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Crowd Innovations

A study of the introduction of innovations for a larger involvement of beneficiary communities in emergency aid and response

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Abstract

With data from crisis-mapping specialists and emergency response agencies in Nairobi, Kenya, this thesis studies *the challenges and potentials in diffusion and implementation of crowd innovations*. The term, *crowd innovations*, is used to describe concepts such as *crowdsourcing*, *crowdseeding* and *crowdfeeding,* which builds on the idea that the public and beneficiary populations can extend their contributions to humanitarian and emergency responders through peer production and consumption of information. This idea is central to the emerging field of crisis mapping.

In this thesis, a *three level diffusion/implementation model* is presented and applied in the analysis of how crowd innovations *spread* (diffusion) and are *put into use* (implementation). *The first level* addresses the diffusion dialogue between the crisis-mapping specialists and individual users (non-organisational adopters). *The second level* addresses the diffusion dialogue between the crisis-mapping specialists and the managers of relevant organisations (organisational adopters), while *the third level* addresses the implementation dialogue between the organisational managers and the lower-level members of the organisation (organisational adopters). A purpose of this model is to highlight the tech-specialists choice to diffuse to individuals that can serve as a member of a crowd directly, or diffuse to and through relevant organisations and their managers.

The findings suggest that there are several overlapping challenges facing diffusion at different levels. These include, for example, insufficient capabilities (lack of technical skills, training, equipment etc.), mistrust in crowd-generated data and lack of knowledge about long-term consequences of adopting crowd innovations. At the same time, early involvement of well-established organisational adopters could potentially power corrective actions to overcome such challenges.

In line with these and other findings, the thesis concludes that the promotion of crowd innovation should to a larger extent recognise the value of diffusion via influential response organisations and their leaders.

Acknowledgement

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Abbreviations

CBDRT	Community-Based Disaster Response Team
CERF	Central Emergency Response Fund
CIA	Central Intelligence Agency
CRECO	Constitution and Reform Education Consortium
DHN	Digital Humanitarian Network
DRC	Democratic Republic of Congo
DRR	Disaster Risk Reduction
DRT	Disaster Response Team
GIS	Geographic information systems
HHI	Harvard Humanitarian Initiative
ICCM	International Conference of Crisis Mappers
ICRC	International Committee of the Red Cross
ICT	Information and Communication Technology
IT	Information Technology
ITU	International Telecommunication Union
KCBDRRT	Kamakunji Community-Based Disaster Reduction and Response Team
KRC	Kenya Red Cross
KRCS	Kenya Red Cross Society
Ksh	Kenyan shilling
MSF	Médecins Sans Frontières
NDM	Naturalistic Decision-Making
NGO	Non-Governmental Organisation
NYS	National Youth Service
OCHA	Office for the Coordination of Humanitarian Affairs
PRIO	Peace Research Institute of Oslo
RAMP	Rapid Mobile Phone-based survey concept
R&D	Research & Development
SBTF	Standby Task Force
SMS	Short Message Service
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNHCR	United Nations High Commissioner for Refugees
URR	Urban Risk Reduction
US	United States
V&TC	Volunteer & Technological Community

Content

1.0 Introduction

In the field of humanitarian technologies[1], recent communication and technology trends have given rise to the notion and concept of "digital humanitarianism", in which new applications of digital and web-based communication technologies are thought to fundamentally transform or redefine humanitarian response (Vinck, 2013; OCHA, 2013a). The term, crowd innovations, is meant to describe tools or strategies for enhanced inclusion of the public and beneficiary populations in emergency-related and humanitarian tasks, predominantly in reporting and assessing needs and events. The idea to include the public in crisis management and response is not particularly new, but growing digitalisation is said to have expanded this potential (Palen et al., 2010). Moreover, new innovations promise to reconnect and reorganise the helpers and the helped in so-called "hard-to-access" areas, that is, areas where the provision of aid is restrained due to physical barriers and barriers created by conflict violence and natural disasters (Barber, 2009; Duffield, 2013).

These and other advantages have boosted the interest for crowd innovations, yet some also remain reluctant to fully adopting these tools. For instance, there are those who fear the beginning of a remote control system of response in which the responders are simply engaging in face-to-screen communication and information monitoring (Duffield, 2013). Another concern is that even if the information gap can be reduced through digital communication, this will create a new gap discriminating those most vulnerable and least digitally able (Vinck, 2013). The overall purpose of this thesis is to understand what fuels (potentials) and limits (challenges) crowd innovations processes.

With data from Kenya´s capital city, Nairobi, I provide an analysis of the relationship between some of the leading change agents behind these recent technology and communication trends,

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1 According to Vinck (2013), humanitarian technologies are "new applications of technology to support efforts at improving access to and quality of prevention, mitigation, preparedness, response, recovery and rebuilding efforts" (p. 20).

the Crisis Mappers, and the more "traditional", humanitarian and emergency response organisations. Crisis mapping is defined as a technology field that

> "…leverages mobile and web-based applications, participatory maps and crowdsourced event data, aerial and satellite imagery, geospatial platforms, advanced visualization, live simulation, and computational and statistical models to *power effective early warning for rapid response to complex humanitarian emergencies*" (The Crisis Mappers Network, as cited in Vinck, 2013, p. 15; emphasis added)

Traditional humanitarian actors include highly professionalised humanitarian actors such as the United Nations, the Red Cross, and other Non-Governmental Organisations (NGOs). In accordance with the diffusion theory of Everett Rogers (2003), I define this relationship as primarily a channel for diffusion of innovations, which suggests a two-way communication between the promoters of an innovation and the potential adopters of that innovation. On the one hand, the majority of diffusion processes by Nairobi-based crisis mappers seems to be directed at individual adopters in projects aiming to build resilience and technological capacities in local communities. On the other hand, one can also find examples where crisis mappers have supported emergency communication between local response organisations and crisis victims during events such as the Kenyan presidential elections in 2013 and the Westgate Mall attack later that same year.

In a recent evaluation of crisis-mapping efforts in Nairobi, it is stated that the tech-community should to a larger extent "recognize the power of local response" (as cited in Omenya, 2013). In line with such statements, I wish to explore the potential for local response organisations to act as *implementers* of crisis-mapping solutions and crowd innovations. Implementation consists of "all the events, actions and decisions involved in putting the innovation into use" (Rogers, 2003, p. 421). Accordingly, this thesis will address not only the efforts fuelling adoption by organisations (diffusion), but also what happens after the organisation decides to adopt an innovation (implementation).

1.1 Background for choice of topic

Information and sharing of information serve many key functions in humanitarian response operations, one of which is to efficiently and effectively inform coordinating bodies and responders about the needs of populations affected by a crisis or disaster. The conventional

methods and strategies for conducting assessments and collecting information about humanitarian needs involve having professionalised responders go to the field and pass on standardised and written information to their respective organisations. This however, requires physical access to an area, which is not always possible or easy. In comparison, digital communication technologies can transfer information across borders and spatial boundaries a lot faster than traditional "pen and paper technologies". These and other competitive advantages of "new technologies" create strong incentives for the adoption of changes in communication by aid agencies.

In addition to digitalisation, crisis mappers and technological communities have also embraced social structures supporting the digital tools or hardware. The concept, "crowd innovations", is meant to refer to such non-technical solutions or adjustments, emphasising not only the human factor but also the organisation of technology (see also 3.1). More concretely, I use this term to combine the concepts, "crowdsourcing", "crowdseeding" and "crowdfeeding". The commonality in all three concepts is the idea that para-professionals and beneficiary populations can play a larger role in humanitarian and emergency response through peer production and consumption of actionable information. *Crowdsourcing* means harvesting information from large populations, while *crowdseeding* refers to the selection of key individuals in a community to report information (van der Windt & Humphreys, 2013a). *Crowdfeeding*, on the other hand, means reversing the flow of information to disseminate messages to crowds (Ziemke, 2012).

1.2 Objectives

I have two main objectives that I seek to meet with this thesis. The first objective is to give a thorough description and interpretation of the Nairobi-based crisis-mapping community and their role as inventors of new technologies for humanitarian and emergency communication. In order to understand the on-going transformations in humanitarian logistics and communication technologies, it is necessary to grasp the motives of the main change agents promoting those transformations. What is not obvious or definite however, is the degree to which these motives are consistently and universally expressed among the identified members of the crisis-mapping network. An analysis is therefore given of the "interpretive flexibility" (Bijker, 2009) of the crisis mappers' efforts and motivations, and of their humanitarian and emergency contributions in particular.

Moving on to the second objective of this thesis, the remainder of the analysis is dedicated to highlighting the organisational prerequisites for a successful implementation of crowd innovations, and crowdseeding in particular. According to Rogers (2003), such innovation processes generally consist of a pre-adoption phase and a post-adoption phase, and while the pre-adoption phase will be studied through analysing the crisis mapper´s diffusion efforts, the post-adoption phase will be studied through analysing an initiative by the Kenya Red Cross Nairobi Branch to enhance emergency communication and outreach to seven slum areas in Nairobi, referred to as "the URR[2]-program" (see also 2.5).

1.3 Research problem and operational research questions

The crisis mappers do not operate in isolation and while their goal is surely to support traditional response, it is not to the same extent well-defined how and under what conditions this support can be given (Vinck, 2013). In search for answers to fuel such knowledge, the following research problem will be addressed:

What are the key challenges and potentials in the diffusion and implementation of crowd innovations for emergency response agencies serving hard-to-access slum populations in Nairobi, Kenya?

Every innovation originates from somewhere, from some change agent or entrepreneur with a new angle or view on potential solutions to a problem, for instance on how to overcome limitations to humanitarian access and connectivity. But in order for the innovation to spread to achieve its purpose, it needs to be communicated – *diffused* – to the individuals and organisations facing the problem at hand. This process can end in adoption (success) or rejection (failure), which suggests that there are not only *potentials* inherent in diffusion, but also *challenges*. The same is true of the process of *implementation*, starting with the organisational leaders' decision to adopt an innovation on behalf of the entire organisation; the organisational leaders may perceive the innovation as beneficial, but they still rely on the grassroots' approval and cooperation in order for the implementation to succeed. Two vital

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[2] Urban Risk Reduction

steps or sub-processes can thus be identified: diffusion and implementation. Correspondingly, I have prepared two sub-questions, each addressing one of these vital sub-processes:

1. **Crowd innovations diffusion by tech-communities:** *What are the key challenges and potentials in the crisis mappers' diffusion of crowd innovations to and through organisations (as compared to direct diffusion to individuals)?*
2. **Crowd innovations implementation by emergency agencies:** *What have been the key challenges and potentials in the KRC's implementation of the URR-program (a crowdseeding-like initiative)?*

1.4 Limitations

While this thesis is largely inspired by the crisis mappers motivations and efforts to leverage technology to power a rapid response to complex humanitarian emergencies (for definition, see 1.0), its context of inquiry is not complex humanitarian emergencies, which requires international response; instead, the focus of this thesis is the efforts of the Nairobi-based crisis mappers and efforts powering local emergency response to the city's informal settlements. I study the implementation in two informal settlements, Mathare and Blue Estate.

The aim is not to offer an all-encompassing discussion on factors determining diffusion and implementation of crowd innovations, but to examine some of the main challenges and potentials that promoters and adopters are likely to experience during such processes. Another limitation worth mentioning concerns the choice to give more attention to the organisational prerequisites and less to the technical prerequisites for successful innovation. Moreover, although crowdsourcing addresses the individual level as well as the organisational level, the predominant focus will be the organisational level (and crowdseeding). Lastly, I study how technology affects, and is affected by, human interaction (organisation), which should not be confused with studying interactions between technology and human cognition (psychology).

1.5 Previous research

Scholars have long recognised the important role of crisis communication in crisis management (Winsor, 1988; Comfort, 1993; Coombs, 1995; Coombs & Holladay, 1996; Quarantelli, 1997; Hale et al., 2005). While some studies have focused more on the prevention and recovery stage

(Winsor, 1988), others have explored the role of crisis communication at the response stage (Coombs, 1995; Coombs & Holladay, 1996; Hale et al., 2005). According to Hale et al. (2005), this is when the most vital decisions are made, and under the most challenging circumstances (see also Endsley et al., 2003; Christensen et al., 2013). Moreover, while most previous studies have viewed ICTs as largely means to enhance command, control and dissemination (Coombs, 1995; Coombs & Holladay, 1996; Quarantelli, 1997), the past decades have seen an ideological shift towards emphasising the importance of the market or private forces (e.g. neoliberalism) in regulating society (Harvey, 2005; Zook et al., 2011).

Dynes (1993) is one of the pioneers behind the decentralised decision-making model, which opposes the use of command and control structures in emergency response operations. The alternative model asserts the effective utilising of "volunteers" as first-responders. High involvement by members of the public in disasters is thus not new, but according to Palen et al. (2010), the introduction of the Web 2.0 and new media make their role more visible and broadens the scope of their participation. Other recent contributions on this subject include Vieweg et al. (2008), Coyle & Meier (2009), Veil et al. (2011) and Stempeck (2013).

Relatedly, solutions for harvesting ideas and information from people loosely affiliated through the Internet, or "crowdsourcing", have spurred increasing interest (Aitamurto et al., 2011; Seltzer & Mahmoudi, 2012). Seltzer & Mahmoudi (2012) study the potentials in crowdsourcing for planning and preparedness, while other scholars (Goodchild & Glennon, 2010; Zook et al., 2011; Roche et al., 2013) have reviewed the crowdsourcing of geographical information during emergencies. Guy et al. (2010) found that rapid citizen-generated reports via Twitter could potentially fill the gap between when an earthquake occurs and when seismically derived information is available. In a study by van der Windt & Humphreys (2013a), the authors examine the benefits of collating information from specific agents, or "crowdseeding". The study concludes that crowdseeding, if presented to the response actors, could serve as an early warning mechanism; as a tool to prioritise interventions; or as a system to relay information to communities. This latter aspect (relaying information to crowds) is often referred to as "crowdfeeding" (Ziemke, 2012).

