of EmerGent is an expectation that the development and deployment of the EmerGent tools and practices will facilitate changes in how citizens and emergency services behave – individually, collectively, organizationally and societally – in ‘threat’ conditions. In section 3.5, we present a review of the literature on assessing the impact of social media, with a focus on the use of social media in emergency situations in particular. The section concludes with a summary of the key conclusions and implications for developing the EmerGent concept (section 3.6).

The methodology used to carry out the review followed the overall approach for WP 2 – as described above in section 2 of this Deliverable, following the principles and procedures of the ‘scientific realist review’. The review covered two categories of literature – the ‘scientific’ (academic) literature derived mainly from bibliographic databases (including SCOPUS; Web of Science; Communication & Mass Media Complete, Academic OneFile, ERIC, Humanities International Complete, PapersFirst, Social Science Citation Index (SSCI) and Dissertation Abstracts International) and ‘grey’ literature derived from ‘alternative’ sources (like conference papers; web-searches). Using the data searching and item appraisal procedures set out in section 2.5 above, the following items were reviewed:

- for the category of ‘general’ IA, a total of 109 items were scanned on the basis of their abstracts, with 31 items selected for more detailed review
- for the category of ‘technology’ IA, a total of 81 items were scanned on the basis of their abstracts, with 11 items selected for more detailed review
- for the category of ‘social innovation’ IA, a total of 167 items were scanned on the basis of their abstracts, with 21 items selected for more detailed review
- for the category of ‘social media in emergencies’ IA, a total of 53 items were scanned on the basis of their abstracts, with 22 items selected for more detailed review.
3.2 Impact assessment in the social sciences

Impact assessments normally attempt to answer the (broad) question: Did the intervention achieve its intended outcomes or impacts? When assessing impacts from a social science based perspective, two broad types of – theoretical – approaches are typically used to investigate the relationship between an intervention’s activities and observed outcomes / impacts: experimental approaches and ‘non-experimental’ approaches.

3.2.1 Experimental approaches

In the ‘experimental’ IA field, the ‘gold standard’ is randomised controlled trials (RCTs) [CaSt73]. These are designed specifically to test causal relationships and answer questions about whether the intervention has had the anticipated results. The aim of the approach is to compare the impact of the intervention with what would have happened anyway without the intervention. It analyses two ‘populations’, one in receipt of the intervention and one without the intervention in order to observe what happens in the absence of the intervention. This evaluation approach provides evidence that the intervention has been successful if the group receiving the intervention (known as the treatment, programme or experimental group) shows significant changes in the impact measure compared with the group not receiving the intervention (referred to as the control or comparison group). The approach thus offers scientific proof of a cause-effect relationship between an intervention and an outcome but only works under specific conditions, e.g. the intervention should not be expected to have differential impacts caused by the setting it is implemented within; the implementation of the intervention does not change during the evaluation period; there is prior knowledge about likely outcomes. Variations of experimental approaches are quasi-experimental studies, which typically relax the conditions required for random assignment for example by using ‘non-equivalent’ control and comparison groups.

A commonly-used definition of RCTs [SFL80] illustrates the characteristics of the experimental paradigm which shapes their methodological and operational orientation and hence the procedures required to implement them:

"[An RCT is] a prospective experimental study in which the effects of one or more interventions are assessed by dividing a research population on the basis of random allocation into one or more experimental and one or more control groups".

Randomised controlled trials hold a privileged position in relation to the assessment of the effectiveness of an intervention [CaSt73] because they offer the prospect of clear-cut results. In principle, they collapse the messiness of complex interactions into relatively simple dichotomies: measurable effect or not measurable effect; positive outcome or negative outcome. They establish causal relationships between an intervention and its effects. They predict outcomes and impacts. RCTs are increasingly seen as inseparable from the promotion of evidence-based practitioner culture because of this capacity to reveal causal relationships and to control for selection bias and for the influence of intervening factors unrelated to the effects of the intervention [LeSW92]. This explains the strong pressure exerted in recent years by funders and donors to migrate ‘experimental’ IA approaches from the medical world to the complex world of social programmes and interventions. In pursuit of the promotion of an ‘evidence-based culture’, good practice examples like the Cochrane Database of Systematic Reviews in the UK reflect a drive
towards the increasing institutionalisation of RCTs within large scale public programmes. In the USA, for example, the Family Support Act of 1988 made it a condition of funding that the new 'welfare to work' programme initiated by the federal government (the JOBS programme) had to be evaluated using random assignment. In the current climate of financial belt-tightening, the need to demonstrate that real changes can be attributed to investment in social programmes by using robust evaluation methods has become increasingly important in policy and practice across the EU.

There is some evidence that RCTs can be used to successfully evaluate the effectiveness of social interventions, even large scale public programmes (see, for example, [Ricc95], [OFHA+94]. In a recent example, work by [BaDu11] with the MIT Poverty Action Lab had by 2010 involved more than 240 RCT-based experiments in over 40 countries to establish what kind of poverty-reduction interventions work under which circumstances in international development. But what is striking about the Poverty Action Lab experience is how it highlights the key importance of contextual factors in contributing to impacts. As [BaDu11] argue, there is no evidence that the ‘Big Idea’ of development aid per se will deliver change. But there is evidence that tiny adjustments to the delivery of aid can significantly increase its effectiveness. When aid is carefully packaged to fit the specific socio-cultural life-world of its target beneficiaries, it begins to deliver results.

Equally, [BaDu11] highlight the importance of contextual factors when using experimental methods like RCTs to assess impacts in social interventions. A consistent problem identified in the literature on evaluation and IA in these complex fields is the difficulty in maintaining the ‘temporal priority’ required in RCTs - the assumption that a suspected cause precedes an event (for example, in clinical trials that the application of a particular drug will ‘cause’ the relief of particular symptoms). There are a number of factors that conspire to undermine temporal priority: history effects (the effects of ‘external’ variables that may have an influence on the outcome of the intervention); selection effects (statistical bias in the treatment and control groups); instrumentation effects (for example using measurement tools in different settings); attrition (uneven loss of participating subjects in treatment and control groups). In short, the range and complexity of ‘intervening variables’ that may influence the effects of a social intervention are potentially unmanageable. As [Stro87] has argued, experiments involving social interventions “simply cannot bear the expense of a sample size large enough to measure all of the possible combinations of treatment mix and client characteristics that characterise the operational environment of a program at a given point in time and as it changes over time”.

In the [BaDu11] case, however, it is possible to distinguish two key features that appear to have facilitated the successful application of RCTs in assessing the impacts of development aid. Firstly, instead of trying to create a causal attribution link between a complex programme and changes in beneficiary status, they focused on assessing the impacts of relatively small changes on people’s lives – for example the effect on educational performance associated with a child de-worming programme in Kenyan schools; the effect on family health associated with ‘nudging’ people to take part in an immunisation programme with an incentive of 2 pounds of lentils. This approach, it would seem, had the effect of considerably reducing the range and complexity of the intervening variables that needed to be handled in measuring impacts using RCTs.
Secondly, they complemented the use of RCTs with impact assessment methods that have been shaped not by the ‘experimental’ paradigm of evaluation but which are drawn from constructivist and participatory paradigms. They spent time talking with people on the ground and listening to their experiences, in order to ‘unravel the mystery of poor people’s lives’. This echoes an increasingly influential view [Boot11] in the evaluation field that interventions are far more effective when they ‘work with the grain’ of the societies and cultures that host them.

3.2.2 Non-experimental impact assessment

Against this background, the field of IA has developed a range of alternative paradigms to the ‘gold standard’. On the one hand, this can be seen as a pragmatic acknowledgement of the difficulties faced in pursuing the ‘holy grail’ of RCTs. However, it can also be seen as a reaction to the inappropriateness of the ‘experimental’ paradigm itself within the context of social interventions. [Stry90], for example, has argued that the ‘test’ for research paradigms is to consider how they treat history and process (the diachronic dimension) and how they treat the wider social environment (the synchronic dimension). On this basis, [Stry90] identifies four ‘meta paradigms’, as shown in Table 3 below.

Table 3: Research paradigms

<table>
<thead>
<tr>
<th>Meta-paradigm</th>
<th>Typical methodological approach</th>
<th>Epistemological/ontological features</th>
<th>Typical research methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normative</td>
<td>Hermeneutics, Phenomenological</td>
<td>Interpretation of historical and cultural uniqueness of particular ‘life-world’</td>
<td>Cultural analysis, Linguistic analysis</td>
</tr>
<tr>
<td>Rationalist</td>
<td>Constructivism, Critical theory</td>
<td>Elaboration/interpretation of phenomena as constituents of abstract idea</td>
<td>Discourse analysis</td>
</tr>
<tr>
<td>Nomologistic</td>
<td>Hypothetico-deduction, Positivism, Scientific realism, Structural analysis</td>
<td>Establish general laws and causality, Generalisation from particular</td>
<td>‘Scientific experiments’, Structural analysis of global societies and cultures</td>
</tr>
<tr>
<td>Teleonomicist</td>
<td>Game-theory, Economic-rationalism</td>
<td>Considers ends to which events are directed; Reductionist: whole can be reduced to sum of parts</td>
<td>Econometric Models, Simulations</td>
</tr>
</tbody>
</table>

As Table 3 shows, the experimental orientation in which RCTs are located has its origins in the nomologist paradigm, which emphasises the need to establish causal relationships and 'laws', by attempting to establish general regularities or systems to explain and classify historical phenomena (high action contingency) and spatial patterns (high symbolic
complexity). This paradigm reflects clear differences in its understanding of social structures and history compared with the normative paradigm within which, for example, methodologies based on unpacking 'truths' through systematic analysis of linguistic structures are situated.

This approach is closely associated, historically with idiographic and interpretivist philosophies, and places an emphasis on understanding the historical and cultural particularities of an 'object' of enquiry. This set of approaches would concentrate, for example, on identifying the factors shaping the development and application of social media in emergencies in relation to processes such as the political dynamics of the new Europe; the 'technicization' of economic production, and the influence of new forms of social and cultural communication systems. Similarly, rationalist approaches share a preoccupation with 'history and culture' but attach less focus to the particular uniqueness of a given historical and cultural context. They accept the notion of 'multiple socially constructed realities' rather than a single reality, and arrive at 'truth' or explanation through a process of finding consistency and consensus in these different interpretations of reality. Typical tools such as discourse analysis will involve continuing iterations of analysing, for example, different 'images of intervention' subscribed to by different stakeholders in EmerGent to arrive at an accepted construction of how it should work.

Teleonomicist approaches have a high 'theoretical' content, in that they focus on analysing highly structured scales of preferences and goals. They tend to be reductionist in the sense that the main objective of such approaches is to arrive at an understanding of the whole by looking at the sum of its parts. Typical applications of this methodology to social interventions involving social media would be modelling the likely utilisation strategies of potential end users in terms of game and decision-making theory.

The normative paradigm presents history as an evolving process in which a particular social context is seen as unique; the rationalist paradigm looks for regularities and common structure in history and society, but accepts the notion of 'multiple, socially constructed realities', and the teleonomicist paradigm tries to arrive at an understanding of the 'whole' by reducing it to the sum of its parts.

The key message from this conceptualisation of the properties of different research and assessment paradigms is that no one paradigm can be seen as inherently 'superior' to another, or in other words, there are different social constructions of 'social reality', and of 'truth' and 'evidence'. In non-experimental frameworks, there is often an emphasis on the involvement of the participants of the research in the process of interpretation of results. This is possible partly because of another aspect of some of the research approaches in the non-positivist framework: that the 'common sense' understanding of the social situation adopted by the subjects of the research takes a central role. This is particularly true of research strongly influenced by the heuristic philosophical traditions which place an emphasis on identifying subjective, and inter subjective meanings.

In practice, this implies that it is legitimate to apply different assessment paradigms and different IA approaches to suit different circumstances. Although this sounds like an argument for subjectivity, there are frameworks which can provide some guidance. One such framework is drawn from the field of critical system thinking. Initially developed by [JaKe84] it provides a map which can be used to relate different research approaches to
different sets of circumstances allow decisions about the appropriateness of different research methods to different kinds of system. The map provides a two dimensional grid which brings together the relative complexity or simplicity with the nature of the relationship between participants in the system. On the one hand, this framework recognises that it is partly 'of the nature' of paradigms that they provide alternative versions of reality, which are likely to be seen by their adherents as in direct competition with one another. However, [JaKe84] also reflect another view of IA, which appears to be gaining in credibility, that different research approaches might be used in the context of one study, either sequentially, or in parallel, in order to provide the opportunity for triangulation of data from different sources.

The development of these perspectives on research paradigms and IA suggest a number of important considerations that need to be taken into account in developing an IA concept for EmerGent, including:

- the experimental paradigm, and the use of ICTs, cannot de facto be considered to be ‘gold standard’ to which all evaluations of social intervention should aspire
- the voice of the ‘user’ in IA needs to be considered
- assessment needs to reflect a ‘pragmatic’ dimension, reflecting logistics, costs and effort
- the ‘relevance’ of an assessment paradigm, in terms of its social and cultural embeddedness, is as important as its ‘objectivity’.

The expansion of the field of evaluation as a mode of research enquiry and practice has enabled the development of approaches and methods of assessment that in various ways allow for these considerations to be operationalised and applied in practice. Evaluation theory and practice has developed concepts, methods and tools that were geared towards capturing how and why (if at all) an intervention affected a target population’s lives as well as whether the circumstances of the target population improved. These developments were influenced by a range of ideas and schools of thought, drawn primarily from the social sciences, probably the most important of which were interpretative and hermeneutic approaches which shaped much of the ‘constructivist’ approach in [GuLi89]. Earlier reactions to the dominance of experimentalism had developed into what could be described as pragmatic, feet-on-the-ground evaluation, of which [Patt82] is perhaps the most widely-known exponent. In this view, evaluation is a collection of tasks that are best expressed through exemplars and operationalised through ‘know-how’, ‘craft’ and ‘skill’. Another way of looking at evaluation from a similar perspective is through what [CoSh86] have described as a ‘theory of evaluation practice’. Any evaluation is carried out within constraints of time, resources and skills and cannot pursue all of the multiple choices on offer. The primary purpose of a theory of practice is therefore to guide the essential decisions in any evaluation. In turn, the evaluation of a complex intervention process implies an ‘open systems’ perspective which gives recognition to the organizational and political processes within which it is embedded [Chen90].

Constructivism, borrowing from the ethno-methodological perspective in social science, attempted to put a theoretical layer on such pragmatist approaches. It emphasised the ‘social construction’ of reality, where behaviour is subject to a continuous process of redefinition and ‘social shaping’ ([Garf67], [Fest57] and [Blum69]). In seeking to capture
these different socially-constructed realities – the notion, for example, that target populations in ICT-based interventions are ‘moving targets’ whose attitudes and behaviours fluctuate according to the ‘social reality’ they occupy at any one time – constructivism widened the scope of who and what was important in evaluation. Thus whilst the experimentalist evaluation might concentrate exclusively on experimental and control subjects, and the pragmatic evaluation on policy-makers, constructivism considers all relevant actors – or ‘stakeholders’ – as having a bone fide interest and engagement in the process of evaluation and assessment. [GuLi89], for instance, distinguish between three broad groups of stakeholders: agents, beneficiaries and victims, all of whose perspectives and needs have to be identified and, if necessary, reconciled in order that a proper process evaluation can be carried out.

Against this background, a ‘pluralist’ perspective can be detected in IA which combines some of the ‘rigour’ of experimentalism with the worldly-wise knowledge of the pragmatists, together with the stakeholder-orientation espoused by constructivism. [Ross85], for example, takes a sociological view of interventions and programmes, which suggests that evaluation needs to look at the ideological reasons surrounding their inception and structure, and the institutional frame governing their implementation. At the same time, unless programmes have a demonstrable impact, it is difficult to defend money being spent, and so an outcome-oriented position is also necessary. Similarly [Cron82] argues that evaluation should be concerned with generating general knowledge applicable to all programmes and interventions, rather than concentrating on how a particular programme was implemented.

Building on this desire to incorporate some element of generalizability into evaluation, there has been a growing interest in what has come to be known as ‘theory-driven evaluation’ ([PaTi97] and [Chen90]). Theory-based approaches to impact evaluation allow for a systematic articulation and testing of the assumed connection (i.e. the theory) between an intervention and the anticipated impacts. The focus of theory-based evaluations is not only on understanding whether an intervention has worked but on why and under what conditions change has been observed. These issues can be explored using a wide range of research methods (both qualitative and quantitative), and data obtained from different sources will often inform the evidence base (known as triangulation) to strengthen confidence in the conclusions. Theory-based approaches are therefore particularly suitable for evaluations that have a knowledge focus and seek to generate learning for future interventions. Theory-based evaluations provide evidence on the outcomes and impacts achieved by the intervention (including unintended ones), the combination of factors that contributed to achieving them (this may also include contextual and implementation issues) as well as how outcomes and impacts were achieved. They are particularly strong for evaluations of very diverse and long term interventions that display a mix of activities, target groups, delivery mechanisms and settings (i.e. interventions that are very complex). That is, they tend to be used in situations where the other approaches would not deliver reliable results because impact pathways are not very straightforward, a number of variables may influence the results and because the research questions are geared towards explaining reasons for change.

Theory-based evaluation can also be useful for the evaluation of interventions where little prior knowledge about causality exists as a tool to build up that knowledge. It allows the
complexity behind interventions to be articulated, and through the evaluation process the influence of different (combination of) factors on outcomes and impacts to be tested. Therefore, the theory-based approach allows evaluators to consider issues such as the context of an intervention, the way it has been implemented and other social, environmental, political and geographic variables which might also influence the impact of the intervention. Theory-based approaches are also the only methods currently in use that allow inferences to be made about the possible long term impacts of an intervention. Types of theory based approaches are: realist evaluation and theory of change evaluation.