Comprehensive reports that support these recent trends include the Harvard Humanitarian Initiative's (HHI) report from 2011, *Disaster relief 2.0: The Future of Information Sharing in Humanitarian Emergencies*, UN-OCHA's report from 2013, *Humanitarianism in the Network*

Age, and the *World Disasters Report 2013: Focus on technology and the future of humanitarian action*. A widely deliberated subject is how to build future collaborations between the emerging Volunteer and Technological Communities (V&TCs) and the traditional humanitarian sector. Capelo et al. (2012), Hichens (2012) and Resor (2013) also discuss this interface. Hichens (2012) studies the motivations behind the voluntary mapping of the Standby Task Force (SBTF). Resor (2013) seeks to "know" the crisis-mapping community in general, and how it is forming institutional connections to the more "formal" humanitarian sector.

Despite its many potentials, reliance on crowdsourced labour has also seen a return to concerns regarding the accuracy and validity of data that is not being centrally managed (Morrow et al., 2011; Zook et al., 2011). Tapia et al. (2011) report widespread reluctance among large-scale responders to incorporate micro-blogged data into their activities, due to perceived lack of authentication. Duffield (2013) disputes a future "cyber-humanitarianism". Similarly, writings by Kristin B. Sandvik (2013; 2014) at the Norwegian Peace Research Institute of Oslo (PRIO) describe how the embrace of technological innovations presents humanitarians with a new set of challenges to the sanctity of the humanitarian principles.

Perng et al. (2012) address the use of social media during the 22/7/2011 Norway attacks, and another study by Andersen & Ranum (2014) finds the social media to be increasingly applied by the Norwegian police, although not yet as a tool for two-way communication. Engum (2014) gives an analysis of the crowdsourced crisis map from a media perspective. Høgestøl (2014) has reviewed the diffusion of micro-blogging for crisis communication in five Norwegian municipalities, and finds insufficient implementation of plans for the use of such platforms during emergencies. While these, and several studies mentioned above, focus on the introduction of largely *face-to-screen* communication platforms, this thesis gives more attention to the potentials in crowd innovations for *face-to-face* communications. Like Høgestøl (2014), this thesis accentuates the importance of diffusion and implementation processes; only the context in which these processes are examined is different.

1.6 Organisation of the thesis

Apart from this introduction, the thesis consists of six main chapters through which I present, discuss and summarise the relevant theory and empirical data to answer the above research question(s). *The second chapter* is set up to give background information about the crisis-

mapping field and the context of inquiry, including the technological community in Nairobi, the Blue Estate and Mathare informal settlements and the surrounding response system serving those settlements. In addition, I give a brief presentation of the URR-program and the implementing organisations, the Kenya Red Cross and the Kenya Red Cross Nairobi Branch. In *the third chapter,* I present the theoretical framework selected for the research and analysis, which consists of five main theories interpreting the concept of technology, the relationship between technology and organisation, the diffusion of innovations and the process of implementation. Additionally, to supplement the diffusion literature on implementation, I also include some insights from outsourcing theory. In *the fourth chapter,* I explain the choice of a qualitative, abductive research approach. This entails a description of the research process and how I organised the data collection. In addition, I describe the choices and conditions that might influence the reliability and validity of the findings, followed by a brief reflection of ethical considerations.

The fifth chapter gives a presentation of the most relevant discoveries concerning the crisis-mapping field and related innovations and processes. The chapter is divided into two sub-sections, starting with data on the crisis mappers' motivations and efforts to spread their innovations to potential adopters – organisations and individuals. At the end of this section, I also present some perceptions concerning the crowdseeding strategy as compared to the crowdsourcing strategy. In the second sub-section, I describe the implementation of such strategies, using the URR-initiative as an example case. In *the sixth chapter*, I construct an analysis of the discoveries and discuss them in light of the theoretical perspectives selected for this thesis. Applying the same two-part divisions as in the preceding chapter, each sub-discussion relates to a sub-question in the introduction chapter. In the first section, the main theme is the "choice" of either direct diffusion to individual users or the inclusion of organisations as implementing units. In the second section, the question discussed concerns the challenges and potentials occurring throughout the implementation process. In *the last chapter* I summarise and conclude on the findings discussed, bringing together all the elements found to play a part in the diffusion and implementation of crowd innovations for a reconnection with hard-to-access beneficiaries.

2.0 Context

As stated in the introduction, the recent trends in humanitarian technology, including the emerging of the field of crisis mapping, are largely fuelled by innovation messages promising to reconnect the helpers and the helped to overcome limitations to humanitarian access. Access to new technology and tools for increased connectivity are thus linked to contexts characterised by blockage to humanitarian and emergency response. In this section I describe recent trends in both humanitarian access (2.1) and access to new communication tools (2.2), globally and locally. Moreover, I give a description of the crisis-mapping field (2.3) and of the main actors involved in crisis-mapping activities and technology development in Kenya (2.4). Finally, I offer a brief presentation of the Kenya Red Cross and of the URR-program (2.5).

2.1 Humanitarian access and limitations

"Humanitarian access concerns humanitarian actors' ability to reach populations affected by crisis, as well as an affected population's ability to access humanitarian assistance and services" (OCHA, 2010, para. 1). This definition is retrieved from a reference paper by OCHA (2010), in which humanitarian access is described as a fundamental prerequisite to effective response and aid delivery.

On a global scale, but also locally, the humanitarian actors' economic resources and ability to physically respond to the needs of crisis-affected populations largely decide humanitarian access. In order to understand the need for new solutions that seek to overcome restraints to humanitarian access, one needs to understand the overarching trends in funding as well as trends in the number and impact of both natural and man-made disasters[3].

2.1.1 Global funding trends

In 2013, the international humanitarian response reached an exceptional US$22 billion, most of which went directly to multilateral organisations, primarily UN agencies (61% in 2012). NGOs were the next largest first-level recipients of humanitarian resources, directly receiving US$2.3 billion (19% in 2012). Local and national NGOs receive a smaller share – 1.6 per cent

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[3] Here, natural disasters refer to disasters created by climate change or events such as earthquakes, floods, storms etc. Man-made disasters, on the other hand, are disasters resulting from acts of war and conflict (OCHA, 2010)

of the sum donated directly to NGOs between 2009 and 2013, and 0.2 per cent of the total international humanitarian response during this period (Swithern, 2014).

Though the international humanitarian response has increased significantly, it still falls short of meeting global needs. Of the 19 countries that had UN appeals in both 2012 and 2013, more than two-thirds (13) experienced a decline in the proportion of their requirements met (Swithern, 2014). Insufficient funding and relatively smaller donations directed at national and local NGOs could suggest that financial resources support a centralised model of response. Pooled funds that aim to power a rapid humanitarian response include the Central Emergency Response Fund (CERF)'s rapid response window as well as the NGO-led RAPID and Start Funds. While the latter two represent funding mechanisms available to most local and national organisations, CERF is only available to UN-agencies (ibid.).

2.1.2 Disaster numbers

Crises are often divided into natural disasters and conflicts, and while natural disasters can cause significant impediments related to climate, terrain or lack of infrastructure, conflicts can cause blockage in the form of active fighting and military operations or hostile attacks on humanitarian personnel, goods and facilities (OCHA, 2010). Looking at the period 1975-2011, the International Disaster Database has documented an overall rise in the number of natural disasters reported in the world (see figure 1).
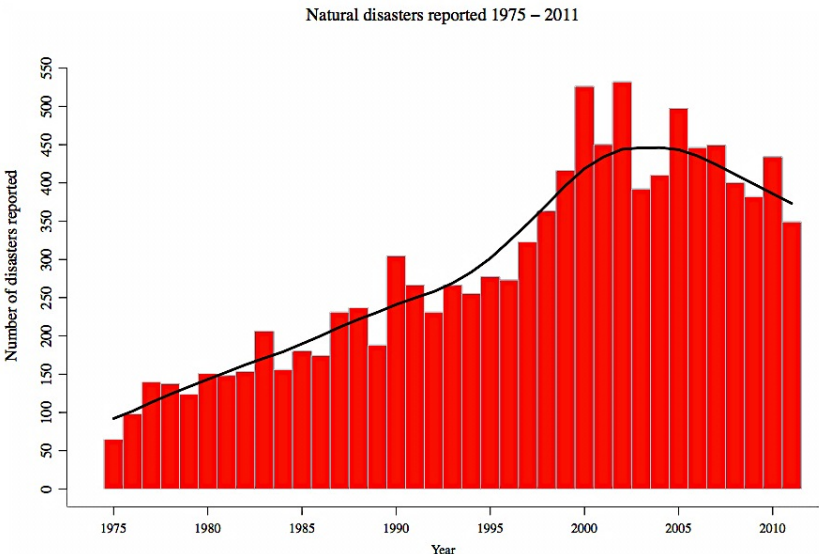
Figure 1 Natural Disasters. Figures, 1975-2011. Source: International Disaster Database

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While in 1975, the number of natural disasters was well below a hundred, the average between 2003-2012 has been a number of 388 reported incidents per year (Guha-Sapir et al., 2014). Concerning impact, the highest recipients of humanitarian aid are the most affected. As stated in a report from 2012: "Essentially, although this group of countries suffer three in every ten disasters, they account for five out of every ten people affected and seven out of every ten people killed" (Kellet & Sparks, 2012, p. 6).

Concerning armed conflict and violence, war between states has increasingly been replaced by civil war conflict and terrorist attacks (Coyle & Meier, 2009). In recent years, politically and economically motivated attacks on humanitarian workers and active fighting have increasingly contributed to limited access to conflict-victims (OCHA, 2010) (see figure 2).
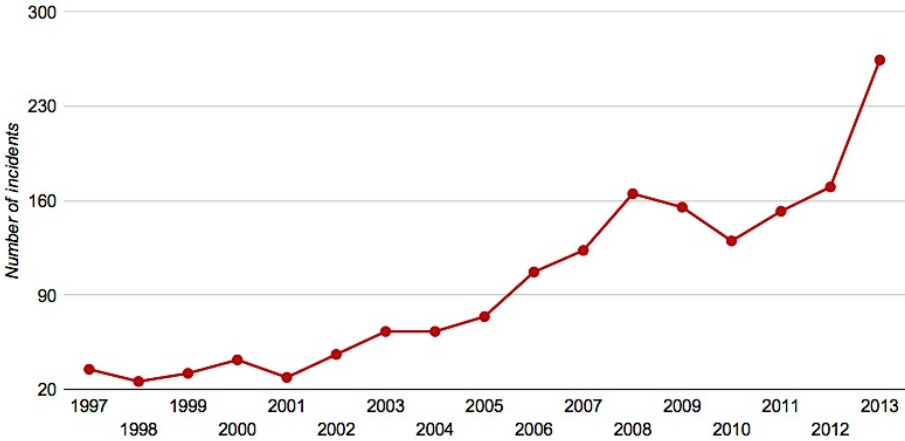
Figure 2 Attacks on humanitarian workers. Figures, 1997-2013. Source: aidworkersecurity.org

2.1.3 A brief history of crises and responses in Kenya

Kenya has the largest economy in East Africa, yet the country ranks among the top aid recipients, receiving significant development and humanitarian assistance (Global Humanitarian Assistance, 2014). As a top recipient of police and military counterterrorism assistance on the continent, Kenya hosts the largest US diplomatic mission in Africa. Kenya's capital city, Nairobi, is also home to one of four major United Nations offices worldwide (Blanchard, 2013).

Looking at Kenya' domestic expenditures to crisis response, the majority of humanitarian resources have been spent on refugee response, totalling US$138 million between 2008 and

2012. Disaster relief, including assistance to disaster emergency response coordination, national disaster operations, and relief and rehabilitation, totalled US$22 million in this period (Swithern, 2014).

Figure 3 Map of Kenya. Source: Central Intelligence Agency (CIA) World Book

Kenya periodically experiences droughts, floods and other natural disasters. In 2011, a severe drought affected the entire Horn of Africa, including 3.8 million Kenyans and a large refugee population, the majority of whom have fled from Somalia to the Dadaab refugee camp, situated in north-eastern Kenya. During the drought, Dadaab received an average of 1,400 every day and reached over three times its intended capacity. Since April 2012, heavy rains have caused flash floods and landslides across the country, resulting in a number of casualties and around 30,000 displaced persons (Global Humanitarian Assistance, 2014).

Kenya is generally known for being a peaceful country, albeit with some noteworthy exceptions. During the 2007-2008 post-election violence, as many as 1,300 people were killed and some 500,000 displaced[4]. More recent crises include the September 2013 terrorist attack and a fire at Nairobi's main airport in August (Blanchard, 2013).

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[4] State Department, "Kenya", Background Notes, May 7, 2012 (as cited in Blanchard, 2013)

At the same time, 2013 also came with a renewed opportunity to reclaim the vision of a free and peaceful election, and together with overall improvements in domestic response to both natural and conflict disasters, the successful implementation of the presidential election in 2013 led OCHA and its partners to conclude that there would be no need for an Emergency Humanitarian Response Plan for Kenya in 2014 (OCHA, 2013b).

2.1.4 Security threats in the North

Despite recent optimism concerning the Kenyan government's ability to take a larger responsibility in serving its population and working together with humanitarian actors to safeguard humanitarian access, there are still locations where access restraints remain a problem to human responders and their beneficiaries. "In Kenya's northeast, the government lacks both capacity and, aid agencies perceive, the political will to provide general security" (Stoddard et al., 2012, p. 7). The government regularly reports on trends in violence in the capital and surrounding areas, but there is a limited discussion and reporting on security in northern Kenya where the majority of incidents targeting aid workers occurs (ibid.)

The insecurity near the Kenya-Somalia border has affected the conditions for both staff and beneficiaries situated in the Dadaab refugee camp. In late 2011, rising insecurity and a series of kidnappings in the border area, led to the suspension of all but emergency relief efforts at Dadaab. While an increased police presence has since allowed some aid activities to resume, security threats continue to hamper aid delivery (Blanchard, 2013).

2.1.5 Current threats to humanitarian access – rural areas and camps

Concerning the most recent developments in the camps, the Kenyan government has launched a plan for encampment of urban refugees and for the return of refugees to Somalia. In a report by UN-OCHA from 2013, the number of refugees in the Dadaab refugee camp is estimated to about 425,000 people, which suggests a reduction from previous years[5]. At the same time, due to the war outbreak in South-Sudan, the number of refugees increased in another refugee camp, Kakuma, which is situated in Turkana County, not far from the city of Lodwar (see figure 3). During the first half of 2013, the number of refugees from South-Sudan increased by 18,000,

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[5] According to 2012 numbers, the population amounted to about 560,000 people (Global Humanitarian Assistance, 2014)

bringing the total population to more than 119,000 (OCHA, 2013b). By end 2013, this number approached 125,000, and Kakuma became overcrowded (UNHCR, 2013). The below photo (figure 4) displays the new reception centres built to cope with the new arrivals from South-Sudan. In light of the current situation, and despite plans for the return of refugees to Somalia, organisations such as the Médecins Sans Frontières (MSF) and Kenya Red Cross (KRC) have called for continued funding of assistance and security efforts in the camps (Maruko, 2014). For instance, the number of Kenyans in need of food aid is estimated to rise by 1.5 million over the next six months (Migiro, 2014).

Figur 4 Photo of Kakuma refugee camp: the new reception centres for South-Sudan. Source: actalliance.org

2.1.6 Current threats to humanitarian access – urban slums

Being a prominent part of Kenya's capital city, Nairobi, the informal settlements are the homes of more than half of the city's population (Wesolowski & Eagle, 2009). Regarding crises and crisis response, these areas have been found to be disadvantaged in several ways. For example, it is difficult for responders to penetrate those areas with their vehicles, because the paths leading into the slums are too narrow. In the picture below (figure 5), one can see how the houses are built extremely close together. Also, the slums have been found to be particularly vulnerable to fire-outbreaks and floods. Access to water and overpopulation are other pressing issues, as potentially underlying causes of conflict and political unrest. More concretely, lack

of trust in the public firefighting teams has provoked physical attacks on those teams as they enter the informal settlements (personal communication with informants).

Figure 5 Photo of the Mathare informal settlement. Source: Guro Åsveen

2.2 Access to new communication tools

While humanitarian access can be said to be under increasing pressure from recent phenomena of climate change and attacks on humanitarian workers, access to humanitarian technology and information seem to be facing a positive outlook.

According to the International Telecommunication Union (ITU), the mobile-cellular penetration in developing countries will reach 90 per cent by end 2014, compared with 121 per cent in developed countries. Though the access to mobile phones is higher in developed countries than in developing countries, the strongest growth is found in the latter category. The ITU figures also indicate that by the end of 2014, there will be almost 3 billion Internet users, two-thirds of them coming from the developing world (ITU, 2014). Another related trend is the extensive use of social networking sites such as Facebook and Twitter. As of October 2014, market leader Facebook reached 1.32 billion registered accounts, while Twitter had over 255 million monthly active accounts (Statista, 2014).

In Kenya, Internet use is high by regional standards. The widespread use of mobile phones enables millions to access the web, and as of 2012 the mobile phone ubiquity was 71.2 per cent. 32.1 per cent of Kenyans are online regularly, and many Kenyans have embraced social media

(World Economic Forum, 2014). In a survey examining the use of social networks such as Facebook, Twitter and LinkedIn in different countries, Kenyans ranked the impact of those websites to 5.5 on a scale from 1 to 7 (ibid.).

In a study of mobile phone usage in the oldest and second largest slum, Mathare, all but one respondent interviewed owned a personal mobile phone. The individual who did not own a mobile phone reported using a friend's or relative's phone at least once a week. Typical application areas were found to include making calls, sending messages and making payments (mainly through Safaricom's M-pesa service). Among the more highly connected individuals (matatu drivers, community researchers), almost half the participants responded that they use their phone for accessing the Internet (Facebook especially) and listening to the radio. In another study of six locations in Kenya, an estimated 16 per cent used mobile Internet (iHub Research & Research Solutions Africa, 2012; Frilander et al., 2014).

Together, the restraints on humanitarian access together with the spread of new communications technologies create strong incentives for adoption of changes to communication by response organisations. Moreover it calls for new collaborations with tech-companies and para-professional local community groups among the beneficiary populations (OCHA, 2013a). In the next section I further outline the role of the main actors and initiatives relevant for emergency response and ICT in Nairobi. But first, I want to give a description of what the crisis mapping field can do in terms of harvesting information from crowds. I focus on three attributes: the information sources (the crowd), the technology hardware and software (the communication device) and the geo-tagged information (the map) (see figure 6).

2.3 Crisis mapping – what it is and what it can do?

In order to make a crisis map, there is first of all a need for a crowd to give information. The crowd can be of a smaller magnitude or include the whole population, depending on, simply put, whether one is using a crowdsourcing strategy (harvesting information from large populations) or a crowdseeding strategy (harvesting information from pre-selected individuals) (van der Windt & Humphreys, 2013a). This flow of information can also be reversed to disseminate messages to the crowd or team of reporters. This strategy can be referred to as crowdfeeding (Ziemke, 2012).
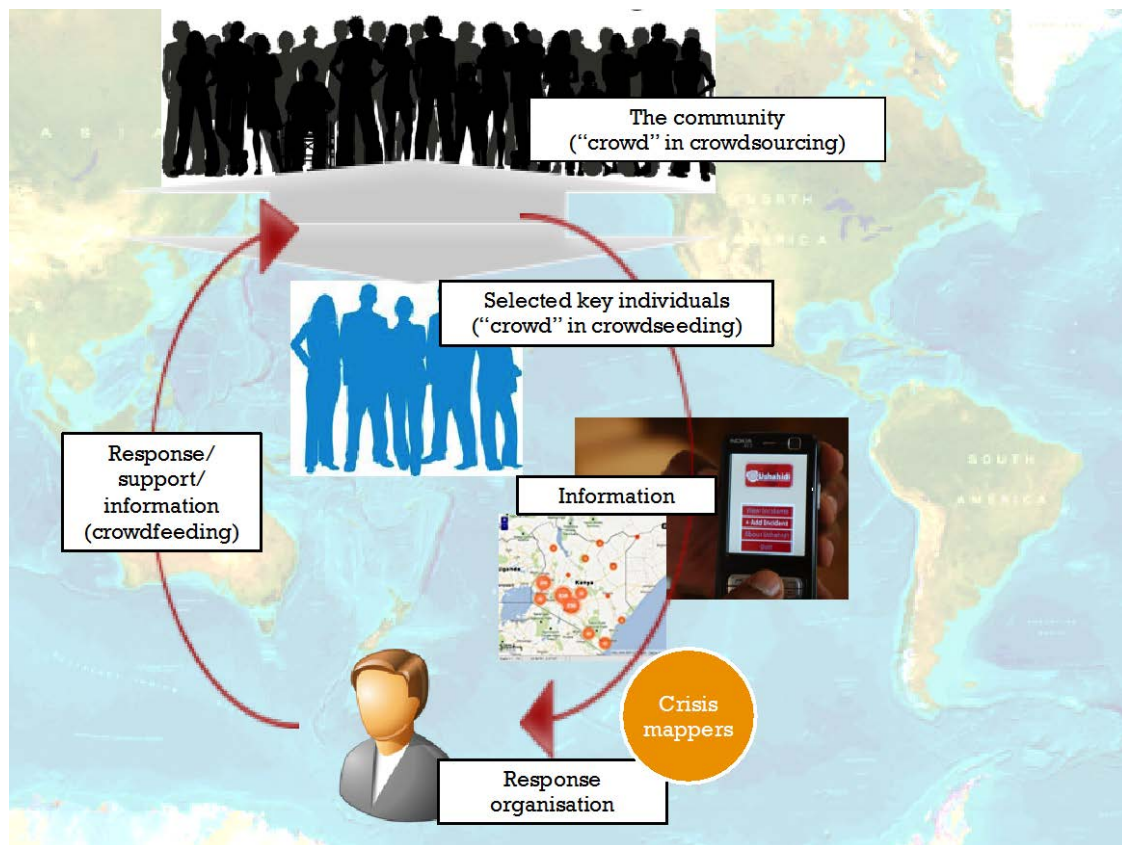
Figure 6 Crisis mapping: Main features and actors

The second thing needed is a tool or technological devise, like the mobile phone, and a central platform to help receive and store the information. The advantages of devices and platforms that support digital communication, is the opportunity to transfer information in a matter of seconds. Moreover, digitalised communication opens up a wide range of opportunities when it comes to verification and visualisation of information (Veil et al., 2011). The challenge, on the other hand, is adjusting these tools to fit a variety of humanitarian settings. For instance, in case there is technical failure during a crisis, one would need tools that are easily combined with traditional "pen and paper technologies".

Regarding the role of maps, experts at the cutting-edge of recent geographic information systems (GIS) trends call the result "Neogeography," which is essentially about "people using and creating their own maps, on their own terms and by combining elements of an existing toolset" (Meier, 2009, para. 4); While previously, traditional mapping tools were expensive and required extensive training to use, this has all changed with the introduction of GoogleEarth and GoogleMaps together with several other platforms and enabling technologies for collaborative mapping (Meier, 2009; Engum, 2014).

In recent years, crisis mapping have grown into a widespread and broad technology field, offering solutions and technology for validating information, monitoring and mapping reported events, translating text and integrating data useful to various humanitarian actors (OCHA, 2013a). Local and international efforts include technical support and mapping missions in response to the Haiti earthquake in 2010, extensive crowdsourcing efforts in support of the Arabic spring and the Typhoon Yolanda disaster response operation in 2013, election monitoring during the 2013 presidential elections in Kenya, and blood-donations support and social media monitoring during the Westgate Mall attack in Nairobi in September of that same year (OCHA, 2013a; HHI, 2011; Hershman, 2013).

In addition, the crisis mappers have also contributed in various non-emergency projects aiming at building resilience and local capacity and awareness. At the same time, emergency- and non-emergency efforts often overlap and co-exist within the same missions, as it did during the presidential election operation in 2013. In this operation, tech-communities and their local partners – the Kenya Red Cross (KRC), CRECO (Constitution and Reform Education Consortium), the police and various civil-society and community-based organisations – collaborated on running a national citizen-centred election-monitoring project, named Uchaguzi (meaning "elections"). During the three main election days (March 3-March 6) there were more than 200 registered volunteers doing live monitoring on the Uchaguzi platform; as of March 18, the platform had 2,699 verified reports, and 4,964 in total. These were reports on events that either entailed acts of violence or that could lead to violence and cause harm to the public. Through this mission it was concluded that massive violence had been avoided (Omenya, 2013; Omenya & Crandall, 2013). At the same time, evaluations also revealed challenges and areas of improvements, one of which was found to be a closer collaboration with local response units.

2.4 The Nairobi-based crisis mapping community: Main actors

Ushahidi, MapKibera and *Spatial Collective* are all Nairobi-based social enterprises working with geographic information systems for development and event mapping. *Ushahidi* was launched during the 2007-2008 election riots, effectively answering to the constrained media coverage of violence and human rights abuses and to the on-the-ground NGOs' reluctance to share vital information. Since then, Ushahidi has continued to develop the platform, adding

important new features and partnering with numerous groups to bring transparency and accountability to other crises (Heinzelman et al., 2011). The original aim and the main achievement of the *MapKibera* initiative has so far been the creation of maps that include the Nairobi informal settlements, which for long had remained a blank spot on official maps. In addition, the Map Kibera team runs the Voice of Kibera website – an online news and information-sharing platform for the Kibera community (Shkabatur, 2012; personal communication with informants). Through data collection and visualisation, *Spatial Collective* supports communities, but also companies and humanitarian agencies, in identifying available resources and applying this knowledge to development initiatives (personal communication with informants).

Two other actors included in this thesis are the *Refugees United* and *FrontlineSMS*. Regarding the work of *Refugees United*, their main work and focus is on using the Internet to reconnect refugees with their families and friends in far-away locations (Parsons, 2014). *FrontlineSMS* is, in essence, a communications platform which, once set up, can be used to solicit any kind of response through the exchange of SMS (Banks, 2011). In addition to many standalone applications, FrontlineSMS has also been successfully deployed alongside Ushahidi. By forwarding messages across the Internet to an Ushahidi-powered website, the messages can be validated and, if approved, posted on a map (ibid.).

2.5 The Nairobi-based response system: Main actors

The Kenya Red Cross (KRC) has been dubbed the "911 of Kenya", pointing not only to the lack of a common Hotline for all response agencies in the country, but more so to the pivotal role they play as the primary first-hand responders to humanitarian and emergency needs of target communities. During the Westgate mall attack, a study by Card et al. (2013) showed that ten per cent of all tweets that were published related to the Westgate-incident were directed at the Kenya Red Cross specifically. In total, KRC have 900,000 followers on Facebook and 300,000 on Twitter.

The Kenya Red Cross Nairobi branch is one of the 64 branches of the Kenya Red Cross Society (KRCS). In 2007/2008 this branch initiated a program dubbed the "URR-program". The name refers to efforts of urban risk reduction, but it has also been called "DRR", which refers to disaster risk reduction. The program was launched with the purpose of improving collaboration

and connectivity with the slum communities of seven informal settlements in Nairobi. Five threats were identified: fire, floods, collapsed buildings, traffic accidents and disease outbreaks.

In order to improve response to the most severe threats in these areas, local community-based teams (CBDRTs) were set up to function as "eyes on the ground" and first-hand responders to immediate emergencies. The two slum areas studied here, Blue Estate and Mathare, now have respectively 55 and 50 members working as volunteers for the URR-program. At the Nairobi branch, a Disaster Response Team (DRT) of 30 core volunteers are assisting the local teams in each of the seven areas included in the program. Whenever there is an emergency, the chairman in the affected area will inform a member of the DRT, and response back-up can be provided if and when the situation develops beyond the capacity of the local units.

The program is largely financed through the KRC's Disaster Risk Reduction/Climate Change Adaption program, which in 2012 had a budget of Ksh 168,547 812 (US$1,886,835) and a budget deficit of Ksh 64,406,401 (US$721,008)[6] (KRCS, 2012). The Danish Red Cross has been a significant donor ever since the start-up in 2007/8, in addition to private corporations such as the Sony Erickson Foundation (KRCS, 2012; personal communication with informants).

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[6] The US$ amounts are based on the exchange rate as of 24.10.14

3.0 Theoretical framework

In this chapter I present the theoretical framework selected for this research and analysis, and the chapter is divided into three main sections. In the first section (3.1), I present theories that describe technology as being both a tool, e.g. a decision-making and emergency management tool (Endsley et al., 2003), but also a process, e.g. a process of social construction (Bijker, 2009) or of mutual interaction between technology and organisation (Scarbrough & Corbett, 1992). In the second section (3.2), which deals with diffusion, I build on the theory by Rogers (2003) and construct what I call a three level diffusion model. In addition, the main factors determining the success of diffusion processes are included in this section to highlight both potentials and challenges in diffusion. In the third section (3.3), key phases in innovation implementation are addressed, followed by a presentation of the outsourcing theory by Aase (2005). This latter perspective is meant to supplement the fairly scarce literature on crowdseeding diffusion and implementation. Lastly, as crowdseeding is about choosing the right people to serve as para-professional aides, the role of aides are addressed in terms of diffusion and implementation.