The latter looks at the theory of change; underlying an intervention – what it seeks to achieve in terms of individual behaviour change, and at the community and societal level – and identifies the ‘causal pathways’ that can trace identified outcomes and impacts back to preceding actions. It argues that IA needs to have an underlying theoretical position that gives some form to process or context mechanisms in order to explain subsequent outcomes that can be tested by observation. Theory-based evaluation is applauded for its ability to make explicit the theory of intervention by articulating the relationship among inputs, activities, short-term outcomes, and long-term outcomes. This specification of linkages in graphic form, using boxes linked by arrows, is called a logic model, which illustrates the programme’s theory of how change is expected to occur [CoKu98]. The primary benefit of this approach is that it makes explicit what are often implicit linkages between variables in the model thus making explicit how the programme activities will lead to intended impacts [Rose02].

Increasingly efforts are being made to develop the theories of change approach to provide a more robust approach to impact evaluation that goes beyond theory building. Contribution analysis [Mayn08] is one option that aims to infer causality by assessing the credibility of the contribution of the programme to the intended impact. This approach explores attribution ‘through assessing the contribution a programme is making to observed results. It sets out to verify the theory of change behind a programme and, at the same time, takes into consideration other influencing factors.’ However, while this approach is increasingly being discussed by evaluators, it is currently not widely used to undertake impact evaluations [Toul10].

This suggests that there is only limited value in assessing the relative strengths and weaknesses of different IA ‘methods’ that might be deployed to develop an effective approach for EmerGent. Comparing methods in this way pre-supposes a universe of discrete and bounded methods out there and that the ‘best’ ones can be selected on the basis of their respective attributes. However, the evidence tells us that different ‘approaches’ have different purposes, orientations and epistemological origins, and they tend to be utilised for different contexts. The IA literature strongly suggests that the ‘right’ approach depends on several factors. No single method or tool is ‘best’. It’s more a matter of appropriateness. The topic of interest is relevant at a general level – i.e. it governs the frameworks and focal topics of investigation. If questions are being asked about economic opportunity or effects on income, economic models might be most appropriate; if the questions being asked are in relation to social justice and opportunity or the social integration of minorities then social-system analyses might be most appropriate.
The use of a particular cocktail of IA methods in a particular intervention context also reflects the ‘values’ of practitioners and other stakeholders. As [Weis95] argues, interventions – and their evaluation – can be seen as a ‘recursive discontinuous process’ which involves a number of complex steps over time, rather than the implementation of a clear, and subsequently unchanging logic at the beginning. All interventions are subject to ‘knowledge creep’ – that is their vision, logic, objectives and purpose change over time as the intervention develops. Impact assessment therefore needs to be able to capture this evolutionary process and, in particular, how the values of the actors engaged in the intervention shape its evolution and how their practices within the intervention also change it. What seems to be needed, therefore, is a more ‘pluralist’ perspective in impacts, one which combines some of the ‘rigour’ of experimentalism with the stakeholder-orientation espoused by constructivism – a position strongly argued for by [BaDu11].

As [Ster07] argues, selection of an ‘appropriate’ IA approach depends on a number of factors, including: the ‘object’ of evaluation; the purposes for which it is commissioned; the capacities and characteristics of different methods – their construct validity/internal validity, external validity; ability to measure and or explain; their requirements for control, large numbers, data availability. He suggests that, in complex social interventions, the ‘rigour’ promised by experimental methods like RCTs has to be complemented by evaluation methods that can capture context and complexity. This is why emerging IA approaches are beginning to blend experimental methods with configurational methods and ‘fuzzy set Qualitative Comparative Analysis’ [Ragi07].

A key challenge for the EmerGent IA concept and methodology, highlighted from the literature, is boundary-setting and units of analysis. There needs to be a clear definition of what are seen as ‘impacts’ and how these relate to intervention ‘results’ and ‘effects’. In the evaluation literature, ‘impacts’ are often defined very loosely, and often mixed with, or used interchangeably with ‘outcomes’ or ‘outputs’. In turn, there are different interpretations of where impacts are situated in relation to the life cycle of an intervention – and hence the life cycle of the evaluation of an intervention. For example, the European Commission takes a particular position on how ‘IA’ is defined in relation to policy development and the design of large scale programmes. In this perspective, IA is defined as an evaluation of the potential economic, social and environmental consequences of the implementation of a policy, programme or intervention. An impact assessment gives decision-makers evidence regarding the need for EU action and the advantages and disadvantages of alternative policy choices. This perspective places IA in the ‘ex-ante’ stage of an intervention and evaluation life cycle, i.e. making a contribution to the design of the intervention by assessing its potential impacts, rather than contributing to the ‘ex-post’ assessment of an intervention’s impacts following its implementation. Ex-ante evaluation is commonly understood as a way of designing programmes that incorporate some vision of the kinds of future outcomes and impacts they are intended to create.

The implication from this is that the EmerGent IA concept and methodology needs to address all three ‘moments’ of the evaluation life cycle – ex-ante (at the design stage); ‘formative’ (as the project evolves) and ‘ex-post’ (at the end of the project) – as well as the four ‘moments’ of the ‘emergency life cycle’, i.e. prevention, preparation, response, recovery. This further reinforces the conclusion that a ‘theory of change’ approach is
needed ex-ante evaluation often involves the implementation of both a specific ‘theory of change’ model as well as instruments that are designed to assess the extent to which the model’s intended outcomes and impacts are realized [Weis95]. Theory of change approaches in evaluation, when set within the context of ex-ante evaluation, typically involve key stakeholders in the design of the ‘theory’ behind interventions at programme, project and individual levels that underpin the ‘vision’ of the intervention (and its intervention logic) [SuSt06].

The EmerGent IA concept and methodology also needs to clearly define its boundaries and units of analysis. There is a degree of consensus on the literature on what these are [Euro05]. Typically, there is a distinction between:

- **Outputs** – these represent the concrete results produced by the project activities, in terms of the services, changed attitudes/practices or knowledge available due to the intervention, for example, in EmerGent, the production of Guidelines and ‘Apps’
- **Results** – these represent the changes and benefits associated with the use of the outputs produced, for example, in Emergent, improved communications between EMS’s and citizens. Results are often split between ‘short-term’ outcomes and ‘intermediate outcomes’.
- **Impacts** – these represent the consequences and broader and longer-term social and economic changes of the intervention beyond the immediate effects. Two concepts of impact can be defined: Specific impacts are those effects occurring after a certain lapse of time but which are, nonetheless, directly linked to the action taken and the direct beneficiaries (e.g. in EmerGent, changes in the organization of EMS in Europe). Global impacts are longer-term effects affecting a wider population (e.g. in EmerGent, systemic and widespread changes in the behaviors of EU citizens during emergencies).

### 3.3 Impact assessment of ICTs and social media in social interventions

ICTs (Information and Communication Technologies) refer to "all technical means used to handle information and aid communication, including computer and network hardware as well as necessary software. In other words, ICT consists of IT as well as telephony, broadcast media, and all types of audio and video processing and transmission" [Unes07]. Social media are commonly considered to be a sub-category of ICT. They are defined in the OED (Oxford English Dictionary) as "Websites and applications that enable users to create and share content or to participate in social networking."

Within the specific field of the impact assessment of ICTs in social interventions, the literature is sparse, uneven in quality and the evidence base on ‘what works’ is underdeveloped. Some systematic reviews have been done on the impact of using ICTs in social interventions across a number of domains, mainly in the fields of education ([HaDe03] and [HBL+06]) and health ([KWB06] and [LLWR11]).

There are a larger number of reviews of the impacts of ICTs that have been carried out using less robust ‘narrative’ or ‘hybrid’ approaches. These, together with the few systematic reviews that have been carried out, suggest a polarisation of opinion between the ‘Utopian’ and ‘Dystopian’ perspectives. On the plus side, for example a review by [Rede08] of the
evidence on the impacts of ‘Web 2.0’ on education and training suggests that social media can contribute to making educational organizations more dynamic, flexible and open. They support co-production of knowledge, not only between professionals but between learners and professionals. They enable educational institutions to intensify their collaboration with other organizations, across borders, language barriers, and sectors. However, other evidence shows negative effects associated with the use of social media in social interventions. For example, work on the contribution of ICTs and social media to supporting the social inclusion of vulnerable young people [FaSe07] suggests that social media can further exacerbate the exclusion of young people because they find they do not achieve results as well as their more able peers.

The main lesson from the literature on impacts is that positive effects associated with using ICTs and social media in complex health, education and social interventions are highly dependent on contextual factors, and using the right tools in the right contexts for appropriate purposes. Research conducted by [PWR08] emphasises that ‘appropriate use’ is crucial for positive outcomes. No single ‘one size fits all’ solution will be effective. Rather, a set of solutions that focus on different groups of target users, within a system that offers sufficient social intervention to engage them, will need to be identified.

Whilst these reviews give some indication of the contribution – positive or otherwise – ICTs make to intervention effects – for example changing student learning patterns and outcomes; changing health risk behaviours and risk outcomes – they tell us little about which IA approaches work best in what situations. A recent review of the literature on IA in ICT-mediated interventions carried out by [HSC11] concluded that much of the work in developing methodologies for IA of ICTs has been pitched at the macro-level, i.e. in relation to assessing policy impacts at a societal level. This means that IA in the field of ICTs lacks granularity. It concentrates on the big picture. However, as noted above, ICTs are not a ‘one-size-fits-all’ solution, and therefore their effects have to be assessed and studied on the ground or in the life environments of citizens. Yet the literature clearly shows that IA at this ‘grounded’ level is poorly developed.

The IPTS (Institute for Prospective Technological Studies) review also included an analysis of the IA approaches, methods and tools applied across a range of complex social interventions carried out in the EU (European Union) using ICT to deliver their objectives. This review of 60 such initiatives analysed the robustness of the IA approaches used, on the basis of factors such as internal consistency, reliability and transferability of evidence. This assessment concluded that IA of ICT’s varies considerably in approach, relevance and credibility, when it is carried out at all. Many of the evaluations and IAs of initiatives employed ‘self-assessment’ approaches and methods, rather than more objective ways of evaluating evidence. Most initiatives adopt a ‘pragmatic’ evaluation paradigm, typically using a combination of feedback methods, interviews and user surveys to develop conclusions on effects. A small proportion adopt a ‘constructivist’ approach, in which the ‘user voice’ figures predominantly and in which users themselves are actively involved as ‘co-producers of knowledge’. There does not appear to be a high degree of alignment between the ‘vision’, purposes and orientation of initiatives and the ‘evaluation paradigm’ adopted.

The overall picture from this research is that little work has been done on developing and applying concepts and methods in technology IA, although there are notable exceptions.
There are few systematic literature reviews, and even fewer examples of ‘meta-analysis’ of the effects of using ICTs to support social interventions. There is an impression of a domain in which an evaluation culture has not yet taken root. A side-effect of this is the lack, to a large extent, of evidence-based practice and, in turn, the lack of a culture of sharing of evidence and experiences amongst the scientific community and communities of practice.

The main reasons for the relatively under-developed use of impact assessment in the technology field appear to be: the lack of an evaluation culture embedded in the domain (which leads to insufficient expectation to do IA; insufficient knowledge of how to do it); the multi-dimensional and long term nature of social interventions and the difficulty of measuring long term and complex impacts, and handling many intervening variables; the variable requirements of sponsoring and funding agencies in carrying out evaluations; pressure to report success.

### 3.4 Impact assessment of social innovations

A review of the literature on social innovations was considered necessary because the core visions of EmerGent, and its key objectives, are consistent with accepted definitions of social innovation. Broadly speaking, social innovation can be defined as “new ideas that work in meeting social goals” [Mulg07]. SOLIDAR [Reut12] defines social innovation as “innovations that are social both in their ends and in their means...new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. In other words they are innovations that are both good for society and enhance society’s capacity to act.”

Two specific features of what is currently considered to be core characteristics of social innovations are of particular relevance for EmerGent – the use of technologies—particularly collaborative social media – to deliver social innovation (as is the case with EmerGent’s exploration of ‘Apps’ to deliver new kinds of EMS management), and the formation of new types of networks and multi-stakeholder partnerships to create new social benefits. These new kinds of delivery arrangements typically involve some form of service integration [DaSi13] (as is the case with EmerGent’s exploration of partnerships involving citizens, EMS, commercial enterprises, civil society and government as delivery vehicles for new kinds of emergency management).

In keeping with the situation for ICTs generally, as noted above, IA in the field of social innovation is under-developed. A study carried out in 2010 for the European Commission, DG Employment, Social Affairs and Equal Opportunities reviewed the different ways in which social IA is currently carried out in the EU in order to identify recommendations for the implementation of effective social impact assessment systems and for effective social impact assessment analysis [Tep10]. The study concluded that social IA is still in its infancy in most European IA systems. Where it takes place at all, the assessment of social impacts is often less well developed than the assessment of economic or financial impacts. Examples of IAs that contain an in-depth analysis of social impacts are few and far between; where they do exist, they are most often conducted on policies with specific social objectives. Social IA in member states takes two main forms. It is either undertaken as one part of an integrated IA that considers all relevant impacts of a proposal, be they economic,
environmental, or social; or through a specific impact test that only covers one specific type of social impact (e.g. gender equality or health impacts).

At this macro-level (i.e. EU-wide or within EU member states) a number of IA approaches have been developed. These include: the 2005 OECD Oslo Manual Guidelines for collecting and interpreting innovation data (incorporating an Innovation Barometer Survey of public service organizations); the Innovation Union Scoreboard (IUS), which compares the innovation performance of different EU Member States against their main trading partners, including the USA, India and China; Measuring public innovation in the Nordic countries (MEPIN) – a 2008 project, initiated by the Danish Ministry of Science, Technology and Innovation, which has a particular focus on ICT-driven social innovation. Most of these initiatives focus on the broader area of general social innovation IA. This area is still strongly influenced by ‘classical’ IA paradigms and methodologies like High Impact Philanthropy – Cost per Impact and Social Return on Investment (SROI). Because these approaches are pitched at trans-national and national level, and because of their focus on broad socio-economic impacts, they are of only marginal interest to EmerGent. However, one particular approach that could have relevance is the Wellbeing and Resilience Measure (WARM) – a tool developed by the Young Foundation, UK. This integrates a wide range of indicators to measure wellbeing (how people feel about themselves and their communities) and resilience (the capacity of people and communities to bounce back after shock or in the face of adversity) [CHM14].

Methodologies to measure the impacts of ICT-mediated social innovation are difficult to find. The only significant research carried out in this field appears to be the IPTS MIREIA initiative [MRT12] which carried out a review of 81 social innovation IA approaches. In keeping with a similar study carried out by IPTS on the impacts of ICTs (cited above), this research highlighted the lack of an established evidence base on how social innovation actors evaluate what they do, and what their actual impacts are. The data gathered by initiatives are generally not sufficiently robust to evaluate their outcomes and to validate their impact. There is no established ‘evaluation culture’ and the evaluation that is carried out reflects differing, sometimes oppositional, approaches and methods; different classifications systems, a scarcity of data, and scattered initiatives characterized by under-developed evaluation skills and capacities. The study showed that only a small number of the social innovations analysed – 5% – used robust IA approaches based on experimental or quasi-experimental methods (for example using control-comparison groups to assess effects). Around a quarter of the approaches identified reflect a ‘pragmatic evaluation’ perspective which looks to arrive at a balanced view of the effects of an intervention, based on ‘triangulation’ of different forms of data derived for example from surveys, observation, focus groups. Around 18% of the examples collected were based on ‘participatory’ and ‘developmental’ IA, where the users of the innovation are actually involved in the co-production of the innovation as it develops over time. The data collection methods and tools used to implement these methodologies constituted a broad spectrum covering surveys, focus groups, observation, action research, simulations, econometric models, case studies and statistical models. In terms of what is being measured, over half the examples collected assessed economic impacts; a similar proportion assessed social impacts and around half of the examples identified included measurement of the impact of ICTs
specifically. An example of a typical ‘pragmatic’ IA approach used to assess the effects of an ICT-mediated social innovation is shown in the Box below.

**Example of IA social innovation IA**

The Institute of Social Informatics and Technological Innovations of the University of Malaysia, Sarawak develops IA approaches in the fields of Rural Informatics, ICT development and ICT for development. The initiative is based on a multi-stakeholder partnership involving the Malaysian and Sarawak State Governments through different ministries and departments, non profit organizations such as Ruram Kelabit Sarawak, PANGAEA, universities (Malaysia Sabah, and Hong Kong City University), telecenters (eLamai, eBario, eBuayan, eLarapan, eBa'Kelalan) and some secondary schools. The IA approach is focused on determining the ICT impact on community development and is based in a bottom-up participatory approach. Some of the tools and methods used in the IA approach are: Outcome mapping, indicators, statistics, surveys, questionnaires, focus groups, participative observation and eAssessment tools. Data collection is conducted once a year, on-line and face to face from the intermediary and the beneficiary of the intervention. Data collected relates to socio-demographic information, ethnic origin, educational level, employment status, number of users enrolled in digital courses, participating in other type of activities and using web-based services, community development and economic outcomes. Short-term outcomes identified by the approach focus on the levels of involvement of individuals in eBario, which continues to grow over time. Finally, one illustration of the long-term impact is that the first community radio license for eBario Radio has been granted from the Malaysian Communications and Multimedia Commission. The main difficulties of the IA implementation relate to the difficulty to attribute causality between activities, perceived outcomes of ICT, cost of evaluation and a lack of experienced post-doctoral researchers to follow-up the process.