3.1 Key aspects of technology

A *crisis* is, according to Boin et al. (2005), "a serious threat to the basic structures or the fundamental values and norms of a system which under time pressure and highly uncertain circumstances necessitates *making vital decisions*" (p. 5; emphasis added). The role of *technology* in such circumstances is to function as a tool to aid decision-making and to support efforts at improving access to and quality of prevention, mitigation, preparedness, response, recovery and rebuilding efforts (Vinck, 2013).

During a crisis, decisions have to be made in complex, disorganised, chaotic and dynamic circumstances (Christensen et al., 2013; Hale et al., 2005). In complex and dynamic environments, decision-making is highly dependent on *situation awareness* – a constantly, evolving picture of the state of the environment. Three principles are highlighted as decisive in order for technology to support situation awareness. First, it needs to take into account that situation awareness is goal-oriented. A second principle is that supporting situation awareness means directly supporting the cognitive processes of the operator. Finally, keeping the user in control is fundamental to good situation awareness. An important principle is therefore that technology tools should be user-oriented and not tech-oriented (Endsley et al., 2003).

This way of interpreting technology – as a *tool* – is well established and serves several purposes in both everyday life and academic research. Yet, it says little about the technology as a social phenomenon and how it has come to benefit those who use it. In terms of development, it is simply taken for granted that those who developed the technology tool – whoever they might be – have been able to identify its areas of application to construct a tool that "works" (Rip & Kemp, 1998). In this thesis, when using the concept of *technological change*, I do not refer to technology development in this narrow sense, but to the development of technology in interaction with the system in which the technology is embedded.

Describing this joined and interactive process of technological change, Everett Rogers (2003) gives important insight into the process of *diffusion of innovations*, or how innovations spread. An *innovation*, according to Rogers (2003), is an idea, practice or object that is *perceived as new* by an individual or other potential units of adoption. As most of the new ideas whose diffusion have been analysed are technological innovations, the words "innovation" and "technology" are commonly used as synonyms (ibid.). I will include in this category the ideas and technology tools of crisis mapping. Therefore, when I refer to the spread of "new technologies" by crisis-mapping innovators, it is equivalent to diffusion of ideas or innovations as defined by Rogers (2003). The theoretical understandings of the words "diffusion" and "newness" will be further addressed in section 3.2. In this section I explore the following aspects or meanings of technology (or innovation): the hardware aspect, the software aspect, the orgware aspect, and lastly, technology as a process.

3.1.1 Hardware, software and orgware

Two main components of technology are the *software* and the *hardware*. The *hardware* aspect consists of the device that embodies the technology as a material or physical object, while the *software* aspect consists of the information base for the device (Rogers, 2003). Furthermore, while human interaction with hardware is about the possibility for man to cooperate with technical equipment like instruments, machines, robots and computers, the human-software interface deals with written information, automation, procedures, and other information aspects which allows us to use an innovation or technology for certain tasks (Ericson & Mårtensson, 2010; Rogers, 2003). This demonstrates the close relationship between the human factor and technology, as well as between the software and hardware aspects.

But, making effective and beneficial use of technology is more than implementing a functionally appropriate system. How organisations understand and deal with technology either as means to automate existing work or as enabling and supportive media for creating and enacting an improved organisational practice is decisive for the economic and other benefits that can be gained (Brödner, 2005). I therefore discuss the *organisation* (or orgware) as a third aspect of technology, implying that new technologies require certain types of restructuring of the organisation or system of adoption. Sometimes, and in the case of crowdseeding solutions, the restructuring *is* even the innovation. The most basic understanding of technology orgware, or what some theorists (Hekkert et al., 2007) have chosen to call the *innovation system*, is the organisation and management of technology (ibid.; Makovetskaya & Bernadsky, 1994).

While the orgware and software aspect are closely related, almost overlapping concepts, there is a need for this distinction in the network age, as there is a fundamental difference in how humans respond to instructions in a computerised system, through face-to-screen interaction, compared to how they respond to instructions delivered to them in a non-technical way, or through face-to-face interaction (Brödner, 2005). Correspondingly, it is important that the user's goals, needs and capabilities are given equal priority to the technology hardware and its performance. Emergency responders, for example, will need to have systems designed to maximise situation awareness (Endsley et al., 2003).

As described in Endsley et al. (2003), deploying a user-centred approach when designing communication systems entails assuming a *Naturalistic Decision-Making (NDM)* perspective on how decisions are made, which falls within the realm of *bounded rationality*; Decisions do not happen in the form of fully informed choices between a set of options to maximise positive outcomes. During emergencies one has little time to weigh the pros and cons of every possible course of action. For the preponderance of decisions, the majority of the decision-maker´s time and effort is spent assessing and classifying the situation. An integrated picture of the current situation may be matched to a prototypical situation in memory, each prototypical situation corresponding to a suited action or decision (ibid.).

But while decisions are not taken as fully informed, rational decisions, the operator is normally well aware of his or her goal when performing a certain task or job (Endsley et al., 2003). In what is known as "top-down" or *goal-driven information processing*, these goals determine

which environmental elements to pay attention to as people perform their tasks (ibid.). To give a very plain example, a person who is out shopping for bananas would not be interested in knowing the price on a pack of cereals. At the same time, shopping is also a good example of situations in which one is easily distracted by information catching ones attention independently of goals. These cues, if indicative of something important, may lead to a sudden shift in action. For instance, a pilot may abort the goal of landing in order to avoid another plain that appears on the flight path. This latter form of processing is called bottom-up or *data-driven information processing*. Alternating between bottom-up data-driven and top-down goal-driven processing is vital for supporting situation awareness (ibid.).

From an NDM-perspective, this alternating takes form as an integration of the information harvesting function and the response function within the person in charge of decision-making and response. This in turn, suggests that situation awareness is difficult to communicate to others, which again points to the challenges facing the response actors when trying to plan for a response to hard-to-access areas. Therefore, in order to build a suitable system of communication to support operations in such areas, the system should at least seek to reduce the distance between the providers and users of information as much as possible. When discussing the benefits of crowdseeding (collating information from key sources) as compared to crowdsourcing (collating information from entire populations), I emphasise the potential for crowdseeding to bridge this gap through face-to-face interaction between the response agencies and the pre-selected crowds. Digital exchange of crowdsourced information, on the other hand, although suited for travelling fast across long distances, is largely limited to face-to-screen interaction (for discussion, see 6.2.1).

3.1.2 Technology as a process

To study *technological change* means to study how technology *develops* (development) and how it *spreads* to organisational and individual users (diffusion), followed by an analysis of the process in which technology is *put into use* by the adopting unit or organisation (implementation) (Scarbrough & Corbett, 1992; Rogers, 2003). However, as discussed by Scarbrough & Corbett (1992), the proposition that development, diffusion and implementation are linked together in sequential fashion, although it highlights the transformational aspects of technology and the key social processes from which it emerges, in general assumes a deterministic view of technological change. In essence, society has no choice but to adapt to

new technology and the only remaining uncertainty is "how the innovation process itself is initiated, whether by 'technology push' or 'demand pull'" (Langrish et al., 1972; as cited in Scarbrough & Corbett, 1992, p. 7).

What is more, deploying a linear model to analyse the innovation process, would involve neglecting the possibility for knowledge to be generated in a variety of contexts.

> "Admittedly, the generation and application of knowledge is subject to a broad societal division of labour, such as we associate scientists in laboratories with invention, and workers in factories with implementation of that invention. Still, the deployment of knowledge-workers in industry, and the increasing pressure for "user involvement" in the technology process are increasingly standing that proposition to its head" (Scarbrough & Corbett, 1992, p. 8).

As the model by Scarbrough & Corbett (1992) model suggests, the flows of knowledge between different social contexts can more usefully be depicted as cyclical and reciprocal in character; in organising the exchange of knowledge and resources within and between different groups, organisations shape the technology process at the same time as it shapes them. Accordingly, the researcher should seek to "know" how each phase in the innovation process is realistically shaped and reshaped by the exchange of knowledge between developers and potential adopters of innovations.

A similar understanding of technological change is found in Bijker's (2009) theory of the *social construction of technology. The social construction of technology* highlights the fact that new technologies are characterised by a certain "interpretive flexibility", because technology is not "set" from the very point it is launched by developers. Instead, different social groups will view innovations differently, using different theoretical frames to interpret and describe the innovation and what it does (artifacts). Over time, this interpretive flexibility "diminishes, because some artifacts gain dominance over the others and meanings converge – and, in the end, one artifact results from this process of social construction" (ibid. p. 90-91).

An example given by Bijker (2009) to illustrate this interpretive flexibility is the introduction of the Ordinary bicycle, which, according to Bijker (2009) had two very different artifacts: the "Unsafe machine" (through the eyes of women) and the "Macho machine" (though the eyes of

the young male Ordinary users); "For women, the bicycle was a machine in which your skirt got entangled and from which you frequently made a steep fall; for the "young men of means and nerve" riding it, the bicycle was a machine with which to impress a lady" (ibid., p. 91). This explains why the newness of innovations can contribute to spur both enthusiasm and apprehension about new technologies and their implications.

Aside from "interpretive flexibility", concepts such as "stabilization" and "closure" can help understand why diffusion and implementation efforts can sometimes be difficult, due to lack of convergence of meanings: "'Stabilization' stresses the process character: a process of social construction can take several years in which the degree of stabilization slowly increases up to the moment of closure" (Bijker, 2009, p. 91). "Closure" can only occur if and when the members of a system or unit of adoption have reached some sort of agreement about what the innovation could and should mean to various stakeholders (Bijker, 2009).

3.2 Diffusion of innovations

Building on the same kind of sociological and processual understanding of innovation as outlined above, Rogers highlights the process of diffusion as a significant part of the defining of an innovation, in which developers and potential adopters exchange views on what the technology can do and how it could benefit the users. At the same time, diffusion is not the only significant process that shapes a new technology or idea; rather, in recent diffusion studies, innovation diffusion (or promotion) is regarded as but one of many important tasks in a sequence of tasks and decisions (Rogers, 2003). I will study those sequences, firstly, in terms of diffusion, and secondly, in terms of implementation. It should be noted that although these are portrayed as sequential phases in a linear process, it is not necessarily assumed that phases occur in the linear sequence that they are discussed. In many cases, certain of these phases do not occur, or the exact time order for the phases may be changed. Nevertheless, the notion of the stages in these models is useful for understanding how innovation develop and diffuse (ibid.).

In addition to the processual models of diffusion, I will also present the key explanatory factors assumed to enhance the adoption of innovations, some of which are exclusive to certain user-groups or units of adoption, others which are related to context, the innovators efforts or to the innovation itself. This is to better understand the potentials and challenges in the introduction

of innovations at the different stages of the innovation process. But first, to prepare for the presentation of those models, I will address some general concepts related to the diffusion of innovations.

3.2.1 Diffusion concepts

Diffusion, as already stated, refers to the two-way communication about an idea or technology with the potential of leading to the adoption and implementation of the idea or technology by an individual or other unit of adoption. Diffusion efforts can be either centralised or decentralised or something in-between, depending on the innovation type and the surrounding circumstances (Rogers, 2003). While *centralised diffusion* takes the form of a top-down, one-way communication of innovations, controlled by government officials and technical subject-matter experts, *decentralised diffusion* resembles more of a client-controlled system in which innovations bubble up from local experimentation by non-expert users (ibid.).

Regarding the role of knowledge and information sharing, this role is largely defined by the need for information that can reduce the uncertainty created by the "newness" in innovation messages (Rogers, 2003). *"Newness"*, as a key concept in diffusion theory, is not meant to describe the technology or innovation as such; but rather, it refers to the user's own perceptions and to the receiving of an *innovation message* – a message containing key information about the innovation and what it can do (ibid.). Once informed, the receiver might be persuaded to adopt, or reject, the innovation (ibid.).

Uncertainty can be defined as "a sense of doubt that blocks or delays action" (Lipshitz et al., 2001, p. 337), and while one type of uncertainty in diffusion is linked to the uncertainty about innovations and their implications, another emerge from the knowledge-seeking process (Rogers, 2003). This may seem paradoxical, as new knowledge is commonly thought to solve or reduce uncertainty, and not create additional uncertainty. At the same time however, research has found that shared experiences and information from neighbours and peers tends to be particularly important for persuading someone to adopt an innovation (ibid.). Uncertainty can thus be fuelled by mixed messages in the subjective evaluations of individuals and groups found at different levels of an organisation or a system.

The success of the diffusion of innovations to potential adopters is dependent on a number of factors, many of which are subjectively perceived attributes of the innovation or individual factors related to the user's personality and characteristics. Yet, innovation processes are not reducible to individual innovativeness and the diffusion of messages to individual adopters (Rogers, 2003). Other factors that matters are: the environment, the nature of the social network surrounding adopters and dedicated change agents, organisational structures and so on (Rogers, 2003) (see also 3.2.3).

Regarding, for instance, recent developments in IT management and the Internet revolution, it is commonly stated that these developments have made diffusion easier in the sense that communication about innovations can reach more people, faster, without being limited by physical boundaries (Rogers, 2003). Relatedly, a shift in organisational practice and theory in the post-industrial age has caused decision-making in organisations, including decisions to adopt or reject innovation, to assume a more decentralised and flexible structure (ibid.; Scarbrough & Corbett, 1992). Individuals and workers previously viewed as passive receivers of centralised efforts and initiatives are recognised as a resource and not a limitation to organisational and technological change and success. At the same time, "although the flexibility strategy may emphasise the importance of up-grading knowledge, 'skills' and autonomy, these may be seen by the worker not as enhancing flexibility but as increasing their workload and responsibilities" (Scarbrough & Corbett, 1992, p. 41). This shows that the diffusion process, aside from being a process driven by subjective perceptions and evaluations, is also inherently social and highly complex. In order to understand the development or process of technology, one must therefore seek to understand the social changes forming the diffusion of technologies.

In addition, while the diffusion research has come a long way in expanding the diffusion framework to include models for analysing both diffusion to individual and organisational adopters (Rogers, 2003), there is a need to address the implications of diffusing to organisations as compared to individuals. Building on existing diffusion models by Rogers (2003), I therefore present a combined diffusion model customised to analyse the spread of crisis-mapping innovations to and through organisations as compared to individuals.

3.2.2 A combined model of diffusion

Figure 7 The Innovation-development process (Rogers, 2003)

Starting with the *innovation-development* process (figure 7), the innovator will try to *identify a need* for a technology, before initiating a *research and development* phase, followed by a phase of marketing and *commercialisation*. Based on the experienced gained through these efforts, the innovator will proceed to *diffuse* the innovation to the potential *adopters*, and hopefully, receive in return, valuable feedback on the implications and *consequences* of the innovation (Rogers, 2003). In the combined diffusion model presented below (see figure 9), I describe this process of promotion and feedback, on three levels; between the innovators and individual adopters (level 1), between innovators and organisational adopters or managers (level 2), and between organisational managers and their members (level 3). The next figure describes the innovation process in *organisations* (level 2 and 3 diffusion).

Adoption/Rejection
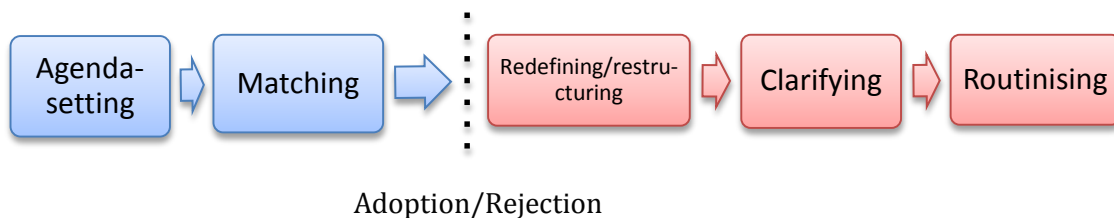
Figure 8 The innovation process in organisations (Rogers, 2003)

As shown in this figure, the *innovation process in organisations* typically consists of the following phases: *Agenda-setting* and *matching* of the agenda to fit the organisations needs in the pre-adoption initiation phase, and *redefining/restructuring*, *clarifying* and *routinising* "newness" in the post-adoption implementation phase. These phases will be described in more detail in section 3.3.1 and 3.3.2. In the model that follows (figure 9), figure 7 and figure 8 is re-presented together with the relevant actors involved in the diffusion and implementation of an innovation. A key purpose of the combined model is to highlight the tech-promoters "choice" to diffuse to either individuals or organisations.
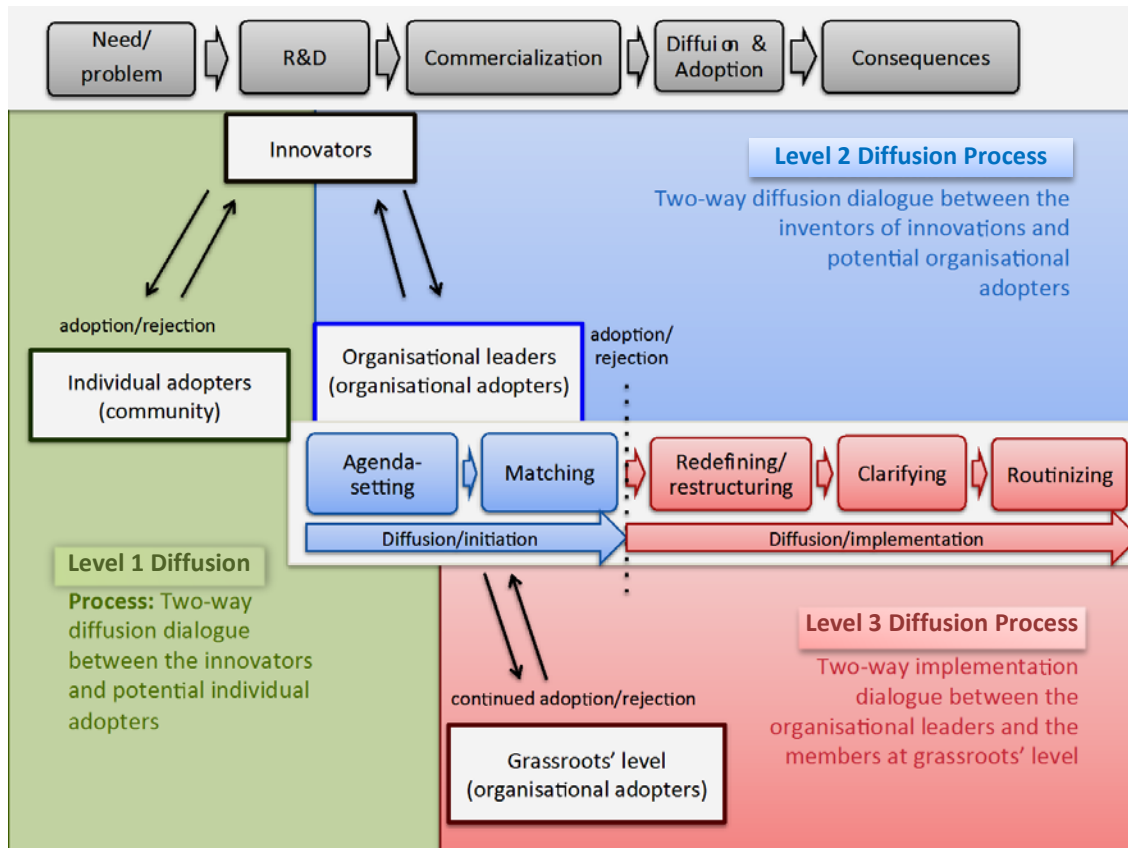
Figure 9 The Three Level Diffusion Model. A model based on Rogers (2003)

Starting with the *level 1 diffusion process*, the innovators would seek to reach as many individual users as possible to have them adopt the innovation. This would entail a two-way diffusion dialogue with relevant user-groups, where the adoption marks the end of the diffusion process and the beginning of the implementation process. "Implementation" is here understood as the user-driven implementation in a relatively loosely tied system or society; decisions to adopt an innovation are made with comparably low involvement from experts or managers. The *level 2 diffusion/initiation process*, on the other hand, assumes diffusion via organisations and their leaders, meaning that the organisational leaders will select and assess innovations on behalf of their clients and staff members. At this level, the innovators' role is to provide useful insight and documentation that can inform the innovation decision. Subsequently, in a *level 3 diffusion/implementation process*, the organisational leaders turn to their members for their collaboration on making the innovation an on-going element in the organisations activities.

While the first level diffusion system could be said to represent a decentralised diffusion system, the second level diffusion system is more centralised; instead of targeting the grassroots directly, it turns to the organisational leaders to hopefully have them throw their weight behind

the technology to make it more credible. The third level diffusion system will probably be more decentralised than centralised, but this will also depend on the organisational structure of the lead organisation. The second level diffusion system is different from the others because it exists to prepare not only for initial adoption, but also for the introduction of the innovation to the larger system of an organisation. Thus, the second level diffusion process should take into consideration the aims and goals of the entire organisation and the entire innovation process, that is, both diffusion/initiation efforts (*agenda-setting* and *matching*) (see also 3.3.1) *and* diffusion/implementation efforts (*redefining/restructuring*, *clarifying* and *routinising*) (see also 3.3.2).

As also shown in previous sections, knowledge about the organisation or receiver of the innovation message is key to a successful diffusion. Gathering such information is preferably done in the early stage of the innovation-development process described above, as one prepares the diffusion and adoption phase. However, considering the complexities of these matters and the time-consuming task of "knowing" organisations, diffusion efforts targeting organisations might be significantly hampered compared to efforts targeting individual users in loosely coupled communities.

3.2.3 Diffusion success

When explaining why some users seem to adopt innovations more rapidly, or why some innovations might be adopted faster than others, diffusion theory has come up with several explanation factors related to either the innovation, the system surrounding the early adopters or the personality of early adopters. In this thesis, I will focus mostly on perceived attributes of an innovation's compatibility and relative advantage, which, according to Rogers (2003) are particularly important in explaining rates of adoption/diffusion success.

Compatibility and relative advantages

Discussing the diffusion and adoption rates of certain innovations, Rogers (2003) finds innovations to be both independent and interdependent. This means, on the one hand, that innovations diffusing at about the same time or within the same innovation system are likely to be equally successful or faulted, as people's perception about one innovation is highly influenced by how they perceive the other. On the other hand, it should not be assumed that all

innovations are equivalent units of analysis. In fact, while consumer innovations such as cellular telephones and VCR's required only a few years to reach widespread adoption in the United States, other new ideas, such as using the metric system or seat belts in cars, required decades to reach full use. A similar tendency might be found in crisis-mapping diffusion, in which it might prove easier to get a number of random reporters to operate a mapping software than it is to convince the humanitarian and emergency authorities that the maps they produce are useful. The characteristics of innovations – their perceived compatibility and relative advantages – help to explain their different rates of adoption.

Compatibility is defined as the degree to which an innovation is perceived as being consistent with the existing values, past experiences and needs of potential adopters. *Relative advantage* is the degree to which an innovation is perceived as better than the idea it supersedes, either in economic terms, in terms of social prestige, convenience or satisfaction. It does not matter whether an innovation has a great deal of objective advantage. What does matter is whether the user perceives it as advantageous according to the user's needs (Rogers, 2003).

Other factors explaining successful diffusion

While compatibility and relative advantage are the key factors explaining successful diffusion, other noticeable factors worth mentioning include other perceived attributes of the innovations observability and trialability, personality/characteristics of early adopters, the nature of the social system, type of innovation system, communication channels and the extent of change agent promotion. In the following I briefly address each of those factors.

In addition to compatibility and relative advantages, an innovations *observability and trialability* can help ease diffusion. Observability refers to the degree to which the attributes of an innovation is visual to potential adopters, and trialability is the degree to which it is tested out in a limited scope to begin with, increasing the chances of persuading adopters to start using the innovation for their own purposes (Rogers, 2003). To a certain extent this is addressed through acknowledging the use of short-term pilot projects as a way of motivating adoption and as a way of improving innovations.

While most factors related to *personality and characteristics of early (individual) adopters* are left out of the analysis in this thesis, I find it to be an interesting paradox that the socio-economic

status of adopters and their assumed need or benefits of innovations are found to have a negative correlation, in which those who have the greatest need for an innovation are also those who are last to adopt an innovation (Rogers, 2003). In the discussion, I will briefly discuss how this paradox has played out for the tech-promoters and for the potential receivers within the slum communities. This means, I will not discuss access to technology as a marker of individual innovativeness; but rather as a potential challenge to the realisation of the claimed advantages of humanitarian innovations for entire slum communities.

Like the socio-economical background of individuals, factors in their current surroundings and the *nature of the social system (norms, degree of network interconnectedness etc.)* in which they operate have been found to be decisive for the decision to adopt an innovation. For instance, closeness to opinion leaders and the degree to which innovation messages are shaped according to social norms and traditions have been found to fuel adoption of innovations (Rogers, 2003). In this thesis, I recognise the adjustments made to fit the needs of the potential adopter, and the role of the opinion leader is also analysed as a prerequisite for diffusion, although the question of "to what extent?" is replaced with the question of "how?".

Concerning the *type of innovation decision (collective, authoritative, optional),* authoritative decisions, in which the innovation is more or less forced upon individual adopters, will generally give higher rates of adoption. Correspondingly, the more optional the innovation decision, the lower the rate of adoption (Rogers, 2003). This will only be addressed indirectly through the typology of decentralised and centralised systems of diffusion.

Communication channels refer to the use of either mass media or interpersonal communication for communicating an innovation. While mass media function as an important source of information and knowledge, the information and subjective views exchanged through interpersonal communication is often more decisive for a person's willingness to adopt new technology at the decision stage (Rogers, 2003). In this thesis, the channel of communication is only briefly discussed in relation to the opportunities in new media and online communication (for a more decentralised diffusion).

Last but not least, the more *active change agent promotion*, the higher the adoption rate (Rogers, 2003). In this thesis, I will not consider the intensity or scope of promotion efforts. However, when analysing factors in promotion and in the client-change agent relationship, I discuss *how*

these efforts are shaped to suit the needs and workflows of potential adopters. I should also note that although I do not study the relationship between the organisation and their innovators directly, I simulate a matching of the crowdseeding method with the needs of the Kenya Red Cross, through constructing the comparison between the URR-initiative and the crowdseeding solution (see also 3.3.1).

3.3 Implementation

3.3.1 Initiation: Agenda-setting and matching

For an organisation looking to adopt an innovation to help solve a problem or make production run more effectively and efficiently, identifying both needs and available solutions represents a key phase in the organisations' innovation process. Rogers (2003) describe this phase as "agenda-setting and matching" (see also figure 9).

Agenda-setting refers to seeking out general organisation problems that may create a perceived need for innovation. This entails identifying needs, problems and issues in an organisation, and then, searching for compatible solutions in the organisations environment (Rogers, 2003). *Matching* refers to the fitting a problem from the organisations agenda with an innovation, in which the organisations members attempt to determine the feasibility of the innovation in solving the organisations problem. Such planning entails anticipating the benefits, and the problems, that the innovation will encounter once it is implemented. On this basis, the decision-makers make the decision to either reject or adopt the innovation. Effective matching is key to whether the new idea is sustained over time (ibid.). This degree of fit is one particular type of compatibility of the innovation, as described above. Goodman and Steckler (1989, as cited in Rogers, 2003) found that whether or not an innovation "found a home" by fitting with the need or an existing program in a health organisation was crucial to its later sustainability.

3.3.2 Implementation: Redefining/restructuring, clarifying, routinising

Once an organisation has decided to adopt the crowdseeding system, the organisations depend on the further acceptance and adoption of these ideas throughout their organisation (Rogers, 2003), and in the case of the URR-initiative, all the way down to the slum community level. This process of post-adoption implementation is shaped through the interaction between the

organisational leaders and their aides, and will be studied by addressing the following phases: redefining/restructuring, clarifying and routinising (see figure 9).