Based on the analysis of IA approaches, the MEREIA study proposed a number of conclusions and recommendations for designing IA for ICT-based social innovations:

- There is no ‘one size fits all’ IA solution for ICT social innovation. No particular IA approach or method is ‘best’. A more fruitful approach to IA in this field would be to consider IA as a set of ‘scenarios of praxis’. These scenarios reflect a particular conceptual and methodological focus and orientation of an innovation, which then becomes embedded in the practices of innovation actors and subsequently adapts and develops through ‘use’.

- The main purpose of IA in the field of ICT-mediated social innovation should be to support innovation as a ‘process’ – the process of creating the conditions to enable the embedding and implementation of concepts, methods, tools and practices, and their subsequent adaptation and evolution through use. In other words, the main purpose of an IA framework and tools is to support ‘praxis’.
• Evaluation and IA in social innovation should be designed as a ‘learning process’ that covers the whole intervention life-cycle: from designing interventions through to not only supporting organizational and intervention development by applying the results obtained, but moving further along the ‘impacts journey’ to consider the transferability and replication of practices that ‘make a difference’.

• This ‘learning environment’ needs to incorporate seven key elements: i) a ‘Scoping’ element, providing tools for organizational Analysis, intervention profiling, evaluation Needs Assessment ii) a ‘Training’ element providing tools for evaluation facilitation, webinars, a training toolkit, and training events iii) a ‘Design’ element, providing tools to support: identification of IA Purposes, Objectives, Audiences; guidelines and tools on appropriate Methodology and Methods; tools for assessing IA logistics and resource requirements iv) an ‘Implementation’ element, providing tools on data collection strategies and practices and quality control v) an ‘Analysis’ element, providing tools for Coding; Quality Control; Statistical modelling; Cost analysis; Qualitative analysis vi) a ‘Results’ element, providing tools on Data Reduction; Statistical tests; Verification; Data Triangulation; Review methods and Data Synthesis vii) a ‘Learning’ element, providing tools to support Dissemination; Organizational change; Intervention development; Transferability of results; Replication.

The MEREIA study reinforces the conclusions of other research on IA in the field of social innovations. These include a number of major EU research projects on social innovation: the WILCO project, which examined 77 cases of social innovation in 20 European cities [EEB14]; the INNOSERV project, which developed an evidence base on innovation in social, health and education services, and the impacts associated with such innovation [Inno12]; TEPSIE, which provides a map of the field, reviewing theories, models, methods and identifying gaps as well as developing an evidence base on impacts [MNT13]; and MC-eGov, an initiative that is collecting evidence on the impacts of ICT-driven innovations in public services [Euro09].

A review of the IA dimension in these research programmes suggested that there is no strong evaluation culture embedded in the domain of ICT-mediated social innovation. In the DIT case, all of the projects involved in the programme had undertaken some form of evaluation, with some projects using ‘pre-test/post-test’ methods. The evaluation approaches used vary considerably since they reflect the type of innovation being implemented and the context of implementation.

### 3.5 Impact assessments of social media in emergencies

Since the penetration of social media into most facets of social, economic and cultural life has been a relatively recent development, it is not surprising that the development of methodologies to assess the impacts of social media is itself at an early stage. The following section (3.5.1) outlines the main methods used in previous studies to measure the impact of social media in emergencies, while the next section set out the actual impacts and outcomes identified in such studies (3.5.2). Finally, section 3.5.3 explores the findings of IAs of relevance to EmerGent from other fields, including health and education.
3.5.1 Methods used in previous studies

The review identified a variety of both qualitative and quantitative methods used in previous studies to investigate the use and/or impact of social media in emergency situations. As regards quantitative methods, these included:

- Content analysis of social media data (coding and quantitative analysis)
- Surveys of representative samples (online)
- Experimental studies

As can be seen in Table 4, eight of the 17 studies ([PHSS13], [MRPS11], [OAR13], [LiKI11], [Schw12], [SSJF14], [NRPM12] and [FBBC13]) identified for detailed review utilised some form of quantitative content analysis to analyse social media messages. This includes, for example, an analysis of Facebook and Twitter usage during the earthquake relief efforts in Haiti [MRPS11]. The study team collected 4006 Facebook posts and 6673 Twitter tweets of 41 non-profit and 8 media organizations over a 2-week period from when the earthquake hit Haiti in January 2010. The data were coded and analysed quantitatively to identify any differences in the use of social media by non-profit and media organizations during this emergency. A similar approach was adopted by [SSJF14] more recently, with a greater focus on impact. This study focussed on the difference message content and style made to citizens’ retweeting behaviour during an emergency. It involved collecting, over a 48-hour period, all tweets made by 16 public officials at local, state and federal level who were serving in a public-safety capacity and were actively tweeting about a wildfire when it first developed. The data were once again coded in relation to different relevant theoretical categories and conducted a regression analysis using a negative binomial model.

While most of the studies reviewed used content analysis to study Twitter data, there were some that focussed on other types of social media including Facebook and other types of social media. This included [NRPM12], which explored data from a social media platform for students in Germany which was used during the Love Parade disaster in 2010. Once again a sample of posts on this platform were coded by the research team and analysed quantitatively.

The value of content analysis for the analysis of social media data is that it can provide quantitative evidence of patterns within very large datasets. This relies though on the implementation of a valid and reliable coding strategy to ensure that codes applied to the data are done so in a meaningful, consistent and reliable way.
Table 4: Overview of IAs of social media in emergencies: methods, focus and location

<table>
<thead>
<tr>
<th>Reference</th>
<th>Quant</th>
<th>Qual</th>
<th>Methods</th>
<th>Type of social media</th>
<th>Type of emergency</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dabn12</td>
<td>X</td>
<td></td>
<td>Qualitative interviews, online qualitative survey and qualitative analysis of Facebook posts</td>
<td>Twitter: X, Facebook: X</td>
<td>Natural disaster</td>
<td>NZ</td>
</tr>
<tr>
<td>Smit10</td>
<td>X</td>
<td></td>
<td>Qualitative analysis of tweets</td>
<td>Facebook: X</td>
<td>Natural disaster</td>
<td>Haiti</td>
</tr>
<tr>
<td>PHSS13</td>
<td>X</td>
<td></td>
<td>Content analysis</td>
<td>Facebook: X</td>
<td>Various</td>
<td>Various</td>
</tr>
<tr>
<td>BKJ10</td>
<td>X</td>
<td></td>
<td>Qualitative interviews</td>
<td>Twitter: X, Facebook: X</td>
<td>Various</td>
<td>USA</td>
</tr>
<tr>
<td>MRPS11</td>
<td>X</td>
<td></td>
<td>Content analysis</td>
<td>Twitter: X, Facebook: X</td>
<td>Natural disaster</td>
<td>Haiti</td>
</tr>
<tr>
<td>OAR13</td>
<td>X</td>
<td></td>
<td>Content analysis</td>
<td>Facebook: X</td>
<td>Terrorist attack, product recall, crime</td>
<td>USA and India</td>
</tr>
<tr>
<td>YaPa11</td>
<td>X</td>
<td></td>
<td>Participant observation</td>
<td>Twitter: X</td>
<td>Natural disaster</td>
<td>Haiti</td>
</tr>
<tr>
<td>Liki11</td>
<td>X</td>
<td></td>
<td>Content analysis</td>
<td>Twitter: X</td>
<td>Health/Disease</td>
<td>USA</td>
</tr>
<tr>
<td>Schw12</td>
<td>X</td>
<td></td>
<td>Content analysis</td>
<td>Twitter: X</td>
<td>Public event/disaster</td>
<td>Germany</td>
</tr>
<tr>
<td>SSJF14</td>
<td>X</td>
<td></td>
<td>Content analysis</td>
<td>Twitter: X</td>
<td>Natural disaster</td>
<td>USA</td>
</tr>
<tr>
<td>HjK11</td>
<td>X</td>
<td></td>
<td>Focus group</td>
<td>Twitter: X, Facebook: X</td>
<td>Natural disaster</td>
<td>Japan</td>
</tr>
<tr>
<td>Freb12</td>
<td>X</td>
<td>X</td>
<td>Focus group, survey, experiment</td>
<td>Twitter: X, Facebook: X</td>
<td>Food recall</td>
<td>USA</td>
</tr>
<tr>
<td>Sug11</td>
<td>X</td>
<td></td>
<td>Experiment</td>
<td>Twitter: X, Facebook: X</td>
<td>Product recall</td>
<td>Germany</td>
</tr>
<tr>
<td>NRPM12</td>
<td>X</td>
<td>X</td>
<td>Content analysis, qualitative interviews, online survey</td>
<td>Twitter: X</td>
<td>Public event/disaster</td>
<td>Germany</td>
</tr>
<tr>
<td>Spn14</td>
<td>X</td>
<td></td>
<td>Experiment</td>
<td>Twitter: X, Facebook: X</td>
<td>Food infection</td>
<td>USA</td>
</tr>
<tr>
<td>FBBBC13</td>
<td>X</td>
<td>X</td>
<td>Data mining, content analysis, qualitative interviews</td>
<td>Twitter: X</td>
<td>Natural disasters</td>
<td>Australia, NZ</td>
</tr>
<tr>
<td>MSB13</td>
<td>X</td>
<td></td>
<td>Qualitative interviews, focus groups</td>
<td>Twitter: X</td>
<td>Various</td>
<td>Various</td>
</tr>
</tbody>
</table>

29/90
An alternative quantitative method employed by a few studies ([Freb12], [NRPM12]) reviewed is the use of online surveys. [NRPM12] used this approach as part of its research on the Love Parade disaster – this included conducting an online questionnaire of 174 participants who had used social media in relation to the disaster. Participants were recruited to the study via various social media platforms with the explicit request to explore “the role of social media in the context of the Love Parade 2010”. The survey aimed to explore the function of social media for such users – including how they used and why they used social media within this disaster situation.

The value of online surveys such as this lie in gaining robust quantitative data from a sample of respondents relating to their views, experiences or attitudes towards the use or impact of social media in emergencies. This relies on choosing a representative sample of respondents in order to provide robust quantitative evidence of the questions under study.

As noted above, RCTs are often said to be the gold standard of quantitative evidence [CaSt73] because they offer the prospect of clear-cut results about whether a particular intervention has had the anticipated results (see section 3.2.1). In cases where it is not possible to adopt an RCT due to the nature of the subject area under study, it may still sometimes be possible to use quasi-experimental designs to explore the differential response of different groups of participants to a particular situation or intervention. These typically use ‘robust’ evaluation methods – for example comparing the situation ‘before’ and after, or using a ‘counter-factual’ method to assess the likelihood of what might have happened in the absence of an intervention – but may not necessarily apply randomisation.

Such approaches were used by a few of the studies reviewed ([Freb12], [SUG11], [SPN14]). This included a study [Freb12] to explore the impact of crisis messages communicated to consumers via a survey of 400 participants. Focus groups, qualitative interviews and an online survey was initially used to develop an experimental tool, consisting of four fictional scenarios, to explore the response of individuals to a food recall message from different sources (official and non-official). This tool was then used with a nationally representative consumer panel to explore whether consumers were more or less likely to respond to crisis messages communicated via social media depending on the source of the message. A very similar approach was adopted by [SPN14] to explore the impact of social media type, source and information provided on students’ responses to a crisis message within a university setting. In this case, the research team once again set up an online experiment in the form of a scenario study to explore how more than 400 participants responded to particular (fictional) scenarios. As part of this study, research participants – randomly allocated to eight experimental groups – were asked to read a hypothetical crisis scenario and to complete an online questionnaire to measure their responses.

The value of such experimental studies is to provide quantitative evidence of different responses to scenarios or prompts in relation to social media use. It is worth noting though that fictional scenarios may elicit different responses than real situations or emergencies and so the value of findings from such studies may be limited.
The reviewed studies also employed a variety of qualitative methods, including:

- Qualitative one-to-one interviews
- Focus groups
- Online qualitative surveys
- Participant observation
- Qualitative analysis of social media data

Several of the studies reviewed adopted a case study methodology, employing one-to-one qualitative interviews ([Dabn12], [BKLJ10], [NRPM12], [MSB13]) or focus groups ([Freb12], [HjK11], [MSB13]). While quantitative surveys can provide a robust overview of the views, experiences or attitudes of a sample of respondents towards the use or impact of social media in emergencies, qualitative interviews can sometimes allow researchers to explore particular issues or topics in more depth, involving a non-representative group of participants. Qualitative interviews can take different forms – structured or unstructured – and take different delivery approaches, conducted either face-to-face, via the telephone or by email; they can be done one-to-one or involving groups.

[Dabn12] used a qualitative methodology when investigating how one university had utilised Facebook for information and support purposes following a natural disaster. In-depth qualitative interviews with two members of staff, a qualitative online survey of 3500 students (using mainly open-ended questions, rather than closed questions as in a quantitative survey) and documentary analysis were used together to construct a case study of how the university had responded to the September 2010 Canterbury earthquake in New Zealand. [BKLJ10] and [MSB13] on the other hand used qualitative interviews with EMS to explore their use of social media in emergencies, while [NRPM12] and [Freb12] employed qualitative interviews and focus groups respectively to develop scenarios for a quantitative experiment.

As noted above, the value of qualitative interviews lies in exploring particular questions in depth with a non-representative group of participants – indeed, it allows the research to focus on particular individuals or key informants who are believed to be able to provide expert opinions or views on the use or impact of social media in emergencies, such as EMS staff or citizens with first-hand experience of an emergency. This means though that the findings from such research are usually not generalizable to a wider audience – however, the results can sometimes be tested using a quantitative methodology, with the qualitative interviews acting as a first step towards a more generalizable theory.

One recent study [YaPa11] used participant observation as part of an action research approach to study the response of a US government agency to the 2010 Haiti earthquake. The research explored how social media were used in this situation, what influences they made on knowledge sharing, reuse and decision-making among the agency staff and staff of other organizations and how knowledge was effectively (and at times ineffectively) maintained in these systems. It was conducted by a US Air Force reserve officer who supported the relief effort while at the same time studying the use of social media by the agency.

Such an action research approach can provide valuable first-hand experiences and insight into the realities of social media in organizations with an aim of improving approaches...
used rather than just studying them passively. In other words, it involves making active contributions to the community being studied while undertaking the research. However, such an embedded approach is sometimes criticised for lacking objectivity as the researchers may not be able to distance themselves sufficiently from the phenomena and organizations being studied.

Finally, another study [Smit10] adopted a qualitative methodology to analyse 1400 Twitter tweets once again focussing on the 2010 Haiti earthquake. Rather than using a quantitative content analysis method to code and analyse the frequency of particular types of messages, the authors employed a constant comparative method to categorize tweets into topics of discussion surrounding the disaster. Based on the ‘grounded’ evaluation approach developed by [GuLi89], the constant comparative method involves breaking data down into discrete incidents or ‘units’ and then coding them into categories. Successive comparison of these units, and their inter-relationships, enables an integrated and coherent explanatory theory to be developed. This was used to explore how social media such as Twitter to create new types of social public relations.

The advantage of such an approach is that it allows a more in-depth exploration of the use of social media by different actors – with a focus on the tone and content of individual messages. At the same time, such an approach can be very time consuming and does not provide a generalizable theory about social media use in emergencies.

Table 5 provides an overview of the methods identified in previous studies and explores their relevance to EmerGent, as well as their strengths and weaknesses – it also outlines the main requirements or prerequisites of using each method as part of the case study work.
### Table 5: Overview of impact assessment methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Possible purpose(s)</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantitative</strong></td>
<td><strong>Quantitative content analysis</strong>&lt;br&gt;Identify patterns of use within large social media datasets – in relation e.g. to their content or source.&lt;br&gt;To answer questions such as: What types of messages are more likely to be retweeted? What types of messages are more likely to generate a response? Etc.</td>
<td>Provide generalizable / statistical evidence&lt;br&gt;Large complex datasets are reduced to a few categories to answer specific quantitative questions</td>
<td>Coding data is time intensive&lt;br&gt;Detail can be lost in reducing the data to a few categories</td>
<td>Access to data (Twitter, Facebook, etc.)&lt;br&gt;Ensure that there is inter-coder reliability – those coding the data assign codes / categories consistently&lt;br&gt;Knowledge of statistical analysis techniques to analyse data</td>
</tr>
<tr>
<td><strong>Experiment</strong></td>
<td><strong>Compare the responses of citizens or EMS to different scenarios.</strong>&lt;br&gt;To answer questions such as: Are citizens more likely to respond to a message from a trusted source than from an unknown source?&lt;br&gt;What would EMS response be to a particular message provided to them via SM or</td>
<td>Provide generalizable / statistical evidence&lt;br&gt;Simulate emergency situations and citizens and EMS responses to them – to provide an insight into how they might respond in a real life emergency.</td>
<td>The findings from an experiment may not be relevant to real life emergency situations – i.e. simulations or scenarios may elicit unrealistic responses</td>
<td>Access to a large sample (in the 100s) of citizens or EMS to conduct the experiment.&lt;br&gt;Ensure that scenarios used will be clear to all those taking part in the experiment.&lt;br&gt;Knowledge and experience of designing and running experiments.&lt;br&gt;Knowledge of statistical analysis techniques to analyse data</td>
</tr>
</tbody>
</table>
## D2.1 Concept for Impact Assessment