The *redefining/restructuring* is a mutual adaptation that amounts to social constructionism, in which perceptions of the organisation´s problems and the innovation come together and each are modified in the process (Rogers, 2003). At this stage, the innovation start to lose its foreign character; it is re-invented so as to accommodate the organisations needs and structures more closely. At the same time, the organisation is modified to fit with the innovation. Sometimes a new organisational unit is created for the innovation, or it might affect the structure of the entire system (ibid.). Concerning the reinvention and the success of innovation implementation, innovations that are generated externally will have a greater chance of failing if it is not flexible and without sufficient training, time and opportunities to adjust to and adjust "new technology" (ibid.).

During the *clarifying* phase, the relationship between the organisation and the innovation is defined more clearly, so that the meaning of the new idea gradually becomes clearer to the organisation´s members. At the clarifying stage, management is particularly difficult and complicated, and misunderstandings or unwanted side effects of an innovation may occur. To guide this process, it is often not enough to come up with an answer to the questions about workings of new technologies. The framing of the innovation policy is just as important for the credibility it receives from end-users, and thus for whether it fails or succeeds. The meanings of an innovation are constructed over time as the people in an organisation talk about it, and particularly influential are the opinions of so-called innovation champions, often middle managers, opinion leaders or simply a charismatic individual who throws his or her weight behind an innovation (Rogers, 2003).

During the *routinising* phase, the innovation becomes part of the everyday activities and workflows of the organisations, and loses its identity as something that is "new" (Rogers, 2003). A closely related concept to routinising is sustainability, defined as the degree to which an innovation continues to be used after the initial attempts to secure adoption is completed. Sustainability is more likely if widespread participation has occurred in the implementation process, if reinvention has taken place and if an innovation champion was involved (ibid.).

3.3.3 Implementation of outsourcing (challenges and pitfalls)

The deployment of crowd innovations is not a one-time solution; instead, for this to work it needs to be implemented to make it continuous and permanent (Aitamurto et al., 2011; Seltzer & Mahmoudi, 2012). By offering an interpretation of the crowd innovations systems to support outsourcing of vital tasks to para-professional reporters, I build on traditional outsourcing theory for analysing the prerequisites for such systems to become fully implemented. This shift from in-house reporting and response to a full-fledged outsourcing of those tasks has been vaguely discussed in terms of exhausting the potentials in open-data sharing and face-to-screen communication (e.g. Coyle & Meier, 2009; OCHA, 2013a). What is lacking however, is a description of how this transformation can be sought organisationally.

In his book about outsourcing of business processes, Aase (2005) describes outsourcing as, basically, a process of reorganisation. This reorganisation involves a transferring of tasks from the outsourcing organisation to the outsourcing target or partner. If it succeeds, the organisation is likely to experience increased efficiency and reduced costs in the production and delivery of services. Yet, as all reorganisation processes, outsourcing can also fail. Aase (2005) lists main challenges and pitfalls that may determine whether implementation of outsourcing strategies ends in success or failure:

- The outsourcing organisations are often more concerned with what their outsourcing partners can offer in terms of making production more efficient, and less with what is required on the part of the outsourcing managers to facilitate a successful implementation
- The outsourcing partners tends to underestimate the complexity of the tasks they are asked to perform on behalf of the outsourcing organisation
- Cultural differences and role confusion are typical barriers to implementation
- Another common problem occurs when outsourcing projects are not sensitive to how the outsourcing might affect the personal and professional lives of the individuals involved in the project
- Finally, many outsourcing organisations lack proper technological systems to support the exchange of information and support between the outsourcing organisations and their partners

3.3.4 Selection and professionalisation of aides

Because crowdseeding is more about choosing the right people and less about choosing the right enabling technology for a reconnection between the helpers and the helped, a brief presentation of theory on the selection and professionalisation of aides is necessary in order to grasp the role of key individuals in crowdseeding implementation.

In diffusion theory, the support from para-professional aides can help make diffusion to lower-status clients easier (Rogers, 2003). In Aase (2005) these aides are referred to as "super-users" serving as a valuable resource during the implementation of new technology and/or organisational changes to facilitate outsourcing. Aides or super-users act as a link between the change agents and the end-users of an innovation, and while the implementing organisation (e.g. the Kenya Red Cross) could constitute such a linkage between the innovators (e.g. the crisis mappers) and the lower-status aides (e.g. slum reporters), the community-based aides (slum reporters) can play a similar role to the implementing organisation (Kenya Red Cross) to help them succeed with their initiative.

In terms of potentials in emergency response, collaboration and training with aides (or crowds) could facilitate a successful transferring of situation awareness and potentially, the opportunity to outsource tasks to a known agent. This however, needs to be discussed in terms of resources and capabilities; traditional outsourcing suggests a homophilic (equal) partnership, which, in turn, requires efforts to professionalise the aides (Aase, 2005).

In diffusion theory, professionalisation of aides is a strategy with benefits, but also significant drawbacks. As an attempt to develop the lower-status adopters' ability to be their own change agents, the innovators will seek to shift the position of those adopters, and especially the para-professional aides, from a position of reliance on the change agent to one of self-reliance (Rogers, 2003). In that case, professionalisation represents a key strategy towards independence. At the same time, professionalisation of aides to increase their level of competence and homophily with the change agents at the implementing organisation needs to be weighed against the importance of maintaining a close link between the aides and their peers (ibid.). As described by Rogers (2003), this link, which builds on a special form of credibility, is a unique function of the para-professional aides:

> "Even though change agents have less *competence credibility*, defined as the degree to which a communication source or channel is perceived as knowledgeable and expert, they have the special advantage of *safety credibility*, the degree to which a communication source or channel is perceived as trustworthy" (p. 385).

Moreover, Rogers (2003) describe so-called inauthentic professionalisation as the challenge of having the aides themselves trying to act like professionals or at least look like them; this may destroy the very heterophily-bridging function of which the change agents aides are recruited, but if made aware of this problem, Rogers (2003) states, they will usually act in ways to correct this threat to their effectiveness with clients.

Also, closure and attempts made by the change agents to put themselves out of business should not hamper feedback and a continued dialogue with the lower-status adopters and super-users. In general, active user-involvement throughout the implementation period is crucial, and also discussing the implications and expectations for future deployments. Rogers (2003) refers to this as building the evaluative ability of adopters.

3.4 Theoretical conclusions

The different aspects of technology exhibited here suggest that technology is not only a product or tool, but also a process of sociological and organisational nature. This in turn, points to a first key insight from this chapter: *The innovation process is assumed to change the nature and attributes of the innovation at the same time as users adapt to the innovation.*

Secondly, *the users can either be individual users or members of an organisation.* The modified diffusion model presented in this chapter is customised to highlight the tech-promoters "choice" to diffuse to either individuals or organisations.

Thirdly, *when the adaption happens in an organisation, this is a complex process that generally requires organisational changes.* From a diffusion perspective, these changes are the results of mutual adaption in both the innovation and the adopting organisation, as well as of mutual exchange of messages about the innovation and its attributes between promoters and potential adopters. This mutual exchange and adaption spans across several phases; agenda-setting and matching in the pre-adoption initiation; and, redefining/restructuring, clarifying and routinising

in the post-adoption implementation. From an outsourcing perspective, organisational changes serve as means to the end of increasing performance through outsourcing specific tasks to a vendor.

Fourthly, *the fact that innovation processes and reorganisation are highly complex and uncertain, suggests that there is not only potentials but also challenges facing the change agents.* Whether the diffusion ends in failure (rejection) or success (adoption), depends on various factors related to either the perceived attributes of the innovation, the characteristics of adopters, or the nature of the systems surrounding the adopters. Some of those factors are also decisive for implementation and outsourcing processes. For example, the active inclusion of para-professional aides or "super-users" is found to be positive in many regards, especially when dealing with lower-status populations. At the same time, for these aides to serve as a link between the change agency and the lower-status users, the right balance between professionalisation and homophily with peers must be maintained. Together, this and the above challenges and potentials are useful for analysing crowd innovations processes.

4.0 Methodology

4.1. Research design and approach

In this section I present the research design chosen for this research, the qualitative, explorative design. I will pay particular attention to aspects that makes this a suited approach for exploring *new fields* of research and how the qualitative approach allows for in-depth research on *processes*. In addition, I explore the possibilities offered by the *abductive* model for scientific reasoning as compared to the inductive (and deductive) model. Finally, the potential *biases* that may result from the reasoning in and execution of qualitative inquiry is discussed in relation to the data and analysis presented in this thesis.

4.1.1 A qualitative approach: Exploring a new area and understanding processes

The research for this thesis has been conducted using a qualitative, explorative approach, which involves "an *immersion* in some aspect of social life, in an attempt to capture the wholeness of that experience, followed by an attempt to convey this understanding to others" (McLeod, 2011, p. ix, as cited in Hill, 2012, p. 7). The choice of research design or approach was guided by the research problem, which in this case focuses on processes of diffusion and implementation of technology from crisis-mapping innovators to local emergency agencies in Nairobi and all the way down to the community level. This choice was also due to the newness inherent in the crisis-mapping field. Other reasons for choosing a qualitative approach are if you want to investigate infrequent events, describe complicated phenomena or build theory (Hill 2012).

Entering the field of crisis mapping, my knowledge about this field was at first limited, and so I found it necessary to use an open-ended approach. Aided by the processual perspective on technologies (see section 3.1.2), it was crucial to "know" the narratives of the crisis-mapping field and of the diffusion of crisis-mapping innovations. Furthermore, the processual perspective of technology necessitates a research design suited to transcend the "thin" description of technology as aggregations of machines and systems, using words rather than numbers to account for the complex nature of technology as interlocking processes (Scarbrough & Corbett, 1992).

4.1.2 Abductive approach

Qualitative research is frequently characterised as inductive. *Induction* is the process in which the researcher observes a number of instances in order to say something general about the given class of instances. *Deduction*, on the other hand, is a phase in the knowledge-producing process of deducing testable hypothesis from general theories, and then seeking to falsify these (Brinkmann, 2012). Despite these models being well-established ideals for scientific reasoning, Brinkmann (2012) among others, have argued that

> "both deduction and induction…take for granted that we already know what we are talking about in the research process; that we have some stable entity that we can study repeatedly in a number of cases to build general knowledge (induction) or that we already have general ideas from which we can deduce particular consequences (deduction)" (p. 46).

This is seldom the case in everyday life, where social reality and ideas are constructed and deconstructed through social experiences often unexpected and mysterious to the individual (Brinkmann, 2012; Blaikie, 2010). According to Brinkmann (2012), qualitative research can thus benefit from deploying elements of abduction.

Abduction is a form of reasoning that we employ in situations of uncertainty, when searching for an understanding or explanation of some effect; we observe X (a man pacing up and down in front of a public toilet, clearly upset and clearly determined to chase people off). X is unexpected and breaks with our normal understanding (why is the man trying to block this public space?). We can conjuncture that there must be some explanation, Y, making X understandable (there must be some kind of danger that the man wants to warn people about to get them to leave). This notion of Y (potential danger) makes the persons behaviour understandable, and so we infer that this is the case, at least until we arrive at a better interpretation (Z) (Brinkmann, 2012).

The above example is based on a personal experience from one of my visits to the Mathare slum, and interestingly, the reason for the man´s behaviour proved to be quite different from the initial interpretation (potential danger); I was told that in recent years, the long-standing dispute over land between the government and the slum inhabitants has culminated into a number of violent or tense situations in the slums. In this specific case, there had been reports about a physical attack on the toilet facilities the night before. In this light, it became quite

obvious that the man´s intention was not at all to protect others from getting hurt, but rather to confront and scare off those trying to enter the location, which he claimed belonged to him.

This example is included to illustrate the usefulness of qualitative abduction to resolve breakdowns in understanding. In other words, it gives an example of how the abductive way of reasoning has aided this research, as it has aided a significant number of qualitative studies by others. Nonetheless, although the aspects of abduction are predominant for this thesis, there are also elements of induction embedded in the data collection and in the analysis of those data. For example, I seek to infer from the study of the URR-initiative key prerequisites and lessons learned on the implementation of crowdseeding structures in emergency organisations more generally. Moreover, if one was to truly adopt the pragmatic perspective on the analytic divide between models of inquiry, most qualitative studies, mine included, would also entail some small aspect of quantitative research and deduction. To exemplify, occasionally the qualitative inquirer will think in terms of representativeness and numbers (how many informants hold a certain view?) when considering validity. Validity will be discussed in more detail in later sections. But first, in the coming section, I will briefly present and discuss the concepts of heuristics and biases.

4.1.3 Heuristics and biases

As an important aspect of qualitative inquiry, abduction can be said to embody a "creative moment" in which the researcher employs his or her sociological imagination to create meaning. This social imagination may be aided by a number of heuristics, or thinking tools, as they can help make sense of observations of the social world (Brinkmann, 2012; Blaikie 2010). On the one hand, this represents an opportunity for generating new knowledge and insights. At the same time however, if the meanings that the scientists give to those observations are significantly different from those given by his or her informants, it can potentially produce research biases. These biases represent "personal issues that makes it difficult for researchers to respond objectively[7] to the data" (Hill et al., 1997, p. 539, as cited in Hill, 2012, p. 61).

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[7] "Objectively" should here be interpreted as knowing how to acknowledge and report the potential influence of the personal prejudgments and heuristics of the researcher. Because researchers cannot avoid having biases and thus cannot be completely objective, dealing with biases is a matter of knowing how to acknowledge and address their effects (Hill, 2012)

4.1.4 Challenges of being on the inside – biases from emotional engagement

In my research, I can only assume that personal issues and biases have influenced the results of this thesis. It was important for me to become an inside learner, instead of an outside expert (Blaikie, 2010). In doing this, I sought to overcome some of the cultural and social barriers between my informants and myself. At the same time, the challenges I faced when doing research in a different social and cultural context than what I am normally used to, may have influenced the research. For instance, achieving analytical distance to the data was difficult due to the concentration of the research within a limited time frame, and the intensity that resulted from this concentration, especially when everything around me was new and unfamiliar. Also, the personal relationship that I established with the participants caused me to become emotionally attached to those participants. One can therefore say that analytical distance was largely sacrificed for closeness to data and the emotional need to interact with the participants also on a personal level.