### Method

<table>
<thead>
<tr>
<th>Method</th>
<th>Possible purpose(s)</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantitative</strong></td>
<td>by telephone?</td>
<td></td>
<td></td>
<td>analyse data</td>
</tr>
<tr>
<td></td>
<td>Explore the views, experiences or attitudes of a representative sample of citizens or EMS using mainly closed questions. To answer questions such as: What difference did using SM in an emergency make to citizens/EMS?</td>
<td>Provide generalizable / statistical evidence of citizens’ or EMS’ responses.</td>
<td>Achieving high response rates can be very difficult – thus reducing the validity and / or relevance of the findings.</td>
<td>Access to a representative sample of respondents – citizens and / or EMS. Knowledge and experience of designing surveys Knowledge of statistical analysis techniques to analyse data</td>
</tr>
<tr>
<td><strong>Qualitative</strong></td>
<td>Interviews/Focus groups</td>
<td></td>
<td></td>
<td>Interviewers need to be able to engage with interviewees and probe for deeper insights into the experiences, views or attitudes explored. Access to citizens or EMS to provide relevant information. Knowledge of qualitative analysis techniques to analyse data</td>
</tr>
<tr>
<td></td>
<td>Explore the views, experiences and attitudes of a non-representative group of citizens or EMS in-depth. Explore ‘what if’ scenarios to provide new ideas or solutions. To answer questions such as: How did EMS use SM in this emergency, what</td>
<td>Allows the research to explore “Why? How? In what way?” questions in depth.</td>
<td>Analysing the data can be very time intensive. Responses are not generalizable beyond the people interviewed and so may not provide a true picture of citizens’ or EMS’ views.</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>Possible purpose(s)</td>
<td>Strengths</td>
<td>Weaknesses</td>
<td>Prerequisites</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Survey (open-ended)</td>
<td>difference did it make and why? What would help to increase the impact in future?</td>
<td>particular topic or question.</td>
<td>Not possible to explore responses of citizens/EMS in more depth or clarify meanings. Analysis the data can be very time intensive. Responses are not generalizable beyond the people interviewed and so may not provide a true picture of citizens’ or EMS’ views.</td>
<td>Need for agreed coding framework to categorise responses. Access to a sufficiently large sample of citizens or EMS to provide relevant information. Knowledge and experience of designing and analysing qualitative surveys.</td>
</tr>
<tr>
<td>Participant observation</td>
<td>Gain first-hand experiences of the use of SM by EMS in emergencies.</td>
<td>Allows researchers to collect in-depth case study evidence of the use of SM by an EMS in one or more emergencies.</td>
<td>Time intensive nature of this approach means that the research can focus only one or two cases. Researcher may not be able</td>
<td>Access and skills to participate in or observe an EMS during an emergency. Knowledge and experience of</td>
</tr>
</tbody>
</table>
## Method

<table>
<thead>
<tr>
<th>Method</th>
<th>Possible purpose(s)</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Prerequisites</th>
</tr>
</thead>
</table>
| Qualitative content analysis  | Identify the different ways in which SM are used to generate responses to a disaster. To answer questions such as: How did citizens use SM in an emergency – what responses did they generate among EMS? | Large complex datasets are reduced to a few categories to explore particular qualitative questions. | Analysing the data is very time intensive                                                      | Access to data (Twitter, Facebook, etc.)
|                               |                                                                                                                                                                                                                  |                                                                           |                                                                                               | Ensure that researchers categorising the data do this in a consistent way.                       |
3.5.2 Impacts and outcomes of the use of social media in emergencies

There are at the moment very few studies at the moment which provide detailed evidence on the outcomes or impact of the use of social media in emergencies on EMS or citizens. Instead, much of the research reviewed so far provides insights into the reasons for using social media and the different uses of it in such situations.

The few studies which do provide some evidence of outcomes or impacts illustrate:

- **The way different types of Twitter tweets by citizens during emergencies are more likely to create rumors** [OAR13] – this was done via a quantitative content analysis of tweets during the three recent emergencies (the 2008 Mumbai terrorist attack, the 2010 Toyota recall and the 2012 Seattle café shooting) to measure the effect of anxiety, information ambiguity, personal involvement, and direct messages in tweets on the likelihood of rumor creation

- **The positive effects of the use of social media on knowledge sharing processes within and across organizations** [YaPa11] – this was shown via a case study of a disaster relief operation in Haiti via participant observation

- **The positive impact of two-way conversations with citizens via Twitter and Facebook on the work of the American Red Cross** [BKLI10] – explored via qualitative interviews with 40 Red Cross employees

- **The impact of thematic content, message style and number of Followers of tweets sent by 16 public officials at local, state and federal level at the start of a wildfire on citizens’ retweeting behavior** [SSJF14] – studies using quantitative content analysis of tweets send during a 48-hour period

- **The role of social media in helping or hindering citizens’ management of a crisis and the emotional support it can provide** [HjKi11] – explored via an in-depth focus group with five graduate students who experienced the March 2011 earthquake disaster in Japan

- **The effect of crisis message source and content communicated via different types of social media on citizens’ intention to comply studied via experimental designs** ([Freb12], [SPN14] and [SUG11])

3.5.3 Impacts and outcomes of the use of social media in other areas

As with the literature on ICTs generally, cited above, there has been a concentration of research in social media IA in two main fields: health and education. A review of the literature on evaluations of social media-driven interventions in healthcare [OWBU+09] concluded that IA of social media interventions requires the design and application of a ‘dynamic framework’. This suggests incorporating technology (e.g. system robustness, reliability, usage statistics) and computer-mediated interaction (e.g. usability, accessibility, interactivity) elements within system evaluations, to move beyond simply collecting end user statistics and to integrate evaluation methods from multiple disciplines. The ‘dynamic framework’ incorporates five impact assessment themes across three evaluation phases, as shown in Table 6 (adapted from [OWBU+09]).
A review of the use of ‘Web 2.0’ in education and training [Rede09] in 250 EU projects concluded that evaluation data and scientific evidence is scarce. Most initiatives did not collect systematic data on impacts. Very few implemented ‘experimental’ approaches using control-comparison groups. Much of the evidence is anecdotal. This and similar studies recommended that more systematic approaches to impacts evaluation of social media needed to be developed, incorporating indicators on outputs and outcomes; evidence on internal consistency, reliability and transferability of data. At the same time it was recognised that the ‘grass roots’ nature of many of these innovations required IA approaches to be adaptable to the context of use, and to reflect the voices of the key actors involved.
A third key sector that has played an instrumental role in the development of IA approaches for social media interventions has been international development. This work is of relevance to EmerGent because much of it has been done in the context of conflict and emergency situations. A recent review of evaluations of the use of media in conflict situations (covering ‘traditional’ media such as radio and press as well as social media like Twitter) carried out by the US Institute of Peace [AHA11] concluded that there are several factors associated with conflict and emergency situations that inhibit the effective application of IA methods to establish the effects of the use of social media. One important factor is the effect of security considerations. The report quotes a recent British National Audit Office report which found that security considerations had disrupted the monitoring and evaluation plans of 40 percent of DFID (Department for International Development) programs in fragile states. Researchers and program implementers must continually adapt their plans in response to unexpected shifts in safety, economic, and social conditions. The Report concludes that IA needs to take several concrete steps to improve evaluation, and proposes a number of principles – the ‘Caux Principles’ - intended to improve evaluation of media-based interventions. These include enabling better collaboration between donors and implementers, expanding financial support for evaluation, encouraging realistic and honest assessments of project successes and failures, designing flexible evaluation plans that are sensitive to changing conditions on the ground, and engaging with local researchers. In particular the Caux Principles include recommendations for applying ‘theory of change’ frameworks in IA, reflecting the set of beliefs or assumptions about how change happens and how these link to programme ‘logic models’. The Report observes:

“There is broad agreement among those working in conflict environments and in the international development and peace support community that theories of change benefit M & E frameworks by providing a systematized means of thinking about the different components of project planning, implementation, and evaluation. But too often, monitoring and evaluation plans are drafted without a clear articulation of the theory of change that guides a specific media intervention. Failure to articulate theories of change impedes learning from the research process, because there is no systematic test of which theories work and which do not.”

The emphasis placed in the ‘Caux’ approach on contextualisation of IA, on the incorporation of mixed data collection methods and on the use of participatory approaches involving target groups is echoed in the literature on IA of the use of social media in emergencies. This reflects two main factors: the distinctive life-cycle of emergencies, as they unfold in a four-stage evolution of prevention, preparation, response and recovery – each of which has its own distinctive chronology – and the complexity of the emergency scenarios involved, each of which has its own contextual situation. Because of this, IA approaches for evaluating the effects of social media in emergencies tend to blend real-time data-mining with an array of multi-methodological data collection and analysis techniques. A review of the approaches used in emergency situations [WKWK12] concludes that, because emergencies involve interaction between all community stakeholders, a holistic approach to IA is required. This would entail combining real-time data gathering and analysis with an ‘action research’ approach, using social media to develop responses as situations evolve, with community actors playing a role as co-producers of knowledge. Using an Action Research framework, the approach proposed combines qualitative and quantitative research
(triangulation) where actual data from interactions will produce information that can be used in the real world. Other studies have argued a similar case for applying Action Research approaches in measuring the impact of social media in emergencies. [RDMM11] for example conducted a study focusing on identifying the most effective design, implementation and evaluation features for changing the overall preparedness, communication, and knowledge management processes for emergency responses. The conclusion of the study was that action research offered the best solution in terms of supporting multi-stakeholder interactions, using impacts data in rapid response decision-making, collecting and analysing data on impacts and using these data for future learning.

3.6 Conclusions and implications for EmerGent

The review presented above highlights a number of conclusions and implications for the design and implementation of the EmerGent IA concept and methodology, as follows:

- Experimental methods – RCTs – still remain the ‘gold standard’ in impact assessment. However, these are extremely difficult to apply in complex social interventions like EmerGent because of various factors including the inability to control for intervening variables and, as a consequence, difficulties in establishing ‘attribution’ (cause and effect); attrition of population; high resource and time costs; the lack of involvement of users in IA. In fact, recent developments in evaluation methods and practices have argued for combining ‘robust’ approaches with ‘participatory’ approaches that capture context and the perspectives of people ‘on the ground’.

- No one assessment paradigm can be seen as inherently ‘superior’ to another, or in other words, there are different social constructions of ‘social reality’, and of ‘truth’ and ‘evidence’. This implies that it is legitimate to apply different assessment paradigms and different IA approaches to suit different circumstances. For EmerGent, this suggests that the voice of the ‘user’ in IA needs to be considered; IA needs to reflect a ‘pragmatic’ dimension, reflecting logistics, costs and effort; it needs to balance ‘relevance’, in terms of its social and cultural embeddedness, with ‘objectivity’.

- To maximize objectivity, the EmerGent IA concept and methodology needs to have an underlying theoretical position that gives some form to process or context mechanisms in order to explain subsequent outcomes that can be tested by observation. This suggests using a ‘theory of change’ approach as the central framework for the concept and methodology.

- The theory of change framework should be developed as a ‘dynamic framework’, capable of responding to the evolution of EmerGent as it develops – possibly in ways that were not originally envisaged. This dynamic element also needs to reflect the life cycle of EmerGent’s ‘unit of analysis’ – the four-stage process of prevention, preparation, response and recovery in emergencies.

- The IA approach needs to clearly define what are seen as ‘impacts’ and how these relate to intervention ‘results’ and ‘effects’. It needs to distinguish between outputs, outcomes, results and impacts.

- The design of the EmerGent IA concept and methodology needs to reflect the project’s status as an ‘ICT-driven social innovation’. At present, IA in this field is
poorly-developed, and lacks an established evidence-based on what works. The literature on research and practice in this field reflects the lack of an evaluation culture. Most interventions lack robust evaluation designs and tend to use IA tools and indicators that rely heavily on anecdotal evidence. There are few guidelines to help shape the EmerGent concept and methodology. Most of the IA frameworks that have been developed are pitched at the ‘macro-level’ (i.e. at trans-national or national impacts of innovation) and focus primarily on assessing social rates of return.

- The review of IA approaches used in previous studies to investigate the use and/or impact of social media in emergency situations shows that this field is underdeveloped and is rapidly evolving. What little literature there is suggests that IA approaches typically adopt a multi-methodological strategy, combining content analysis (including quantitative content analysis) with surveys, focus groups and observation. There is very little evidence of more novel methods being applied beyond these conventional methods, for example using social network theory or action research – although some examples were identified using quasi-experiments to investigate the impact or use of social media in emergency or disaster situations.
4 Review of Key EmerGent Concepts

This section looks at key concepts used in EmerGent and discusses their use in the wider literature. The aim is to gain some definitional clarity which will support further work in WP2 (the impact assessment and other tasks) as well as other WPs.

4.1 Definitions and classifications of emergencies

4.1.1 Emergencies versus disasters

Both in official (EU) publications and academic writing, the word ‘emergency’ often seems to be used synonymously with the word ‘disaster’. For instance, ECHO (EU Humanitarian Aid and Civil Protection Department) talks of the disaster cycle (prevention, preparedness, response and recovery) rather than using the phrase emergency (management) cycle [WWW01]. And the 2007 Council Decision establishing the Community Civil Protection Mechanism covers “all types of major emergencies occurring inside or outside the Community, including natural and man-made disasters, acts of terrorism and technological, radiological and environmental accidents, including accidental marine pollution” [WWW02].

However, as [BSB13] point out, “disasters are distinguished from emergencies – events which require urgent action and which might involve destruction or injury and extra resources or operational procedures – by their scale”. In other words, a disaster is a major emergency that goes beyond a small geographic space and requires help from the outside. Thus, they present four levels of emergency:

- **First (lowest) level, or everyday emergencies**: this is about routine events, e.g. a car accident or a stroke in a public place.
- **Second level emergencies**: those events that can be dealt with within the municipality or local level without requiring significant resources from outside areas. This includes severe flooding or a power outage.
- **Third level of emergency**: a major incident or disaster requiring regional or ‘inter-jurisdictional’ resources and higher levels of coordination. Examples include a train accident.
- **The fourth level**: refers to a national or international disaster, an event of such magnitude and seriousness that it can be managed only with the full participation of the national government, and perhaps also international aid. Examples include an earthquake or an act of terrorism.

According to the EmerGent DOW, the project will not only focus on big emergencies but also smaller incidents that may escalate. Therefore, the project spans all four levels as outlined above.

In addition to looking at scale, another way of distinguishing everyday emergencies from the large(r) scale emergencies (or disasters) is to look at the impact they have on EMS. [Quar06] points out that research has found at least four differences in the way organizations are affected by disasters (as opposed to everyday emergencies):
In disasters, organizations have to quickly relate to far more and unfamiliar converging entities as large number of different types of organizations can be on site (one study in Canada found that 348 organizations were present).

Adjustment has to be made to losing autonomy and freedom of action. Since community and crisis-time needs and values take precedence over everyday ones, all groups may be monitored and ordered about by social entities that may not even exist in routine times, or where the destruction of property is accepted to save lives in search and rescue efforts, or in the building of levees or firebreaks.

Different performance standards are applied. For example, the normal speed of response and individualized care given to treating the injured is superseded by a need to curtail the level of care given to victims as well as spending time, efforts and resources on more equitably distributing the many victims to the available medical facilities.

There is a much closer than usual public and private sector interface. The need for the quick mobilization of resources for overall community crisis purposes often leads to a preemption of everyday private rights and domains. This means that goods, equipment, personnel and facilities in the private sector are often without due process or normal organizational procedures requisitioned by public agencies for the common good. Everyone, be they individuals or groups, becomes subject to being taken over by governmental groups.

This would perhaps suggest that the potential (positive) impact of using social media is potentially greater in ‘disasters’ than everyday emergencies, for instance if their use can be harnessed to coordinate the efforts of the range of actors present or direct resources to areas with large numbers of affected people. Both the case study work in WP2 and the broader EmerGent impact assessment could usefully cover this dimension.

4.1.2 Emergencies versus catastrophes

Whilst larger scale emergencies (or disasters) can be distinguished from everyday emergencies, they can also be delineated from catastrophes. Catastrophes are events where “the whole community has been severely impacted (...) [own highlight]. The affected population cannot rely on friends and family to help them, because friends and family are also affected. The emergency management organizations in the community are also affected, and so the normal mechanisms put in place to provide assistance have themselves broken down.” [BSB13]. Examples of catastrophes include what happened in in New Orleans and other localities in Hurricane Katrina, the earthquake that hit Messina, Italy in 1906 to the Tangshan earthquake in China in 1986.

According to [Quar06], differences between emergencies / disasters and catastrophes can be especially seen at the organizational, community and societal levels. Six ways in which they differ are that in catastrophes:

1. Most or all of the community built structure is heavily impacted. For example, Hurricane Hugo destroyed or heavily damaged more than 90 percent of all homes in St. Croix. That made it impossible, for instance, for displaced victims to seek shelter with nearby relatives and friends. In contrast, only parts of a community are typically impacted even in major disasters. In catastrophes, the facilities and operational
bases of most emergency organizations are themselves usually hit, making work operations in them impossible. In major disasters, however, the great majority normally survive with little or no damage.

2. Local officials are unable to undertake their usual work role, and this often extends into the recovery period. This is because some local workers either are dead or injured, and/or unable to communicate with or be contacted by their usual clients or customers and/or are unable to provide whatever information, knowledge or skills, etc. they can usually provide. One overall consequence is that because local personnel are casualties and/or usual community resources are not available, many leadership roles may have to be taken by outsiders to the community. This can mean that the local-outsider organizational friction that only occasionally arises in disasters can become a major problem in a catastrophe.

3. Help from nearby communities cannot be provided. In many catastrophes, not only are all or most of the residents in a particular community affected, but often those in nearby localities are also impacted.

4. Most, if not all, of the everyday community functions are sharply and concurrently interrupted. In a catastrophe, most if not all places of work, recreation, worship and education such as schools totally shut down and the lifeline infrastructures are so badly disrupted that there will be stoppages or extensive shortages of electricity, water, mail or phone services as well as other means of communication and transportation. Even in major disasters, there is no such massive across-the-board disruption of community life even if particular neighborhoods may be devastated. Such disruption appears to lead to decentralized decision making, particularly of an emergent nature which may continue as the crisis lessens. The idea that there could be any centralized control imposed on these disparate decisions and varying community activities flies in the face of what researchers have found occurs in crises.