Although this sacrificing of analytical distance is both expected and required in qualitative studies, it is necessary to report that these emotional and personal aspects may have influenced the selection of informants, and information, for this thesis. Especially towards the end of my stay, it is easy to think that my relationship with some of the key informants, made it difficult to distinguish between my role as a researcher and a friend or ally. In Howard Becker's paper "whose side are you on?" (1997, as cited in Bloor & Wood, 2006), this is discussed as a challenge resulting from the tension between the researcher´s desire for objectivity and the commitment to his or her principles of social justice. Even after having left the field, I felt obliged to be balanced or "fair" in my descriptions and selections of which data to include and not. In some cases, these selections can find exclusive support in ethical principles such as anonymity or confidentiality; in other cases, or in other regards, it is simply the result of the researcher's own perceptions and focus.

4.2 The research process

The data resulting from my fieldwork in Kenya was collected over a period of six and a half weeks, and the majority of that time was spent in Kenya's capital city, Nairobi. To prepare for the data collection, I researched the field online, read relevant reports, attended seminars and made other arrangements for the fieldwork. The period following the data collection consisted of data reduction and analysis. An overview of the research process can be seen below.

Period 1 Autumn 2013	Period 2 January 2014	Period 3 February-March 2014			Period 4 April 2014-
Researching the field	Preparing for the data collection	Data collection			Data reduction & Analysis
Norway/Nairobi	Norway	Nairobi	Kakuma	Nairobi	Norway
(1) Online research (2) Document analysis (3) Attended a seminar at PRIO (Oslo) related to the launching of the WDR 2013 (4) Attended the ICCM in Nairobi (established contact with later informants) (5) Attended two seminars at PRIO (Oslo) on Humanitarian technology and cyber technology	(1) Document analysis (2) Created research problem (3) Developed a first draft of the thesis (4) Developed a semi-structured interview guide (5) Made practical arrangements for the fieldwork in Kenya	(1) Re-established contact with informants that I met at the ICCM (2) Searched for additional informants (mostly through online communication and personal communication with informants) (3) Conducted the first three interviews	Spent eight days in Kakuma refugee camp (1) Field conversations and observations	(1) Document analysis (2) Conducted several interviews (3) Field conversations and observations at the KRC Nairobi branch office (4) Field conversations and observations in the Mathare and Blue Estate informal settlements	(1) Conducted the last interview (via Skype) (2) Data reduction and analysis

Figure 10 The research process

4.3 The data collection: Sampling and informants

In qualitative research, data can be collected using various methods. I chose to use document analysis, semi-structured interviews and field conversations and observations (field notes). The choice of methods was partly a conscious choice based on what would be most suited for the collection of data of interest, partly a result of adjustments made in order to access the data in various situations and contexts. In order to understand the need for this triangulation, I will start with describing the selection of informants and how access to data and informants became a challenge during the course of the fieldwork.

The selection of informants was based on a model similar to what Neuman (2000) calls "sequential sampling", which is to obtain as many relevant informants as possible until new

informants cannot provide any additional information. Relevance is decided based on pre-defined criteria (ibid.). A sampling that seeks to obtain all informants that meet particular criteria is defined as "purposive sampling". Further, the snowball sampling was utilised to search for additional informants based on information from initial informants (ibid.). In sum, I ended up interviewing 21 informants, from three main categories. I will present those categories and the selection criteria for each of those main groups[8]. I will also discuss the accessibility challenge and the limited time span as limitations to the data collection, before turning to the methods and the settings in which interviews were conducted (4.4).

4.3.1 Informants from the crisis-mapping community (CM)

The reason for talking to the members of the crisis-mapping community was due to their valuable knowledge about the crisis-mapping field and all its different aspects. I started off by researching this field online and by chance I saw an invitation to a conference in Nairobi, the 2013 International Conference of Crisis Mappers (ICCM). On only a week's notice, I made arrangements to travel to Nairobi to attend the conference. This was an important decision that enabled me to have important insight and establish contacts – a choice which later shaped the entire research, both in a positive and in a negative way.

On a positive note, the ICCM gave me a preview of what could be studied in this context, and it created the link between the global phenomenon of crisis mapping and the local projects in Nairobi. Another advantage was that I was able to present myself to several crisis-mapping pioneers and test out some of my questions and thoughts on them, and I even made loose arrangements to get together for an interview when I returned to Nairobi two months later. On a negative note, or what I was not able to detect, was the relatively loose or weak collaboration between local crisis-mapping organisations and emergency response agencies in Nairobi. When gathered at the conference, they all seemed to be closely interwoven and accustomed to working together, but in everyday life it became obvious that this was not quite the case.

The initial selection of crisis-mapping representatives at the ICCM thus played an important role in the search for a suitable case for researching deployment of crisis-mapping solutions in

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[8] To protect the informants' anonymity, I will not list the informants by either name or professional title. Instead, I give some main characteristics for each category that I used to select my informants. In appendix 1 I also list the informants according to category and organisation.

emergency response, although not in the way I first expected. The selection criteria for the crisis-mapping informants amounted to a person with crisis-mapping experience, preferably in Nairobi or Kenya, and most of my informants from this category had either been at the ICCM or worked with a crisis-mapping organisation presented at the ICCM. In total, I interviewed 8 informants from the crisis-mapping community.

4.3.2 Informants at the management level (ML)

The second category of informants was selected for the reason of getting the viewpoint of the response organisations. The management level represents the link between the technologists and the end-users of the crisis-mapping technologies. The Kenya Red Cross and the Kenya Red Cross Nairobi branch, which is the organisation that initiated and run the URR-program, turned out to be a central source of information. During the visits to the Nairobi branch office, I also asked about their partnering organisations and about other key individuals to contact within the KRC system. Accordingly, the selection criteria used for this category was a position as key staff or member of the KRC[9] or as a relevant partner to the KRC and the URR-program. This latter sub-group included informants from a local health clinic run by the Médecins Sans Frontières and from the National Youth Service fire station. In addition, to get the perspective of other humanitarian actors with crisis-mapping experience, I interviewed two informants from two organisations that both had initiated crisis-mapping solutions, although not to full extent and not with the main purpose being *emergency* response enhancement. In total, the numbers of informants from management level of response organisations was 8.

4.3.3 Informants at the community level (CL)

The inhabitants of the slum communities were interviewed due to my interest in the URR-initiative, and in total I conducted 7 interviews with 5 key informants at this level. In addition to those one-to-one interviews I also had several group interviews and shorter conversations with other participants and inhabitants of the slums. In the main, these were all members of the community-based teams[10] established by the KRC in Mathare and Blue Estate, the *Mathare Safety team* and the *Kamakunji Community Based Disaster Reduction and Response Team (KCBDRRT).*

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[9] Here I include both volunteer and staff members at the Kenya Red Cross Nairobi branch as well as staff members at the Kenya Red Cross headquarters in Nairobi
[10] Also referred to as CBDRTs (Community-Based Disaster Response Teams)

The choice to collect data from only two out of the seven slum areas included in URR-program was largely due to limitations in time and resources. The reason for selecting exactly those two teams, the team from Mathare and the team from Blue Estate, was more or less the result of an unplanned acquaintance with a representative from the Kamukunji team at a seminar about illegal power connections held by the KRC. My reason for attending the seminar was to meet with an other informant, but it turned out he had to leave before we got the chance to talk. Instead, I left the seminar with the contacts of the community team representative from Blue Estate, and an invitation to visit their locations in the slum. The choice of the Mathare unit was natural both because of Blue Estate and Mathare being so close in distance, and because I had some other contacts that I knew from that area. Later on, I discovered that these two slums are viewed as being more successful than most slums included in the URR-program. This made them suitable for the study of the prerequisites for a successful implementation, although the analysis might have been aided by the inclusion of a third unit with less success.

4.3.4 Accessibility – a challenging and time-consuming task

In the search for key informants I used Facebook and Twitter and personal relationships. On the positive side, it is much easier to build trust to individuals than to organisations. On the negative side, individuals are harder to detect, and this was especially challenging when trying to reach my informants from the crisis-mapping community. The main challenge related to accessing the response organisations was their busy schedule and sudden interruptions that made it necessary to cancel or postpone many interviews. This made accessibility a time-consuming task, and it made it necessary to be flexible or pragmatic in the selection of informants.

The need for using personal communication channels such as Facebook and Twitter was largely due to the fact that crisis mapping as a field is still relatively new and has therefore not yet "found a home" among the established humanitarian and emergency organisations. In consequence, I could not pick up the phone and call the central administration of those organisations and ask for a staff member with crisis-mapping experience. In that sense, I was privileged to have met some of these crisis-mapping enthusiasts at the conference in November. At the same time, when I returned for my fieldwork in late January, the task of re-establishing contact with those individuals proved a lot more difficult than I had imagined. Several

informants did not respond to the emails I sent to arrange for an interview, some responded that they were out of town and that I needed to contact them again later on in the process, and one even called to postpone the interview because he had been in a minor car accident on his way to see me. At this time, some week and a half into my stay, I realised that I needed to search this network of local crisis-mapping enthusiasts using the Internet to look for additional informants to include in my research. Facebook and Twitter became useful tools in that search.

Figure 11 Photo of the iHub Cafe, Nairobi. Source: www.throughawall.com

Another arena that I used to get in touch with potential informants was the iHub Café. The iHub Café hosted a workshop session prior to the ICCM, which I attended during my stay in November. This café is known for being a common meeting place for local crisis mappers and tech-enthusiasts. Therefore, when I had nothing on my agenda, I often went to this café. Most days I ended up engaging in small-talk and brief conversations with a few interesting people, but interesting did not necessarily mean relevant or essential for my research; a majority of the iHub Café visitors are researchers and project managers looking for a place to meet with each other to discuss and work on their projects, and so being surrounded by all these different experiences and ideas, I kind of lost sight of my own project. However, through this experience I realised that I had to be even more targeted in my search for informants.

Being on this journey, I also spent eight days in Kakuma Refugee Camp accompanying my fellow student and travel partner who researched education for refugee children and youth. Though I did not explicitly and directly conduct research for my thesis while in the camp, I had time to reflect on the use of new technologies for beneficiary communication in a camp setting, as compared to, for instance, in slum areas. It became clearer to me who these technologies are

actually for, and so the visit to Kakuma was also an inspiration to seek out potential beneficiary communities when I returned to Nairobi.

Figure 12 Photo of the Kenya Red Cross Nairobi Branch office. Source: KRC Nairobi branch

Approximately three weeks after my arrival in Kenya, I experienced a boost in the data collection process. I spent entire days at the Kenya Red Cross office in downtown Nairobi, and I also paid several visits to the community-based units' offices in Mathare and Blue Estate. This allowed me to observe the every-day endeavours of those organisations and their members, while at the same time engaging in random conversations and doing interviews interchangeably.

Figure 13 Photo of KCBDRRT's office in Blue Estate. Source: Guro Åsveen

Figure 14 Photo of Mathare Safety representatives. Source: Mathare Safety

The time spent in traffic jam was probably the most frustrating and the least productive. At the most, I spent almost three hours getting from Eastleigh to Kilelewsha, which is about 10 km or 20 minutes driving distance. On two occasions I had to postpone an interview, and I seldom had time for more than one or two meetings per day.

Generally speaking, the limited time frame has been a challenge to the degree to which I have been able to reach the depth of this field. At the same time, the choice to extend my stay with one additional week helped me to increase the quality of this research and to bring me closer to the ideals in qualitative research (see also 4.5).

4.4 The data collection: Triangulation

Combining different methods for the collection of research data is clearly an advantage as "different methods for data collection may throw different light on different aspects of research" (Bloor & Wood, 2006, p. 71). In addition, the need to access data in various settings and contexts necessitates a certain flexibility; for instance, while the collection of data from the crisis-mapping organisations and informants at the management level (see also 4.3.1 and 4.3.2) allowed for semi-structured interviews, this method was not to the same extent suitable for collecting data from the slum communities and the CBDRTs (see also 4.3.3 and 4.3.4). In the below section, I describe the main methods applied; the document analysis, the semi-structured interviews and the field-conversations and observations.

4.4.1 Document analysis

The use of written documents has served important purposes in my research. First of all, I used document analysis to prepare for the fieldwork and interviews conducted during my time in Kenya. This included reading comprehensive reports written on the subject of crisis mapping, such as the *2013 World Disasters Report* on humanitarian technologies, the UN-OCHA's report on *Humanitarianism in the Network Age* and the Harvard Humanitarian Initiative's report, *Disaster relief 2.0: The Future of Information Sharing in Humanitarian Emergencies*. Previous research on crisis mapping, GIS for use in disasters and emergencies, humanitarian and communication technology, Volunteer and Technological Communities, crowdseeding and crowdsourcing methods and so on, has further played a part in guiding the formulation of the research problem(s) as well as contributing secondary data to my analysis. To this list one could also add statistical figures and background information recited in the context chapter.

A challenge has been to access official documentation from the Kenya Red Cross after returning from Kenya. While there, I had the opportunity to sit and read through documents at their office in Nairobi, but at the time I had only a vague idea of what to look for. In consequence, the added value of those documents became relatively modest. Yet, generally speaking, the use of secondary data and written documentation represents an important complementary effort to the collection of primary interview data.

4.4.2 The interviews

For the interviews, I used open-ended questions in a semi-structured interview guide to introduce the topics that I sought to address. Except for three interviews (conducted via Skype), all interviews were conducted face-to-face. When allowed, I used a recorder to tape the conversation. This made it possible for me to focus on the natural flow of the conversation, to adjust my questions to the answers given by the informants, and to ask relevant follow-up questions. It is my general impression that this benefitted the data collection, making the conversation more interesting to the informants. I also offered the informants access to both the recordings and the transcribed interviews, which created a sense of visibility and trust in the accuracy of the data. Only one informant declined my request to record the interview.

The adjustments to the original interview guide were conducted in three ways; first, in preparing each of the interviews (as a result of reading about the work of the informant and his or her

organisation), then during the interviews (as a result of the natural flow of the conversation), and lastly, in the course of the research process (as a result of new knowledge and insight). In total, these adjustments can be viewed as attempts to improve the internal and external validity of the data. At the same time, these adjustments may have caused irregularities in the answers that I got in the first interviews and in the later interviews.