5. The mass media system especially in recent times socially constructs catastrophes even more than they do disasters. There is much more and longer coverage by national mass media. This is partly because local coverage is reduced if not totally down or out. There is even more of a gulf between the content of the electronic media and the print media (with the latter focusing on looting and other dramatic visuals). There is far less of the normal filtering and screening of stories especially in the electronic media. Some of the more important consequences of these kinds of media activity were that in Katrina there was far more diffusion of rumors than occurs in disasters. While looting did occur, which is atypical for disasters, the anti-social behavior was widely depicted as typical when the prosocial behavior was by far the norm (it should also be noted that a catastrophic situation is only one condition necessary to have mass looting). The question of “who is in charge?” was reiterated over and over again, as if it was a meaningful question, reflecting the command and control model that disaster research has indicated does not work well in disasters, much less in catastrophes.

6. Finally, because of the previous five processes, the political arena becomes even more important. All disasters of course involve, at a minimum, local political considerations. But it is a radically different situation when the national government and the very top officials become directly involved. Even in very major disasters, a
symbolic presence is often all that is necessary. In catastrophes, that symbolism is not enough, particularly for the larger society.

[Quar06] argues that whilst there is little difference between disasters and catastrophes in terms of how individuals react (citizens rarely panic, family or household units mostly undertake evacuation, and neighbours help one another) for the organizational level catastrophes mean:

- Even slower organizational assessments of the problems in the situation
- Poorer and more inaccurate information flows between agencies
- A substantially greater difficulty in coordinating the organized response which makes an incident command system (which is a dubious arrangement even for disasters) even less appropriate for a catastrophe.
- The implications for the use of social media are as follows:
  - The comprehensive destruction of infrastructure in a catastrophe might make the use of social media (via mobile telephony) impossible.
  - At the same time, there is clearly an opportunity for social media use in these situations (should it be possible), e.g.: improving accuracy of information flow between EMS, offering local affected people and communities tools to help themselves, support effective decentralized decision making.

On balance, therefore, it would seem useful to include a case study of a catastrophe in the WP 2 work of EmerGent (if possible) in order to understand the (potential) use and impact in such extreme circumstances better.

4.1.3 In summary

The word ‘emergency’ covers a range of risky situations, from the everyday accident to a major catastrophe. It would seem that EmerGent should usefully cover the whole spectrum of these emergencies in order to understand use and (potential) impact in these different (and extreme) scenarios so that key outputs (such as guidance documents, data mining methodologies and the EmerGent app) can benefit from this analysis. In practice, however, events that can be classified as catastrophes are rare in Europe. Certainly within the timeframe we are looking to cover with the impact assessment work (at most five years into the past) few if any of such events have occurred in Europe. Practically, therefore, the EmerGent impact assessment will cover any emergency other than catastrophes as defined in the text above.

4.2 Types of emergencies

As well as understanding better what we mean by emergency, it is useful to be explicit about the types of emergencies that exist. A range of typologies have been developed, each varying slightly in scope. For instance:

- The International Disaster database (em-dat) distinguishes between two generic categories for disasters (natural and technological) [Cent2009].
- The International Federation of Red Cross and Red Crescent Societies distinguishes natural hazards (naturally occurring physical phenomena caused either by rapid or
slow onset events) from technological or man-made hazards (events that are caused by humans and occur in or close to human settlements) [WWW03].

- [BSB13] makes a clear distinction between a hazard (an event or phenomenon that has the potential to cause harm) and the disaster, drawing on UNISDR which draws a distinction between natural hazards (earthquakes, floods, droughts and cyclones) and the damage they cause (the disaster) [WWW04].

However, it would seem that the classifications offered are not mutually exclusive but merely offer different levels of granularity. One of the main differences seems to be the extent to which man made, and in particular social, disasters are captured. Here, the classification offered by the International Federation of Red Cross and Red Crescent Societies seems to be particularly strong. The table below therefore presents an attempt at amalgamation of the three classifications mentioned above to offer as comprehensive a typology as possible to inform the EmerGent impact assessments.

**Table 7: Types of hazards and disasters**

<table>
<thead>
<tr>
<th>Type of hazard</th>
<th>Examples of emergencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Natural hazards</strong></td>
<td></td>
</tr>
<tr>
<td><em>Naturally occurring physical phenomena caused either by rapid or slow onset events</em> [WWW02].</td>
<td></td>
</tr>
<tr>
<td>Geophysical</td>
<td></td>
</tr>
<tr>
<td>(Events originating from solid earth)</td>
<td>Earthquakes, landslides, tsunamis, volcanic activity, accelerated erosion, subsidence</td>
</tr>
<tr>
<td>Hydrological</td>
<td></td>
</tr>
<tr>
<td>(Events caused by deviations in the normal water cycle and / or overflow of bodies of water caused by wind set-up)</td>
<td>Avalanches, floods, flash floods</td>
</tr>
<tr>
<td>Climatological</td>
<td></td>
</tr>
<tr>
<td>(Events caused by long-lived/meso to macro scale processes (in the spectrum from intra-seasonal to multi-decadal climate variability)</td>
<td>Extreme temperatures, droughts, wildfires</td>
</tr>
<tr>
<td>Meteorological</td>
<td></td>
</tr>
<tr>
<td>(Events caused by short-lived/small to meso scale atmospheric processes (in the spectrum from minutes to days)</td>
<td>Cyclones, storms / wave surges, hurricanes, tornados, ice storms, blizzard, lightning, rainstorm, hailstorm, fog, snow, snow avalanches</td>
</tr>
<tr>
<td>Biological</td>
<td></td>
</tr>
<tr>
<td>(Disaster caused by the exposure of living organisms to germs and toxic substances)</td>
<td>Disease epidemics, insect / animal plagues or infestations, crop blight, epizootic</td>
</tr>
</tbody>
</table>
### 2.1 Concept for Impact Assessment

#### Type of hazard

<table>
<thead>
<tr>
<th>Type of hazard</th>
<th>Examples of emergencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technological hazards</strong></td>
<td></td>
</tr>
<tr>
<td>Events caused by humans and occur in or close to human settlements</td>
<td></td>
</tr>
<tr>
<td><strong>Hazardous materials and processes</strong></td>
<td>Carcinogenic, mutagens, heavy metals and other toxins, industrial accidents</td>
</tr>
<tr>
<td><strong>Dangerous processes</strong></td>
<td>Structural failures, radiation emissions, manipulating and transporting hazardous materials</td>
</tr>
<tr>
<td><strong>Devices and machines</strong></td>
<td>Explosives, unexploded ordnance, vehicles, trains, aircrafts, transport accidents</td>
</tr>
<tr>
<td><strong>Installations and plans or critical infrastructure</strong></td>
<td>Bridges, mines, refineries, other industries, power plants, storage plants, power lines, pipelines, communication networks, accidents associated with high rise buildings</td>
</tr>
<tr>
<td><strong>Social hazards</strong></td>
<td></td>
</tr>
<tr>
<td>Events caused by humans and occur in or close to human settlements</td>
<td></td>
</tr>
<tr>
<td><strong>Terrorist incidents</strong></td>
<td>Bombings, shootings, hostage takings, hijacking</td>
</tr>
<tr>
<td><strong>Crowd incidents</strong></td>
<td>Riots, demonstrations, crowd crushes, stampedes, displaced populations</td>
</tr>
<tr>
<td><strong>Under-development / poverty</strong></td>
<td>Famine, complex emergencies / conflicts</td>
</tr>
<tr>
<td><strong>Pandemics</strong></td>
<td>Flu (avian or swine flu) or other diseases</td>
</tr>
</tbody>
</table>

#### 4.3 Responding to emergencies: the Emergency Management Cycle (EMC)

Because emergencies are unforeseen events that challenge organizations’ normal ways of working and affect large parts of the population negatively, effort is put into finding ways to manage such events. In EmerGent, the term ‘emergency management’ is used to encompass all activities carried out by (federal) state and local agencies (referred to as EMS – Emergency Management Services). These activities have the primary goal of managing hazards, risks and emergencies of all types.

Emergency Management tends to be conceptualised as a cycle – the Emergency Management Cycle (EMC). This consists of prevention, preparedness, response and recovery. The following definitions from the EmerGent DOW and further descriptions from
the United Nations International Strategy for Disaster Reduction (UNISDR) offer a comprehensive insight about what each phase entails [WWW05]:

- **Prevention:** Avoid an incident or intervene to stop an incident from occurring.  
**UNISDR description:** “Prevention (i.e. disaster prevention) expresses the concept and intention to completely avoid potential adverse impacts through action taken in advance. Examples include dams or embankments that eliminate flood risks, land-use regulations that do not permit any settlement in high risk zones, and seismic engineering designs that ensure the survival and function of a critical building in any likely earthquake. Very often the complete avoidance of losses is not feasible and the task transforms to that of mitigation. Partly for this reason, the terms prevention and mitigation are sometimes used interchangeably in casual use.” According to [Topp11] “Mitigation is distinguished from preparedness by its emphasis on creating long-term resilience through permanent modification of physical and other circumstances which create risk and vulnerability”.

- **Preparedness:** “The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions” [WWW05]  
**Description:** Preparedness action is carried out within the context of disaster risk management and aims to build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response through to sustained recovery. Preparedness is based on a sound analysis of disaster risks and good linkages with early warning systems, and includes such activities as contingency planning, stockpiling of equipment and supplies, the development of arrangements for coordination, evacuation and public information, and associated training and field exercises. These must be supported by formal institutional, legal and budgetary capacities. The related term “readiness” describes the ability to quickly and appropriately respond when required.

According to the EmerGent DOW, preparedness encompasses actions that involve a combination of planning, resources, training, exercising and organizing to build, sustain and improve operational capabilities. In this phase, governments, organizations and individuals develop plans to save lives and minimize emergency damage (e.g. compiling state resource inventories, mounting training exercises or installing warning systems).

- **Response:** According to the EmerGent DOW, response “includes immediate actions to save lives, protect property and the environment, meet basic human needs and preserve business operations.  
**Description:** In this case, the UNISDR definition is somewhat more specific in that it defines response as (The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected” [WWW05]. Description: Disaster response is predominantly focused on immediate and short-term needs and is sometimes called “disaster relief”. The division between this response stage and the subsequent recovery stage is not clear-cut. Some response actions, such as the supply of temporary housing and water supplies, may extend well into the recovery stage.
• **Recovery**: According to the EmerGent DOW, this involves programs to assist victims and their families, restore institutions to suitable economic growth and confidence, rebuild destroyed property and reconstitute government operations and services affected by emergencies. Recovery activities continue until as systems return to normal or better.

**Description**: The recovery task of rehabilitation and reconstruction begins soon after the emergency phase has ended, and should be based on pre-existing strategies and policies that facilitate clear institutional responsibilities for recovery action and enable public participation. Recovery programs, coupled with the heightened public awareness and engagement after a disaster, afford a valuable opportunity to develop and implement disaster risk reduction measures and to apply the “build back better” principle.

When put into practice (e.g. in disaster management plans), these phases seem to express an implicit theory of change, where preparedness improves response and recovery behaviours. The figure below illustrates this.

**Figure 5: The Emergency Management Cycle**

The EU uses these terms, too, among others in key documents ([WWW06]; [WWW07]). However, the definitions used across the Member States and across various EU instruments are not always used consistently. It would, therefore, seem that for the purposes of EmerGent and to ensure clarity and consistency of interpretation, combining the definitions in the DOW with those used by [WWW05] definitions is beneficial as together they offer a comprehensive idea of what each phase entails and hence a good framework for the impact assessment work.
4.4 Actors involved in emergency management

As mentioned in section 4.1 above, in a response and recovery situation, numerous actors may be on site (see also Deliverable 3.1, [RLFM+14] for further details of the types of actors involved in emergencies). These emergency management services have “specific responsibilities and objectives in serving and protecting people and property in emergency situations” [WWW05].

According to [WWW05], emergency management services “include agencies such as civil protection authorities, police, fire, ambulance, paramedic and emergency medicine services, Red Cross and Red Crescent societies, and specialized emergency units of electricity, transportation, communications and other related services organizations.”

The following broad types of EMS can be identified:

- Governmental agencies or bodies
- First responders
- NGOs
- Businesses
- Media.

The table below offers some thoughts on the remit of these organizations in emergencies, as well as further examples. As the table suggests, potentially a large number and different types of organizations can be involved certainly during the response and recovery phases of an emergency. How the use of social media affects their operation, interaction with each other and the public (positively or negatively) will clearly need to be an important aspect of the impact assessment in EmerGent.

Table 8: Typology of Emergency Management Organisations

<table>
<thead>
<tr>
<th>Emergency organizations, type and examples</th>
<th>Remit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Government agencies at supranational, national, regional and local levels</strong></td>
<td></td>
</tr>
<tr>
<td>The Emergency Response Coordination Centre (ERCC), EU</td>
<td>Tend to have supporting roles to first responders by focusing on coordination, planning, provision of information, analysis of information, monitoring of hazards, and other supportive activities throughout the Emergency Management Cycle.</td>
</tr>
<tr>
<td>The Copernicus emergency management service</td>
<td></td>
</tr>
<tr>
<td>European Flood Awareness System (EFAS)</td>
<td></td>
</tr>
<tr>
<td>Environment Agency, UK (England)</td>
<td></td>
</tr>
<tr>
<td>Civil protection authorities, e.g. Federal Office of Civil Protection and Disaster Assistance (Germany)</td>
<td></td>
</tr>
<tr>
<td>The military (national armies and international corps)</td>
<td>Protecting humanitarian relief workers, such as those representing international agencies and NGOs, from attacks by</td>
</tr>
</tbody>
</table>
**Emergency organizations, type and examples**

<table>
<thead>
<tr>
<th>Remit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belligerents and generally from the dangers of war;</td>
</tr>
<tr>
<td>Directly engaging in humanitarian action for example, delivering humanitarian relief supplies, maintaining essential services and reconstructing damaged buildings;</td>
</tr>
<tr>
<td>Facilitating contacts between adversaries over such matters as resettlement of refugees and visits to grave sites;</td>
</tr>
<tr>
<td>Establishing certain designated areas (‘safety zones’ ) where a high degree of protection is intended for the inhabitants from the threat or use of force.</td>
</tr>
</tbody>
</table>


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**First responders**

| Includes fire, police and emergency medical personnel, paramedics or emergency medical technicians (EMT)). They are trained to react quickly in emergencies. |
| The first responders’ primary task is to make sure people are safe. This includes evacuation, rescue, crowd control, and medical attention. They also make sure that the area where the emergency is occurring has been secured. They redirect traffic and they keep onlookers away. In addition, they try to serve as a calming force, keeping panic and disorder to a minimum. First responders have a unique perspective because they know their localities well; they are familiar with street plans and landmarks, and they also understand the local municipal structure. This can give them an advantage if the disaster that strikes does not devastate the community’s infrastructure. |

See more at: [http://homelandsecurity.uslegal.com/natural-disasters/first-responders/#sthash.1um5CrOK.dpuf](http://homelandsecurity.uslegal.com/natural-disasters/first-responders/#sthash.1um5CrOK.dpuf)
### Emergency organizations, type and examples

<table>
<thead>
<tr>
<th>Local people</th>
<th>Remit</th>
</tr>
</thead>
<tbody>
<tr>
<td>who use their skills to help their communities when it counts. Volunteers trained and recruited to act on the ground / in the local community on behalf of an emergency service (e.g. an ambulance service in the UK).</td>
<td>Volunteers acting on behalf of a (first responder) emergency service to deal with specific emergencies on the ground before the service arrives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NGOs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humanitarian agencies such as the International Red Cross, Red Crescent, Medecins sans Frontiers, Caritas international, and others. A list can be found here: <a href="http://www.globalcorps.com/jobs/ngolist.pdf">http://www.globalcorps.com/jobs/ngolist.pdf</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Businesses in charge of public utilities such as: electricity, water, gas, telecommunications.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Media</th>
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<tbody>
<tr>
<td>Traditional: TV, newspapers, radio etc.</td>
</tr>
<tr>
<td>New media: social media</td>
</tr>
</tbody>
</table>

### 4.5 The complexity and unpredictability of emergencies

During emergencies and disasters, unexpected problems, dynamic changes of situations or environmental and knowledge limitations often lead to the need for improvisation. Based on an analysis of the response to the 2001 World Trade Centre attack, the following characteristics of emergency management can be considered as reasons for improvisation [Mend07]:

- The rarity of incidents limits opportunities for training and learning
- Time pressures force a convergence of planning and execution
- Uncertainty is present because developments within emergencies are rarely predictable
Extreme events have very widespread consequences leading to complexity, which necessitates a need to manage interdependencies among a wide range of physical and social systems.

Multiple decision makers and responding organizations may negotiate while responding to the event (see section 4.4).

Despite these complexities, all EMS have developed systematic approaches to deal with these uncertainties and to provide planned and coordinated activities in crises. Still, many situations require spontaneous, ad-hoc decisions and short-term (re-)planning and the need for skills in improvisation [Weic93]. The ability to improvise is therefore a valuable asset for individuals and organizations, and is usually cultivated in crisis training [RePM09] and grows with experience [LPRW12a]. Computer-based systems can support these processes, if the design is informed by an understanding of the cognitive processes involved in responding to unanticipated contingencies [MeWa07].

The type, quantity and quality of information, that an agent needs within a given decision making context to complete a specific task, is called ‘information demand’. However, objective and subjective information demands are not always the same. The objective demand includes information, which should be available to complete or achieve a specific task. The subjective demand includes all information that is relevant from the individual’s own point of view. The information supply includes all external and internal information to which an agent has to at a particular time point.

[Orei80] studied how the amount of information affects the quality of the decisions made. He showed that individuals, who claimed not to have received sufficient information to complete their tasks, felt less satisfied, but, in fact, made better decisions. On the other hand, individuals, who claimed that they had received too much information, felt more satisfied, but the quality of their decision making was not as good. However, the apparent conclusion from this research that a ‘lack of information’ has less negative effects than ‘information overload’ has to be seen in context of the finding that a lower satisfaction of individuals is closely linked to an “increased tendency by senders to distort information during transmission” [Orei80]. Therefore both the problem of information paucity and overload are of relevance to the issue of subjectivity during emergencies. It is also worth noting, that it is not only the amount of information that plays an important role in decision making, but also the quality and the format of the information provided [HoTa01]. Both of these are subjective concepts as well and can vary according to the individual [NaRo00] or scenario [ChRe13] involved in an emergency.

In emergency management, decisions have an extensive impact. They are based on incremental information from on-site reports and messages [ReLP14]. Individuals and organizations need to make decisions “under conditions of incomplete or inaccurate information in a context of changing and possibly ambiguous hazard consequences and response objectives […] under considerable time pressure” [Pato03]. [BZAZ09] showed that, during exercises, Commando Place Incident Team (COPI) leaders spent on average “30 min or more collecting information and directing the operations of their own agency, followed by a 15-min interaction with other COPI members”. [LuAs11] analysed groups involved in regional and international operations, with regard to the flow and exchange of information and communication and found that such organizations often mistrust their IT systems or are
dissatisfied with them, often as a lack of investment in training or acquiring the proper equipment. To assure trust, acceptance and a safe handling of the systems, they should be used during normal operations and not just in emergencies [KNK06]. Further problems exist in the area of situation awareness. The lack of communicating task-oriented, dynamic information and the related ‘information overload’ can lead to serious problems during the response phase [PYK11]. Furthermore, in collaborative environments, the different roles and expertise of group members make sense making even more challenging, because group members do not only need to understand task-related information but also need to comprehend the relative relevance of the information available to them [PaRe10]. Other occurring problems concern the finding of a correct recipient, unclear channels of communication [LPRW12b], time-consuming, ineffective forms of messages [LuAs11] and different interpretations of terminologies used [RPWL12]. Some of the problems could be solved by the use of more appropriate communication technologies, albeit the main challenge is to articulate the individual information need in an easy way.

In summary, the unpredictability of emergencies means that decision making within such situations is of complex and marked by the subjective experience and views of individuals within EMS [LuRP13]. This means that a particular piece of information can be viewed in very different ways and lead to very different responses and support needs.

4.6 Implications for the EmerGent impact assessment

This section has attempted to define key concepts of relevance to EmerGent in order to ensure a basic and shared knowledge of the potential scope of EmerGent as a project and the impact assessment work carried out as part of it. From this definitional work, the following conclusions about implications for the impact assessment work in EmerGent can be drawn:

- Case studies need to be selected to consider all phases of the emergency management cycle, as the use of social media (including benefits and potential negative outcomes) are likely to differ.
- Equally, use of social media in a range of types of emergencies should be investigated with the help of the case study work, tied in with a range of emergency scales. This is so that the EmerGent impact assessment can build up a pool of knowledge about to what extent these factors matter for how these tools are deployed.
- The inter-organizational dimension (i.e. how different organizations work together – or not – in an emergency) in the context of bottom up decision making seems to be crucial for understanding the potential scope of positive impact (as well as unintended outcomes). This should therefore be part of any case study work, as well as the link back to the citizen.

These issues will need to be considered in the detailed execution of the case study work, including design of research tools.
5 Proposed Concept for EmerGent Impact Assessment

5.1 Introduction – overall concept (theory of change)

This section of the deliverable draws together the results of the research activities set out in the previous sections to present an initial ‘baseline’ framework for understanding the impacts of social media in general and the EmerGent outputs more specifically and how these could be assessed. The main conclusions argued for in section 3 were that the IA concept for EmerGent needs to:

- reflect a ‘pragmatic’ dimension, reflecting logistics, costs and effort and to balance ‘relevance’, in terms of its social and cultural embeddedness, with ‘objectivity’
- have an underlying theoretical position that gives some form to process or context mechanisms in order to explain subsequent outcomes that can be tested by observation; this suggests using a ‘theory of change’ approach as the central framework for the concept and methodology
- be developed as a ‘dynamic framework’, capable of responding to the evolution of EmerGent as it develops – possibly in ways that were not originally envisaged. This dynamic element also needs to reflect the life cycle of EmerGent’s ‘unit of analysis’ – the four-stage process of prevention, preparation, response and recovery in emergencies
- clearly define what are seen as ‘impacts’ and how these relate to intervention ‘results’ and ‘effects’. It needs to distinguish between outputs, outcomes, results and impacts.
- draw on methods used in previous studies, including multi-methodological strategy, combining content analysis (including quantitative content analysis) with surveys, focus groups and observation, as well as more novel approaches, including for example social network theory, action research or quasi-experiments to investigate the impact or use of social media in emergency or disaster situations.

The use of the term ‘baseline’ is important because it signifies that the proposed framework is a dynamic framework – one that will evolve over the life cycle of the project, and beyond, as EmerGent develops, validates and tests its products and services through further research and through the collaborative involvement of users and other stakeholders as ‘co-producers of EmerGent knowledge’.

The development of this framework reflects three key inter-related lines of enquiry, as reported in this deliverable. The first line of enquiry was an exploration of what happens when social media are used in emergencies. This was done through a review of the relevant literature. The review provided some important insights on what are the likely effects of social media in emergency situations – and what ‘causes’ these effects. We need to understand these effects and causes because it helps EmerGent to clarify what elements need to go into the design of its products and services and how these products and services could be delivered as efficiently and effectively as possible.

The second line of enquiry was an exploration of how these effects and causes could be captured and measured. This was again done through a review of the relevant literature. We need to understand the nature of the effects of using social media technologies in
emergency situations, and how to measure these effects, because this is fundamental to the purpose of EmerGent. In essence, EmerGent is an attempt to provide a socio-technical solution to a problem it has identified. This problem is based on the assumption that, at present, emergency services and citizens are weakly connected and at the same time social media and emergency services are weakly connected. EmerGent seeks to promote a solution to this problem by developing systems, tools and services that will change the nature of the relationships between citizens, emergency services and social media. It is therefore essential for the success of the project that the EmerGent partners and stakeholders understand the nature of this change and understand what needs to done to come to a conclusion – backed by evidence – as to whether and in what ways EmerGent has succeeded in achieving this change.

In other words, at the heart of the EmerGent impact assessment is a ‘theory of change’. As noted above in section 3.2, a theory of change articulates the vision and logic of an intervention – what it seeks to change; the ‘causal pathways’ that connect the desired change with the objectives of the intervention, the actions it carries out to achieve these objectives. It is important to emphasise that a theory of change is not simply a mechanistic ‘logic model’ that shows how inputs lead to activities, outputs and outcomes. The theory of change requires this logic model to be grounded in a coherent group of testable propositions – or assumptions – that explain and predict the outcomes that will result from an action or event. These assumptions need to be defined and tested as the intervention develops and evolves and also need to be reviewed and, if necessary, adjusted if the evidence collected by the evaluation of the intervention suggests that the assumptions are flawed.

The third line of enquiry, which draws on the first two lines, and is set out below in the final part of this deliverable, presents a starting position for EmerGent’s theory of change, including the propositions (assumptions) that will be tested as the project develops. The ‘baseline’ propositions and assumptions – incorporated in the theory of change framework set out below – have been shaped firstly by the description of the project as defined in the DOW and secondly by the initial research activities carried out in the first phase of the project. As highlighted above, this baseline will change as further research activities are carried out, and as EmerGent sets out on its journey of ‘collaborative knowledge production’, involving stakeholders in the ‘living laboratory’ activities that will produce and evaluate its systems, tools and services. In other words, EmerGent’s theory of change is a dynamic and evolving framework.

5.1.1 Underlying assumptions of the framework

Before setting out in this final section of the Deliverable the details of this evolving framework, it is important to highlight two considerations that need to be addressed in the framework.

Firstly, the framework reflects recognition that EmerGent is not simply a set of ‘technical artefacts’. It is a ‘socio-technical system’. The systems, tools and services it develops need to be understood as ‘value embedded action systems’ [CuCo2006]. The concept of value embedded action systems has significant implications for EmerGent and its impacts assessment. On the one hand, the value embedded action model views technologies as
‘non-neutral’ in the sense that they embody what [Feen95] has described as a ‘technical code’. This technical code reflects how technologies are socially and culturally constructed, in the sense that technological design and development does not happen in a vacuum. The features of the design of a technology and the development trajectory it takes will be shaped by the roles and interests of the stakeholder groups involved. As a general rule, the more powerful the stakeholder, the more influence they will have on technology design and development. On the other hand, value embedded action systems refer to the ‘immanence’ of technology. Technologies provide ‘benefits’ for their users not simply in relation to their innate ‘properties’ but in terms of how they embody different purposes and beliefs. Users extract value from technologies not because they make initial rational decisions about what these technologies can do but because they embark on a process of engaging with and interpreting the meaning of the technologies. It is through this process that the very technology itself becomes established through practice. However, since the design and development path of technologies tends to amplify the positions and interests of powerful stakeholders, the process of extracting value through practice often becomes a ‘contest of meanings’ in which the form a technology eventually takes through the process of development, adoption and adaptation through use will be dictated by powerful stakeholders, so that weaker stakeholders may lose out in their attempt to extract value from using the technology.

This leads to the second consideration. Because technology design, development, adoption and adaptation take the form of a contest of meanings, they often lead to unforeseen and undesirable effects. [Feen95] takes this idea even further by describing technologies as having ‘civilising choices’. To take an extreme example, developments in nuclear physics opened up spaces for a complex range of technological options one of which, eventually adopted, was to develop weapons of mass destruction. In more routine technology development scenarios, such choices are often expressed in terms of ‘winners and losers’. In the EmerGent case, for example, it’s possible that the development of an ‘EmerGent App’ intended to strengthen the links between citizens and emergency services through social media could have the unintended consequences of further weakening the links between marginalised groups of citizens – who do not have access to or do not use social media – and emergency services.

The implications of technical coding, immanence and undesired effects for the EmerGent theory of change framework are as follows. Firstly, the theory of change framework will need to capture and reflect EmerGent’s ‘technical code’, and in particular the inter-relationships and positions of relevant stakeholders, as well as the assumptions about how these stakeholders are expected to act with regard to the EmerGent systems, tools and services and the assumptions about the expected effects of the project on these different stakeholders. Secondly, the framework will need to reflect the potential unforeseen and undesirable effects. Thirdly, the framework will need to incorporate mechanisms to capture and assess the EmerGent development trajectory – how the project’s systems, tools and services are evolving through practice; what are the implications of this evolution for EmerGent’s core vision and purposes; whether the development path is supporting gains for a particular user group at the expense of another user group, and what steps might be taken to rectify this situation. Fourthly, the framework will need to incorporate data capture methods and assessment tools to monitor and assess all the above dynamics of the project.
5.1.2 Emergent impact assessment dimensions and challenges

The proposed EmerGent impact assessment has two dimensions:

- The impact of social media on emergencies in general: In logic modelling terms this includes an assessment of the way social media in general – independently of the EmerGent socio-technical innovations – has a positive or negative impact on EMS, citizens and on the EMC and whether or not it enhances safety, speeds up recovery and ultimately saves lives.

- The EmerGent project impacts: in logic modelling terms this covers an investigation of the extent to which planned inputs, outputs and outcomes have been achieved and what the effects and impacts of these are on EMS, citizens and on the EMC.

The challenges for the EmerGent impact assessment are:

- The emergent nature of the project itself, where at the time of writing this deliverable, the exact nature and anticipated audience of project outputs are still not fully known. These outputs and their associated outcomes will evolve, at the project level, as the EmerGent project work gets under way. In turn, at the external level, they will evolve as EmerGent outputs are used and, possibly, adapted by the envisaged target users of the project.

- The timeframe of the project itself, where the wider societal results of the EmerGent project itself are unlikely to be measurable by 2017 (the end date of the project). In terms of research activities, the impact assessment will therefore be confined to looking at outcomes, with judgments on ultimate impact needing to be extrapolated from these.

It is for these two reasons that the EmerGent impact assessment will need to be based on a theory of change approach which will be used to focus on the distance travelled towards more long-term impacts.

The impact assessment tasks of EmerGent will therefore be designed to answer the following overarching questions:

- What, on the basis of a review of relevant literature, are the main effects that social media can have on emergency management?
- What implications does this have for EmerGent outputs and likely societal impacts?
- What results has the EmerGent project achieved during its lifetime, and why?
- What can we conclude from these results about EmerGent’s likely medium and long term impacts?

5.1.3 Designing a theory of change evaluation

This section provides a practical outline of the main steps involved in planning and implementing a theory of change evaluation methodology. These include:

1. When planning a theory of change evaluation, it is best to plan for the evaluation at the intervention design stage or before implementation commences (as opposed to reconstructing them retrospectively). This increases the validity of the findings.
This is done by consulting with all, or as many, relevant stakeholders as possible to agree on expected outputs, outcomes and impacts. It is important to note any areas where perceptions of the intervention theory vary between the stakeholders and try to achieve consensus. This could, for instance, be done through a workshop that brings all stakeholders together for the purpose of exploring the nature of these variations and try to resolve them. It is recommended to develop the intervention theory “back to front”, starting with the expected impacts and then working backwards to the outcomes required to achieve these impacts, the outputs required to achieve the outcomes, the types of activities needed to achieve these outputs and, finally, the required resources for the intervention. The final intervention theory should not only be acceptable to stakeholders, but also be realistic (i.e. timescales and financial resources should be commensurate with the expected impacts). It should also be testable: this means the envisaged outcomes must be specific enough to allow the evaluation to collect data on them.

2. Use the intervention theory to decide, together with the stakeholders, what the evaluation questions need to be so that useful evidence is generated from the research.

3. A key stage now is to examine with stakeholders the availability of existing data which can meet analytical requirements (taking into consideration the quality, relevance, coverage and accessibility of the evidence), and what additional data needs to be collected as part of the evaluation.

4. Identifying the appropriate methodology for informing gaps in the existing evidence base will be based on the evaluation questions, the requirements of the users of the evaluation, available resources, and the timing of the evaluation and the intervention. Evaluators should consider the relative merit and appropriateness of qualitative methods (e.g. interviews, case studies, focus groups) and quantitative methods (e.g. surveys, analysis of monitoring data) to answer the evaluation questions particularly focusing on the methods required to collect data on specific aspects within the intervention logic.

5. Thinking through the evaluation process: the evaluator should seek to design the research activities so that they do not miss valuable and important information. When setting up the timeframe for the evaluation the following questions should be considered:

- **What is a realistic timeframe for the evaluation to capture meaningful impact data?** If the evaluation happens too quickly after an intervention is introduced or finishes, then it is unlikely that it will generate data on overall impacts. Rather, the evaluation is more likely to generate data on outcomes (i.e. short to medium-term impacts).
- **Are there any critical points at which particular data will need to be collected in order to capture important information?** For instance, stakeholder input needs to be gained as early as possible, monitoring arrangements will need to be put in place before the intervention is implemented, and surveys should be undertaken at times when they would deliver the most meaningful input or highest response rate.
- **At what intervals should any knowledge about stakeholders’ thinking on the intervention be updated?** For instance, there might be crucial stages in the intervention at which their perspective would be particularly valuable. For interventions implemented over a long timeframe, it might be useful to speak to key stakeholders regularly (i.e. annually) in order to capture any changes in thinking and to update the overall theory of change.
When do the evaluation findings need to be ready to be valuable to end users? Having a clear focus on the forthcoming policymaking/programme delivery timeframe will ensure the evaluation findings can make a timely and relevant contribution to the evidence base.

6. Plan how the data will be analysed to test the initial assumptions, the results verified and establish the feedback mechanisms with stakeholders. For example, mechanisms might be established for involving stakeholders in the interpretation of the data.

7. An important final step is establishing from the outset the opportunities for learning from the evaluation and considering how this will be fed back into the policy making and delivery cycle to ensure that the evaluation findings will provide value.

5.2 EmerGent project theory of change and distance travelled

Any impact assessment of complex interventions that have a high degree of uncertainty about possible outcomes and impacts using a theory of change approach needs to start from drawing up an intervention logic that links project activities and outputs to – hypothesised – outcomes and impacts. As is ‘convention’ for such an approach (see section 5.1.3 above), the EmerGent logic models presented in the diagrams in this section have been constructed by drawing on a mix of information included in the DOW and by drawing on partners’ expertise on the subject matter – in particular to ‘tease out’ envisaged outcomes and impacts from EmerGent. The benefit of this approach is that it harnesses tacit knowledge of key stakeholders about likely outcomes and impacts, and thus makes explicit the assumptions, hypotheses or theories about how the project will make a difference. These assumptions, hypotheses or theories can then be tested (and hence verified, amended or falsified) with the help of the impact assessment work.

5.2.1 The current EmerGent project theory of change

The figures below present the current ‘state of the art’ logic model for EmerGent. Three figures are presented:

- A very high level logic model outlining in very broad terms how EmerGent is assumed to make a difference (Figure 6). This comes from a project summary in the DOW.
- A more detailed logic model which draws on information from WPs and tasks in the DOW, offering a more granular picture about EmerGent activities and outputs and the outcomes and impacts they are likely to produce (Figure 7).
- Finally, a very detailed breakdown of anticipated outcomes and impacts from EmerGent (Figure 8). This uses information provided by consortium partners and organizes it into a logical sequence of short-term outcomes, medium term outcomes, longer term outcomes (impacts) and ultimate impacts.

From these figures, the following narrative of the EmerGent intervention logic can be constructed:

In the current context where there are weak connections between the use of social media by emergency services and citizens, between social media and the EMC and between social media apps and EMS IT systems, EmerGent research and development work (inputs / activities) will offer new methods and tools as well as guidelines (outputs) that will
strengthen these connections (outcomes) and hence lead to improved awareness of the situation during emergencies and, ultimately, enhanced objective and perceived safety of citizens before, during and after emergencies (impact).

With the help of its three key outputs (guidelines for the future adoption of social media in EMS procedures; an EmerGent app; and an EmerGent IT system for novel emergency management), three types of outcomes – and associated impacts – will be achieved:

- **Citizens and EMS are more strongly connected.** On the one hand, this means that as a result of the use of social media, citizens and EMS are more aware of each others’ activities, behaviors and information needs which will improve the quality of information shared. On the other hand, this means EMS will make greater use of social media before, during and after an emergency, thus reducing dependence on traditional media and reaching a larger number of people. Misinformation can be corrected, volunteers guided and trust in social media is more established. Consequently, the quality of the relationship between citizens and EMS improves. Objective and perceived safety and security of citizens is therefore enhanced, before, during and after emergencies.

- **Social media tools are better connected to the EMC.** This means EMS are aware of the technical potential of social media (positive and negative – e.g. are able to validate information from social media), and have integrated social media into their workflows and / or created new processes to do so. This allows EMS to respond more effectively to incidents generally and to those reported on social media. Citizens better understand the benefits of using social media in emergencies, so that their use becomes standard practice. As a result, citizens share information and act as first responders. Overall, the result (impact) is that situational awareness during emergencies improves.

- **Social apps, EmerGent IT system and EMS IT systems are better or more strongly integrated.** This means functionality for assessing a situation is better integrated and consequently the situational overview in an emergency is improved. By integrating social media into the EMS workflow, social media data are used more often during emergencies and more information is posted by EMS. As a result, situational awareness improves.

The ultimate impact from these three outcomes is easier or faster recovery from an emergency and saved lives.

In short: taken together, the theories of change, as outlined in the text and figures below, express the steps of the project ‘change journey’, the activities carried out at these steps, the activity objectives, outputs, outcomes, potential impacts, indicators and means of verification comprise the ‘intervention logic’ of the intervention.
Figure 6: High level EmerGent logic model

- Emergency services and citizens are currently weakly connected
- Social media and EMAC are weakly connected
- Social apps and EMAC IT systems are weakly connected

EmerGent Research ("studies") on current use of social media in emergencies, potentials and requirements

Development of EmerGent IT system:
- Info gathering, info mining, info routing, info quality
- Visualization and filtering

New methods and tools to reinforce communication between weakly connected crisis communities and emergency management services

Guidelines for officials and the public to get a better involvement of all users into all phases of the EMAC

Disconnected EMAC are strongly connected

Social media to distribute connected to EMAC

Social apps, EmerGent IT system and EMAC IT systems better / more strongly connected

Improved awareness of the situation during emergencies
2.1 Concept for Impact Assessment

**Inputs / activities**

- Technical analysis of processes and interoperable tools within EMS (T3.2)
- Interfaces to mobile devices and major social networks (T3.3)
- Socio-technical requirements gathering and definition (T3.4)
- Development of semantic data model (T4.1) and information mining methods (T4.2)
- Defining and prioritising info quality criteria and indicators (T4.3)
- Definition of enhanced data visualisation and filtering (T4.4)
- APIs for identified major social network (T5.1)
- Information gathering (Public and access granted streams) (T5.4)
- Design of system architecture (T6.1) and validation (T6.2)
- User oriented evaluation (T6.4)
- Dissemination of project findings and results (T7.1)
- Dissemination campaign to engage users (T7.2)
- Exploitation (T7.4)

**Outputs**

- Guidelines for social media integration into existing EMS systems (R)
- Usage patterns (R)
- User requirements (R)
- Potentials of SM use by EMS and citizens (R)
- Tool transforming content information streams into low volume but rich information models properly summarising particular incidents
- Semantic data model
- Information quality criteria and indicators
- Concept for enhanced data visualising and filtering
- EmerGent App for smart phones to give to citizens
- Information routing to EMS and citizens
- EmerGent IT system (for novel emergency management)

**Outcomes**

- Guidelines for future adoption of social media in EMS procedures
- Exploitation plan

**Impacts**

- Citizens and EMS more strongly connected
- Enhanced objective and perceived safety and security of citizens before, during and after emergencies
- Improved awareness of the situation during emergencies
- Social apps, EmerGent IT system and EMS IT systems better / more strongly connected
- EMS and other stakeholders understand benefits of social media and its integration into their processes (conceptually and technically)
Figure 7: Anticipated EmerGent outcomes and impacts

**Outputs**

- Increased knowledge about activities, behaviour and needed information of citizens during emergencies.
- Increased knowledge about processes and needed information of EMS during.
- EMS will reach larger audience more efficiently and effectively than using traditional media, citizens and EMS establish very fast communication channel.
- EMS to perform public warning more efficiently (reach more people).
- EMS responses are more effective and take into account data originating in SM.
- EMS to reach larger audience more efficiently and effectively than using traditional media, citizens and EMS establish very fast communication channel.
- EMS respond to incidents reported in SM.
- Design of new processes in EMC with SM.
- EMS have developed dedicated procedures to validate information and understand the level and type of resources needed.
- EMS are more aware of activities of citizens.
- EMS are more aware of activities of EMS.
- EMS can / cannot handle during emergencies.
- EMS have developed dedicated procedures to validate information and understand the level and type of resources needed.
- Emergency IT system (for novel emergency management).
- Social media tools better connected to EMC.
- Social media tools better connected to EMC.
- EMS will reach larger audience more efficiently and effectively than using traditional media, citizens and EMS establish very fast communication channel.
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- EMS to perform public warning more efficiently (reach more people).
- EMS responses are more effective and take into account data originating in SM.
- EMS to reach larger audience more efficiently and effectively than using traditional media, citizens and EMS establish very fast communication channel.
- EMS respond to incidents reported in SM.
- Design of new processes in EMC with SM.
- EMS have developed dedicated procedures to validate information and understand the level and type of resources needed.
- EMS are more aware of activities of citizens.
- EMS are more aware of activities of EMS.
- EMS can / cannot handle during emergencies.
- EMS have developed dedicated procedures to validate information and understand the level and type of resources needed.
- EMS will reach larger audience more efficiently and effectively than using traditional media, citizens and EMS establish very fast communication channel.
- EMS to perform public warning more efficiently (reach more people).
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- EMS have developed dedicated procedures to validate information and understand the level and type of resources needed.
- EMS are more aware of activities of citizens.
- EMS are more aware of activities of EMS.
- EMS can / cannot handle during emergencies.
5.2.2 Implications for the EmerGent impact assessment

The task of the external and internal EmerGent impact assessment is to explore how this intervention logic has evolved in practice, and how far along the ‘change journey’ the intervention has travelled. The approach and methodology therefore need to be focused on identifying and evaluating the changes associated with the key outputs produced. The data collection tools (i.e. the ‘means of verification’) thus need to be designed to assess the outcomes of these outputs using evaluation measures (i.e. indicators) that are contextualised to the particular characteristics of each activity and its outputs. These can then be used to measure how far the intervention has travelled along its planned ‘change journey’, as the illustration below shows.

*Figure 8: ‘Distance travelled’ stages in a theory of change*

The end point of a theory of change will specify the long-term impacts that are anticipated as a result of implementing EmerGent – and the indicators that should be used to assess whether these anticipated impacts have been realised. This change ‘journey’ can be demarcated at a range of points along its trajectory - from ‘context’, through ‘inputs’ through to ‘outputs’, then ‘outcomes’ and finally ‘impacts’. At the overall project level, the ‘distance travelled’ refers to the stage the intervention has reached along the ‘theory of change’ pathway – in the EmerGent case along the road to strengthening links between citizens and emergency services. However, long-term impacts are very seldom assessed in projects, because they tend to happen too far down the road.

Another aspect of the distance travelled approach to assessing impact in EmerGent is the need to periodically update the theory as articulated above, and associated metrics, to reflect the increasing knowledge of project participants and stakeholders as the content work of the project gets under way. In this process, dimension to consider in order to arrive at a ‘solid’ theory of change are, for instance:

- Testing and potentially expanding the envisaged outcomes, impacts and associated indicators of EmerGent. Currently these are, perhaps understandably, positive.
However, it seems not unreasonable to assume that the greater use of social media in emergencies can also have negative outcomes. For instance, we cannot exclude that greater use of social media in emergency management might divert resources away from more conventional contact points (e.g. telephone lines) and that this might negatively affect some parts of the population; most notably those who, because of age, socio-economic status, disability or choice do not use social media. Thus, in order to usefully inform EmerGent outputs (in particular the guidance document), the impact assessment should seek to cover and identify a range of potential negative consequences from the use of social media in emergencies in order for the project to develop mitigating strategies.

- While the outcome and impact categories included in the logic model cover a good range of the categories included in the dynamic framework for impact assessment (people, content, technology, computer-mediated interaction, systems integration), each of the ‘boxes’ hides very complex processes and behavior changes. Without an effort of unpicking these underlying dynamics both improvement of EmerGent outputs and an extrapolation of potential impacts will not be possible.

- There is currently very little consideration of the conditions necessary to achieve the envisaged outcomes and impacts. This (i.e. the consideration of the assumptions of the project’s logic of intervention) is good practice in logic modelling as it sets the context for any planning, development or assessment work. In EmerGent, what seems particularly important is the potential cultural clash between ‘command and control’ type EMS (especially first responders) and the, by its very nature, bottom up or diffused nature of social media use. The condition for ‘successful’ use of social media therefore seems to lie in the ability of first responder organizations to abandon or at least relinquish some levels of control to citizens. The scope and ability to do this needs to be investigated by the EmerGent IA in order to understand the probability of achieving some of the outcomes (i.e. how far along the line from outputs to impacts the project can travel).

- The logic model, finally, creates the conceptual framework for the development of outcome and impact metrics that will be used as part of the IA to assess project achievements. It allows for a close matching of expected outcomes with an indicator to measure it, thus avoiding that the IA tries to capture things that are out of scope of the EmerGent project work. These indicators will be developed in tandem with the further elaboration of the model as a whole (see below).

Working with and updating the theory of change as part of the EmerGent impact assessment will continue throughout the delivery of the EmerGent project and involve the following activities:

- **Ongoing engagement of EmerGent partners in the development of expected outcomes and impacts.** We have done this already for the purposes of this deliverable, but this work will have to be ongoing in order to reflect the knowledge gains achieved by the consortium as a result of implementing the project. Two vehicles for this exploration are proposed: a) an annual email survey of partners to share their thoughts on anticipated outcomes and impacts b) partner project board meetings, where a more detailed exploration of the range of outcomes and impacts as well as the (causal) pathways about how these will be achieved will be undertaken.
as part of a workshop. The first opportunity for this will be the partners’ meeting in Catania in August 2014. It is proposed that this exercise is repeated up to two times throughout the duration of the EmerGent project.

- **Development and ongoing refinement of impact metrics/indicators.** Based on the current version of the logic model, the TIHR has developed a number of impact metrics – articulated as measures and indicators (see Tables 10, 11 and 12). These will be verified in the project board meeting in Catania with all partners and developed further as work on EmerGent progresses.

The following sections will outline in greater detail how these ideas will be operationalised in the EmerGent impact assessment work.

### 5.3 Scope of the EmerGent impact assessment

As detailed in section 2 and in the DOW, WP 2 as a whole focuses on the impact of social media in emergencies, in the light of approaches used by EmerGent. This means that the IA needs to start with an assessment of the impact of different types of social media, most likely Twitter and Facebook, on citizens and EMS in general and then focus in on EmerGent outputs within this context.

In practice, this will involve:

- Conducting case studies of the impact of social media in past emergencies as well as in relation to live or very recent emergencies
- Evaluating the impact of the EmerGent outputs, including:
  - One or more social media applications to help citizens to share information with EMS more effectively before, during or after emergencies
  - An IT-system for the Novel Emergency Management in Social Media Generation for Information Gathering (IG), Information Mining (IM), establishing Information Quality (IQ), and Information Routing (IR)
  - Guidelines on social media use in emergencies by EMS and citizens

#### 5.3.1 Conducting impact case studies

The key objectives of Tasks 2.2 (impact assessment of social media in emergencies for EMS) and 2.3 (impact assessment of social media in emergencies for citizens) are to use detailed case studies to explore the impact of social media in emergencies. In both tasks, case ‘exemplars’ will be selected to deepen the understanding of the current and potential role and impact of social media in emergencies, with reference both to:

- Past emergencies (up to five years in the past)
- Current or recent emergencies (which occur during the project or happened in the last few months), so that experiences and memories of key stakeholders are still ‘fresh’ and ‘recent’.

It is proposed that case studies would employ a multiple case study design [Yin13]. This involves selecting successive ‘waves’ of cases to test results and reproducibility of the results from the previous case study work. This reinforces the evolving theory of change model as the successive phases of case study work will be able to feed into the refinement of the EmerGent logic model and hence inform the internal impact assessment.
Furthermore, case studies would be constructed using the following methods:

- A scientific literature review to explore the context, use and impacts of social media use in emergencies
- Qualitative or quantitative content analysis of social media data (most likely Twitter) to explore key themes relating to the use and impact of social media in emergencies
- Qualitative interviews with EMS and citizens to explore their experiences of the impact of social media before, during or after the emergency (interviews with citizens are likely only to be of relevance as part of recent emergencies for which there would be sufficient recall of the use and impact of social media)
- Quantitative surveys of EMS and citizens (for recent emergencies only) to provide quantifiable evidence on the use and impact of social media before, during or after the emergency.

At the same time, the case studies could be used as ‘test-beds’ for exploring the usefulness of innovative analytical techniques to assess the impact of EmerGent. We note that to date methods applied elsewhere have been somewhat conventional (see section 3.5.1) and suggest there is scope and value to use some more sophisticated techniques to understand issues of outcomes and impact of social media use in emergencies. The case studies will present us with an opportunity to test the feasibility of these before applying them to the EmerGent IA. This could, for example, include the use of social network analysis techniques as described in Table 9 below.

The case study work is due to continue throughout the EmerGent project (Deliverables are due in months 9, 25 and 34). There will therefore be opportunities to dynamically feed results into the EmerGent work and impact assessment throughout, e.g. via partner meetings, work with the end user panel and others. An ongoing outcome from the case study work would be to ‘reality’ check the EmerGent theory of change, i.e. to use information from elsewhere to verify or falsify assumed hypotheses about likely impact and how this will be achieved, and develop alternative causal strands.
### Table 9: Relevance of network analysis technique to IA

<table>
<thead>
<tr>
<th>Method</th>
<th>Purpose(s)</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social network analysis</td>
<td>Identify and visualise the different types of actors – including EMS and citizens – interacting via SM before, during and after emergencies</td>
<td>Complex interactions and relationships during an emergency can be presented in an accessible visual format. Provides useful model for further exploration using other research methods such as interviews, surveys or focus groups to explore reasons for positions of actors in network.</td>
<td>Needs triangulation, only meaningful alongside other methods.</td>
<td>Knowledge and experience of using free software packages such as SNAPP, Gephi or NAT. Access to data, including either qualitative data – via interviews with key stakeholders to explore relationships between actors before/during after emergencies or data mining of Twitter dataset during an emergency.</td>
</tr>
</tbody>
</table>

#### 5.3.2 Evaluating the impact of EmerGent outputs

This part of the IA will involve the collection of primary data (both qualitative and quantitative in nature) during the lifetime of the project in order to assess what results the EmerGent work has achieved. According to the distance travelled approach, the task will be to explore how far towards envisaged outcomes and impacts EmerGent has travelled, and hence what its potential will be of achieving them overall.

Assessing the impact of EmerGent as a project will therefore involve answering the following impact assessment question:

- What results has the EmerGent project achieved during its lifetime, and why? What can we conclude from these results about EmerGent’s likely medium and long term effects?

This can be broken down into the following sub-questions:

- To what extent has EmerGent achieved its intended outcomes and how far towards its intended outcomes has EmerGent travelled?
- How far towards the ‘ideal impact’ has EmerGent travelled?
- What are (likely) unintended outcomes of EmerGent’s work? What are the implications of those for the dissemination or exploitation of project results?
- Why and how has EmerGent achieved the identified intended and unintended outcomes?
- What causal pathways can be identified that would explain EmerGent’s outcomes (and impacts)?
- What project activities and outputs have been particularly supportive of or helpful to this journey?
- What are the implications of the above for disseminating or exploiting EmerGent’s work?

As can be seen in Figure 6 above, currently the three key outcomes of the EmerGent project, according to the current project logic model, are:

- Citizens and EMS are more strongly connected
- Social media tools are better connected to EMC
- Social apps, EmerGent IT system and EMS IT systems are better or more strongly connected

Figure 8, on the other hand, provided a more detailed breakdown of anticipated outcomes and impacts from EmerGent under-lying these three key outcomes. These were suggested by partners involved in the task (FEU, EENA, USI and WNRI), who as part of Task 2.1 were asked by the Task leader (TIHR) to specify (see Appendix A):

- how to break down the existing high level outcomes and impacts into smaller, more measurable, ones
- any outcomes and impacts EmerGent is likely to achieve that had not (yet) been included in the logic model.

Tables 10, 11 and 12 below provide suggested metrics for the first level of short-term outcomes identified in this way and which were thought to underpin each of the three key (overarching) outcomes – in the form of suggested measures and indicators of change. The final column then provides some suggested methods for identifying changes for these metrics.
### Table 10: Citizens and EMS more strongly connected

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Measure(s)</th>
<th>Indicator(s)</th>
<th>Method(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMS are more likely to use social media to broadcast information with citizens during normal operations (preparation phase of EMC)</td>
<td>Change in EMS tweeting behaviour during normal operations</td>
<td>Increased number of tweets by EMS during normal operations over time</td>
<td>Content analysis of EMS Twitter feeds to compare EMS tweeting behaviour at different time points</td>
</tr>
<tr>
<td></td>
<td>Change in EMS Facebook use during normal operations</td>
<td>Increased use of EMS Facebook pages to share information during normal operations over time</td>
<td>Content analysis of EMS Facebook pages at different time points</td>
</tr>
<tr>
<td></td>
<td>Changed attitudes towards use of social media during normal operation among EMS</td>
<td>Social media seen as more useful for sharing information with citizens during normal operations</td>
<td>Baseline and follow-up qualitative or quantitative interviews or surveys</td>
</tr>
<tr>
<td>EMS more likely to use social media to broadcast information with citizens during emergencies</td>
<td>Change in EMS tweeting behaviour during emergencies</td>
<td>Increased number of tweets by EMS during similar emergencies over time</td>
<td>Content analysis of EMS Twitter feeds to compare EMS tweeting behaviour at different time points</td>
</tr>
<tr>
<td></td>
<td>Change in EMS Facebook use during emergencies</td>
<td>Increased use of EMS Facebook pages to share information during similar emergencies (scope, type) over time</td>
<td>Content analysis of EMS Facebook pages at different time points or in response to similar emergencies</td>
</tr>
<tr>
<td></td>
<td>Changed attitudes towards use of social media during emergencies among EMS</td>
<td>Social media seen as more useful for sharing information with citizens during emergencies</td>
<td>Baseline and follow-up qualitative or quantitative interviews or surveys</td>
</tr>
<tr>
<td>Outcome</td>
<td>Measure(s)</td>
<td>Indicator(s)</td>
<td>Method(s)</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>EMS more aware of activities of citizens during emergencies</td>
<td>Experiences and views of EMS</td>
<td>EMS feel more aware of activities of citizens during emergencies</td>
<td>Qualitative interviews</td>
</tr>
<tr>
<td>Citizens more aware of activities of EMS during emergencies</td>
<td>Experiences and views of citizens</td>
<td>EMS feel more aware of activities of EMS during emergencies</td>
<td>Qualitative interviews or focus groups</td>
</tr>
<tr>
<td>Citizens are more likely to use social media to share information with EMS during emergencies.</td>
<td>Change in citizen tweeting behaviour during emergencies</td>
<td>Increased use of Twitter by citizens to share situational awareness information during emergencies.</td>
<td>Content analysis of tweets during emergencies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Particular groups of citizens use Twitter more often than previously to share information with EMS during emergencies.</td>
<td>Baseline and follow-up qualitative or quantitative interviews or surveys</td>
</tr>
<tr>
<td>Citizens are likely to use EmerGent app to share information with EMS during emergencies.</td>
<td>Citizen’s views and experiences of EmerGent app</td>
<td>Citizen perceive EmerGent app to be useful in emergencies</td>
<td>Experiment – citizen responses to different scenarios</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Qualitative interviews or focus groups</td>
</tr>
</tbody>
</table>
### Table 11: Social media tools are better connected to the EMC

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Measure(s)</th>
<th>Indicator(s)</th>
<th>Method(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased use of social media tools by EMS to reach people with</td>
<td>Self-reported change in use of social media tools</td>
<td>EMS report increased use of social media tools to</td>
<td>Qualitative or quantitative interviews or surveys</td>
</tr>
<tr>
<td>communication disabilities (e.g. deaf, hard of hearing) to share</td>
<td></td>
<td>reach people with communication disabilities</td>
<td></td>
</tr>
<tr>
<td>information with them before, during or after emergencies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMS aware of positive and negative technical potentials of social</td>
<td>Awareness among EMS</td>
<td>EMS display awareness of positive and negative</td>
<td>Qualitative or quantitative interviews or surveys</td>
</tr>
<tr>
<td>media</td>
<td></td>
<td>technical potentials of social media</td>
<td></td>
</tr>
<tr>
<td>EMS have developed dedicated procedures to validate information and</td>
<td>Awareness and understanding among EMS</td>
<td>EMS display awareness of own procedures and</td>
<td>Qualitative or quantitative interviews or surveys</td>
</tr>
<tr>
<td>understand the level and type of resources needed.</td>
<td></td>
<td>understanding of resources needed</td>
<td></td>
</tr>
<tr>
<td>Citizens better understand the benefits of using social media in</td>
<td>Improved awareness and understanding among citizens</td>
<td>Citizens are more aware of the potential benefits</td>
<td>Baseline and follow-up qualitative or quantitative interviews or surveys</td>
</tr>
<tr>
<td>emergencies and how they can be better used during an emergency</td>
<td></td>
<td>of social media and how to use them in emergencies</td>
<td></td>
</tr>
</tbody>
</table>
Table 12: Social apps, EmerGent IT system and EMS IT systems better or more strongly connected

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Measure(s)</th>
<th>Indicator(s)</th>
<th>Method(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better integration of functionality for assessing of a situation on the basis of information</td>
<td>Improved integration of social media into EMS software systems</td>
<td>EMS report improved or increased integration of social media into their software systems</td>
<td>Baseline and follow-up qualitative or quantitative interviews or surveys</td>
</tr>
<tr>
<td>Social media tightly integrated into the workflow of EMS</td>
<td>Improved integration of use of social media in EMS workflow</td>
<td>EMS report improved or increased integration of use of social media in EMS workflow</td>
<td>Baseline and follow-up qualitative or quantitative interviews or surveys</td>
</tr>
</tbody>
</table>
This suggests that the IA of Emergent outputs should use a combination of:

- Quantitative or qualitative content analysis of social media data
- Qualitative interviews with EMS and citizens
- Qualitative or quantitative surveys of EMS and citizens, including a baseline and follow-up survey approach
- Experiments to explore the response of citizens or EMS to different hypothetical scenarios.

This will be done via citizen involvement in the project (Task 2.4) and as part of the case study impact assessment (Tasks 2.2 and 2.3).

5.4 **Implementing the framework**

Implementing the proposed IA concept relies on a number of factors, including:

- Further work, involving all consortium partners to discuss and agree the emerging theory of change and metrics – this will involve agreeing the expected outputs, outcomes and impacts of the EmerGent project (see section 5.1.3)
- Discussions with consortium partners on the proposed research methods for the case study IA and evaluation of EmerGent outputs – with reference to their experience and skills in the use of particular research methods (e.g. quantitative content analysis, setting up and analyzing experiments, conducting social network analysis, etc.)
- Exploring the possibilities for citizen engagement in the case study impact analysis and in evaluating the EmerGent outputs (Task 2.4) across different partner countries – how many and what types of citizens do partners have access to in order to explore their views of the use of social media in emergencies or, for example, to conduct an experiment of the impact of the EmerGent app in a hypothetical emergency scenario?
- Exploring the possibilities of using groups of experts (Task 2.5) to confirm EmerGent output evaluation findings – to what extent are they able to provide input into the likely distance travelled towards longer term impacts?
6 Summary

This Deliverable focuses on providing a concept for measuring the impact of social media in emergencies both on citizens and on EMS as part of the EmerGent project – as such it focuses both on measuring the impact of social media in general and, more specifically, on the impacts of the EmerGent outputs.

6.1 Methodology for WP 2 and Task 2.1

Section 2 starts with an outline of the main role and aim of WP 2 within the EmerGent project as a whole (section 2.1) – to assess the impact of social media in emergencies in general and more specifically the results and outcomes of the project in order to aid the successful evolution of the project as a whole. Section 2.2 sets out the main objectives of the WP and how these relate to the different Tasks and Deliverables that are part of it. Section 2.3 provides the over-arching methodological framework for conducting the research required to fulfil the objectives of WP 2: Impact of Social Media in Emergencies, namely a ‘blended learning environment’ in order to support the subsequent design, development and validation of EmerGent outputs. It also provides an overview of how this approach will be operationalised through each of the Tasks (2.1 to 2.5) and Deliverables (D2.1 to D2.7), while section 2.4 suggests the research methods which will be used for each of the Tasks. Finally, section 2.5 outlines the main methodological approach used for Task 2.1 underlying this particular Deliverable (D2.1), which included three stages: methodological review, conceptual review, developing the EmerGent logic model and finally suggesting specific tools and methods to use in the impact assessment.

6.2 Overview of impact assessment in social sciences

Section 3 of the Deliverable provides an overview of impact assessment methodologies in the social sciences based on a realist review of key literature – starting from a general point of view and focussing in on methods used to study issues of direct relevance to this project: the use of social media in emergencies. Section 3.1 contrasts experimental and non-experimental approaches used for impact assessments in the social science and argues that the latter is likely to be more relevant than the former, given the nature and complexity of the field under study. With this in mind, the following sections review the actual methodologies used in previous studies for impact assessments of ICT and social media in social interventions (section 3.3), of social interventions in general (section 3.4), of the use of social media in emergencies (section 3.5). Section 3.6 draws together the main conclusions from the review conducted and reported on in the preceding section. It proposes for the use of a ‘theory of change’ approach as the central framework for the concept and methodology, which will be capable of responding to the evolution of EmerGent as it develops – possibly in ways that were not originally envisaged. As regards the use of concrete methods, it proposes that impact assessment should draw on methods used in previous studies, including multi-methodological strategy, combining content analysis (including quantitative content analysis) with surveys, focus groups and observation, as well as more novel approaches, including for example social network theory, action research or quasi-experiments to investigate the impact or use of social media in emergency or disaster situations.
6.3 Review of key EmerGent concepts

The next section (section 4) explores some of the key EmerGent concepts of relevance to the impact measurement. It starts with an exploration of the concept of ‘emergencies’ by distinguishing between emergencies and disasters as well as between emergencies and catastrophes (section 4.1). Section 4.2 provides a typology of different types of emergencies, including natural, technological and social hazards/emergencies, while section 4.3 provides an exploration of the different phase of the Emergency Management Cycle (EMC). The next two sections explore the complexity of the emergency situation with regard to the number and different type of actors and organizations involved in emergencies (section 4.4) and section 4.5 discusses how the unpredictability of emergencies means that decision making within such situations is of complex and marked by the subjective experience and views of individuals within EMS. Finally, section 4.6 sets out the main implications of this definitional work on the EmerGent impact assessment task.

6.4 Proposed concept for EmerGent impact assessment

Section 5 presents the proposed concept for the EmerGent impact assessment, using an overarching theory of change methodology. It starts (section 5.1) with an overview of the overall concept set within the context of the main conclusions reached in section 3 as well as a discussion of some of the underlying assumptions of the theory of change framework and the challenges facing such an approach. It then (section 5.2) presents the current ‘draft’ of the EmerGent theory of change and associated logic models based on a review of the DOW as well as input from task partners involved in this Deliverable. As such, it provides both visual and narrative accounts of the current intervention logic at the time of writing this Deliverable. Further work will be needed with other members of the consortium to update and develop the overall theory of change and logic models – starting at the next project board meeting in Catania (August 2014). Section 5.3 outlines the main scope of the EmerGent impact assessment, which includes conducting case studies of past and live emergencies as part of Tasks 2.2 and 2.3, as well as evaluating the impact of EmerGent outputs and prototypes (mainly as part of Tasks 2.4 and 2.5). Further work will be needed to decide on the precise focus and methods as a result of the work on the theory of change and logic models described above. Finally, section 2.5 sets out the next steps needed to implement the proposed impact assessment concept.
7 References

Section 2:


Section 3:


D.1 Concept for Impact Assessment

Version Final PUBLIC


D2.1 Concept for Impact Assessment

Version Final PUBLIC


D2.1 Concept for Impact Assessment

Version Final PUBLIC


2.1 Concept for Impact Assessment

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D.1 Concept for Impact Assessment

Version Final PUBLIC


Section 4:


2.1 Concept for Impact Assessment


Quarantelli, E., (2006), Catastrophes are Different from Disasters: Some Implications for Crisis Planning and Managing Drawn from Katrina. Available at: http://understandingkatrina.ssrc.org/Quarantelli/


2.1 Concept for Impact Assessment


Section 5:


Appendix A: Developing impact metrics for EmerGent

(The following was sent out to Task partners on 27th June 2014 as part of the theory of change planning stage described in section 5)

Introduction

Task 2.1 aims to develop a concept for impact assessment for EmerGent. Part of this work involves developing a set of impact metrics that can be used to measure the extent to which EmerGent has met its intended outcomes and impacts.

This note has been put together by Task 2.1 leaders in order to:

- Engage Task 2.1 partners / contributors / all consortium members into the process of developing outcome and impact metrics by outlining the approach taken.
- Inviting Task 2.1 partners / contributors / all consortium members to contribute to the development of outcome and impact metrics by:
  - Sharing their understanding about the more detailed set of outcomes and impacts that EmerGent is hoped to achieve;
  - Contributing their experience and expertise in order to attach draft metrics to these more granular outcomes.

The results of this exercise will be used by T2.1 task leaders to finalise a long list of possible outcome and impact measures for EmerGent.

In order to support this exercise, this note is structured as follows:

- First, we outline the overall approach taken in T2.1 to develop the outcome and impact measures for EmerGent – that of logic modelling.
- We then offer two sets of logic models that translate information on EmerGent as presented in the DOW in a diagrammatic logic modelling form.
- These, then, form the basis for the outcome and impact metrics development task.
- The note, finally, concludes with a section on next steps and deadlines for input.

Approach to developing EmerGent outcome and impact metrics

A proven method to develop outcome and impact indicators that are clearly linked to the activities they are looking to measure is to use the tool of logic modelling. One way of describing logic mapping is to see it as a systematic and visual way of presenting the key steps required in order to turn a set of resources or inputs into activities that are designed to lead to a specific set of changes or outcomes and impacts. Using this method allows to allocate to each identified outcome an indicator that will be used to measure this change.

As a first step of developing SMART (Specific, Measurable, Assignable, Realistic & Time-related) metrics for the EmerGent project, we have therefore created an EmerGent intervention logic, drawing on the information provided in the DOW (see Figure 6 in section 5.2.1). This presents the following high level narrative of the EmerGent project:
In the current context where there are weak connections between emergency services and citizens, between social media and EMC and between social apps and EMS IT systems, EmerGent research and development work (inputs/activities) will offer new methods and tools as well as guidelines (outputs) that will strengthen these connections (outcomes) and hence lead to improved awareness of the situation during emergencies (impact).

Whilst the logic model is useful to show how the approach works for EmerGent, the model itself is too high level to use as the basis for developing outcome and impact indicators. Figure 7 (see section 5.2.1), therefore, offers a more detailed ‘picture’ of EmerGent activities, outputs as well as articulated outcomes and impacts. Again, this information about inputs/activities, outputs, outcomes and impacts is taken from the DOW.

What should be noted is that:

- The allocation of items from the DOW to logic modelling categories is the result of Task 2.1 analytic activities, as the DOW does not explicitly use these logic modelling terms.
- The links between logic modelling categories (i.e. the ‘story’ of what activities lead to which outputs; which outputs are associated with which outcomes; and which outcomes are associated with which impacts) – expressed using ‘[]’ brackets – is not articulated explicitly in the DOW and hence is the result of Task 2.1 analysis.

**Implications for the design of outcome and impact indicators**

Logic models tend to be dynamic, that is, they get developed and amended as the work on a project progresses and activities and associated outputs (and outcomes) take shape. We would therefore expect that Figure 7 will evolve as work on EmerGent progresses and the results of deliverables can be incorporated.

At this stage, and of relevance for the design of outcome and impact metrics, what is noticeable is that:

- **The EmerGent outcomes articulated in the DOW are few and relatively high level.** Each category of what could be defined as project outcomes (citizens and EMS more strongly connected; social media tools better connected to EMC; social apps, EmerGent IT systems and EMS IT systems better / more strongly connected; EMS and other stakeholders understand the benefits of social media and its integration into their process) could probably be broken down into sub-components that would represent a more detailed account of the range of outcomes to be expected from EmerGent.
- **There is virtually no articulation of expected impacts** (i.e. the longer term results) of EmerGent in the DOW, other than possibly “improved awareness of the situation during emergencies”. In order to develop impact metrics it is therefore necessary for T2.1 to collect partners’ assumptions, understandings, knowledge, hypotheses about the full range of possible impacts EmerGent might/is likely to achieve. Ongoing work of WP2 will subsequently sense-check these and eliminate any articulated types of impact that are unlikely to be achieved.
Task for partners

We would like to invite partners to contribute to developing the first long list of outcome and impact indicators for EmerGent. Using the tables (see Tables 10, 11 and 12 in section 5.3.2), which translate the logic model picture above into a table format, we would like to ask you to draw on your knowledge and experience to contribute thoughts on:

- how to break down the existing high level outcomes and impacts into smaller, more measurable, ones
- any outcomes and impacts EmerGent is likely to achieve that have not (yet) been included in the logic model

The following questions might usefully guide this work:

- What short to medium term results (i.e. outcomes) and longer term impacts can we expect EmerGent to achieve for each of the different stages of the Emergency Management Cycle (Prevention, Preparedness, Response, Recovery)?
- What different outcomes and impacts can we expect for people (individuals, communities, society), organizations, content, technology, systems integration, computer mediated interaction?

Please fill in the table as much as you can – leave any spaces in columns if you are unable to provide details or are unsure of them. We have provided some examples as illustrations – you can correct these or add to them as you see fit; they were really only included as suggestions and ideas to spark other thoughts.

Partners are invited to add their thoughts into the attached Word document and return it to the Tavistock Institute by 4th July 2014 – please email it to kjunge@tavinstitute.org and/or t.spielhofer@tavinstitute.org.