4.4.3 The use of field conversations and observations

Combining observations with interviews can enable the researcher to access what his or her subjects actually do, rather than what they say they do (Bloor & Wood, 2006). Observations as part of a qualitative study and explorative fieldwork are thus opportunities for the researcher to study the participants in their natural environments and experiencing first-hand the phenomenon or situation he or she is researching. Field conversations differ from the semi-structured interviews in being even less formal, but also in the sense that most field conversations are related what is being observed. A common strategy is therefore to combine observations and field conversations (Repstad, 2007).

There were many situations in which observations and informal field conversations played a central role in my research, and especially towards the end of the data collection process. At that point, pre-arranged meetings with informants in offices and cafés had been replaced by multiple hours-long field trips to the Kenya Red Cross Nairobi branch office and to the informal settlements, Mathare and Blue Estate.

Figure 15 Photo of demonstration of siren. California Estate,
Kamakunsji. Source: KCBDRRT

Figure 16 Photo of fire drill. California Estate, Kamakunji. Source: KCBDRRT

I will mention one situation in particular; I witnessed a demonstration and a fire drill at California Estate, Kamakunji, which is located right next to the Blue Estate informal settlement. As one can see in the pictures presented above, several stakeholders and spectators attended this session, including local politicians, a fire fighting team from the National Youth Service (NYS), representatives from the Kenya Red Cross Nairobi branch, who can be spotted in red vests, and in yellow vests, representatives from the Kamakunji Community-Based Disaster Response and Rescue Team.

Although this was not an actual emergency, it was nonetheless valuable to observe how these actors interacted and collaborated, rather than just hearing about it from my informants. I was able to see for myself how the local response teams had almost no equipment and no uniform, yet they were just as involved in the response as their counterparts from the Nairobi branch and the NYS firefighting department. Throughout the day I was also able to see how the local teams and especially their leaders received great recognition from their local peers. Additionally, I was able to walk along the riverbanks and see how several houses are built dangerously close to the river, considering the risk of floods during rain season. And, on the way to the demonstration I was ushered through the narrow paths of the slum – another eye-opening experience that put into perspective how challenging it must be to organise a response in these localities.

4.5 Validity and reliability

While the above section described the method triangulation of my research, in this section I reflect on how the triangulation and the various methods might have influenced my research.

Moreover, it offers a summary of some of the factors mentioned above and how they might affect the validity and reliability of my discoveries.

4.5.1 Validity

The *validity* of this research is a question of how I have managed to balance openness in the data collection with the operationalisation of my research problem in the form of questions and topics presented to my informants. Although this balance has been aided by the methods described in this chapter, the challenges and limitations of putting such methods into use need also to be considered when commenting on validity. Time limitations and accessibility challenges, for instance, may have limited the extent to which I was able to achieve the full depth in my description of the crisis-mapping field and the processes of implementation in the response system. To improve validity I chose to extend my fieldwork with one extra week.

Moreover, the trip to Kakuma refugee camp gave important insights into the potentials for generalisations of findings concerning peer production and consumption of emergency-related information. Though the slum context differs from the camp context in many respects, there are also important similarities; principally, the search for new ways to improve response efforts and including the beneficiaries in this endeavour is essential in either context.

Demonstrating inter-subjectivity, or the degree to which the members of the field in question is able to acknowledge the results as being relevant for their everyday efforts and agendas (Jacobsen, 2005), is important for validity. At the same time, it can be a challenging task for the researcher. For example, I face this challenge regarding the comparison of the crowdseeding method and the URR-initiative, which is largely based on my own discoveries about the similarities between the two systems. The practical argument for this comparison is that it constituted a compromise between the original aim to study the use of crisis-mapping solutions in local emergency response and the realisation that there were relatively few on-going projects of that sort in Nairobi (see also 4.3.1). With that said, the result of this realisation needs also to be conveyed as a choice to highlight certain aspects of the crisis-mapping field and of the URR-program, which theoretically made it possible, or natural, to focus more on the organisational and less on the technical prerequisites for a reconnection between aid providers and receivers in hard-to-access areas. Conceptually and methodologically, my interpretation of "innovation", and particularly "crisis-mapping innovation", is rightfully due to the inherent "interpretive

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flexibility" of those concepts. At the same time, this might not be the aspect that others seek to highlight. The challenge is therefore to convey my own understanding of this field and my findings in a way that makes sense to the crisis-mapping technologists.

Similarly, I need to convey the results of my research to the members of the emergency response system, and the KRC Nairobi branch in particular. Although occasionally used at a higher level of management in the KRC, the concepts of crisis mapping and crowdseeding is not as familiar to the Nairobi branch and the actors involved in the URR-project. The fact that the URR-initiative was established with additional goals (risk reduction and mitigation), besides those similar to the crowdseeding method (reconnection for a more efficient response), makes it additionally challenging, and important, to demonstrate the value of this comparison to the actors involved in the URR-initiative. Inter-subjectivity at an operational emergency level is thus dependent on my ability to demonstrate the relevance of the results of this research to those actors.

The continuous adjustments to the interview guide and focus of my thesis might have caused irregularities in the answers that I got from the first interviews as compared to the later interviews. This, in turn, may cause the first participants to have less recognition than the later participants. Also, and what is probably even more important, is how my own prejudgements and background have unavoidably influenced the analysis of the interpretations of those participants. This is both a question of reliability and validity. If the prejudgments have overpowered the interpretations of my informants, one can question the reliability of those data, and also their validity, especially in terms of how the participants recognise themselves in my discoveries. As a way to enhance recognition, I offered the informants a chance to read through the interview transcriptions. Only one of the participants responded to this bid, but at least the feedback from this participant expressed recognition.

Overall, the validity of the research is limited to the inter-subjectivity of the participants and audiences of this inquiry. I believe that my continuous adjustments and the openness in the data collection have made the results of this research both relevant and recognisable. This however, is a judgement that needs to take into consideration the above factors, and the subjective evaluations of the readers of this thesis.

4.5.2 Reliability

When considering the potential bias-effects on data *reliability*, I need to consider both the more conscious choices concerning collection strategies and tools, e.g. my choice of locations and settings for my interviews, the number of questions asked and so on, as well as the effects of unforeseen changes and irregularities that occurred in the course of the research process. Concerning the choice to use a recorder, this was a necessity that I could not have managed without. At the same time, the settings in which the informants were interviewed sometimes made recording difficult. It should also be noted that recording is found to likely influence the answers given by the informants, as they may choose to only give information that they know is uncontroversial or that fits the official versions of a story or situation. Notwithstanding this possibility, my general impression is that most informants were used to being interviewed and thus also accustomed to audio-recording. I always asked for permission to use a recorder, and only one informant declined.

Concerning the surroundings in which data was collected, most interviews and field conversations took place in less than ideal settings, including noisy coffee shops, a garden near the airport, busy streets, while walking around in congested slum areas, in offices with colleagues present during the interview, etc. Besides making it challenging and time-consuming to transcript interviews, this may have influenced the answers I got from the informants, especially in situations where colleagues were present while the interview was conducted. Now, the topics themselves are not particularly "delicate" or sensitive, so I think most of the answers I got were honest, but the data reliability cannot be judged without considering these potential effects.

In addition to biases and disturbances from surroundings and the locations chosen for the interviews, it is also necessary to consider the potential biases created by me as a researcher and interviewer. Such biases could have resulted from cultural barriers or language barriers. Potential biases may also have occurred from the questions I asked and how I asked them. As the fieldwork proceeded, I had to do continuous adjustments to the original interview guide, which might have caused irregularities in the answers I got in the first interviews as compared to the answers in the later interviews. Moreover, the open dialogue in the field conversations, and observations, became more important towards the end of the data collection process.

Different methods produce different results, but also different challenges and limitations to the production of those results.

As I spent more time confronting my own expectations with those of the participants, the interpretations became more explicit. Earlier I had let the questions of how and what dominate, while later the dominant questions were why and with what intention/purpose. I must therefore assume that my prejudgements and expectations were more visible to the informants in the later interviews than in the early interviews. On the one hand, this has probably created more reliable (and valid) data in the sense that the informants could detect and correct my interpretations according to their own experiences and interpretations. On the other hand, the participants became more exposed to my own views and this might have created biases in the answers they gave. In addition, the fact that I established more close relationships with some informants than others may have caused the answers from those key informants to become more personally and politically motivated. At the same time, as I got more acquainted with my informants and after the second or third interview, I at least felt as though I was better equipped to distinguish the motives from the data itself.

All in all, reliability has been sought through considerable and considerate use of audio-recording, followed by hours upon hours transcribing the interviews and going through my field-notes and other documentation to ensure good data quality. Noteworthy challenges and biases have been the surroundings in which I conducted my interviews, which I often found difficult to control, as well as irregularities in the first interviews as compared to the later interviews, which resulted from both intended and unforeseen adjustments to ensure access to data. Those adjustments included changes in the interview guide and settings, in methods and in my role and efforts as a researcher.

4.6 Ethical considerations

In line with principles for conducting research in an ethical matter, I have strived to offer my informants anonymity and confidentiality. To the best of my ability I have collected informed approvals. At the same time, collecting informed approvals and especially in these kinds of settings, which I earlier described as being "less than ideal", can sometimes prove challenging. For instance, on occasions, people that were not part of an interview would walk up to my informant and me and engage in the conversation. When this produced valuable information, I

often experienced difficulties with communicating clearly that I wanted to use this information as part of a research project. Another challenge or ethical consideration concerns the challenge of balancing anonymity and the need to be precise when referring to data describing certain situations or events. Moreover, as one selects certain data to highlight certain aspects of the research problem, one risks taking data out of context or detaching it from a well-founded argumentation. This could represent a problem in terms of limitations to data quality, but also in terms of research ethics. It is the moral obligation of the researcher to treat the informants and their stories with respect and sincerity. In an attempt to fulfil this moral obligation, I have offered the informants the possibility to read through the transcribed interview prior to analysis – an offer that only one informant responded to. At the same time, or maybe *because* of this, I acknowledge that the main responsibility rests with me as a researcher and regardless of my genuine wish to aspire to ideal research, it is probably naïve to think that I am able to perfectly harmonise the informants' stories and how I interpret those stories through this thesis. Yet, by briefly reflecting on this challenge and all the above, I have hopefully contributed to uncover the weaknesses (and strengths) of my research.

As a final note, it is worth mentioning that crisis mapping, including research to support crisis-mapping technology and deployment, is said to pose new risks and ethical deprivation to the field of humanitarian work and its subjects. Expressions such as "cyber-humanitarianism" and "remote control humanitarianism" are expressions to demonstrate this concern. As this thesis does not build on any surveillance data or sensitive people data, I do not see the need to have a detailed discussion about this aspect with specific reference to the research presented here. With that said, I do however recognise the need for future research to not only consider the potential ethical implications of each individual research project, but also to address the general discussion about what the implications of the recent technology trends could be altogether.

5.0 Empirical data

Diffusion efforts by developers of new technology, as described in section 3.2.2, usually start with the development of the innovation and end with the adoption of that innovation by either organisational or individual adopters. In this chapter I will present data to describe this process, firstly, in terms of diffusion (see also 5.1), and secondly, in terms of implementation (see also 5.2). In the first section (5.1), I will study the motives driving the development and promotion of crisis-mapping technology, using data from both individual technologists and organisations within the crisis-mapping field. The second section (5.2) seeks to grasp the challenges and potentials in implementation by presenting empirical data from largely informants involved in the URR-program. I organise this section using the phases in Roger's model for innovation processes in organisations (see also 3.2.2): the agenda-setting and matching phase, the redefining/restructuring phase, the clarifying phase and the routinising phase.

5.1 Diffusion of crowd innovations: Grasping the crisis mappers' promotion

The crisis mapping is a new technology field, and as every new field, it is characterised by a certain *interpretive flexibility*, meaning that different social groups within and outside the field have different views and opinions about the nature and products of that field; while some are concerned with emergency-related missions in support of international response efforts, others are exploring innovation potentials in non-emergency work in local communities. In the sections below, I present the crisis mappers' motivations and efforts to promote their innovations. To guide this presentation I also include some previous descriptions on this subject. For instance, the paper by Capelo et al. (2012) offer a characterisation of the so-called "Volunteer and Technological Communities" (V&TCs) – a concept often used interchangeably to describe crisis-mapping networks and similar tech-communities. In another paper, a leading crisis-mapping pioneer, Jen Ziemke (2012), presents the main visions and history of the international crisis-mapping network.

5.1.1 Complementing humanitarian communication

Asserting the role of the new tech-communities in aiding humanitarian missions, Capelo et al. (2012) state that:

> "Most V&TCs do not specialize in humanitarian assistance in the traditional sense (i.e. direct provision of food, shelter, health care), but can extend virtual support through outreach to a wider set of actors, including diaspora communities and disaster-affected people by providing information products and services" (p. 10).

Their ability to deliver unique information that traditional actors normally do not access is further highlighted by the authors as a key contribution, and my informants stated the same. One of them said:

> *"Actually, when we started this project, there were so many organisations saying that they were doing the same in terms of getting information, so if you go to UNHCR they will tell you that they are dealing with flooding, with water, etc. Initially, when we first started, we had the needs of UN stakeholder. But on the other hand, if you go to the community, they have other needs" (Crisis Mapper, Informant 8, Mathare/UNESCO).*

Another informant said: *"We have brought in new aspects (new data that needs to be collected) – based on what we see in the communities – that was not originally part of the survey... That is what we do, that is what we are good at" (Crisis Mapper, Informant 6, MapKibera).*

5.1.2 Making information available to the broader public

Another raison d'etre for a crisis map, besides that of filling the information gaps of traditional humanitarian organisations, is crowdfeeding [11] (Ziemke, 2012). Previous research on motivations has shown that the tech-communities' activities are largely driven by an open-source ideology, asserting that information and data should be available and accessible to the public (Capelo et al., 2012). Relatedly, the tech-specialists' have been found to be highly dedicated towards helping distressed populations, and they believe that even through small contributions to information harvesting and sharing of data, significant changes and improvements can follow (ibid.). Typical statements confirming this belief are cited below:

> *"We create the map, we make it accessible, make it free, facilitate. We don't want to claim the throne of liberating the people. We only want to create the data. Even in doing that, I believe, we are already doing a lot to push forward a general justice and a transformation" (CM6, MapKibera).*

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[11] Crowdfeeding means relaying information to crowds

"We try to encourage the community members to express their views and ideas and to make their own decisions. So the information is useful first and foremost to ... the community. We create awareness, and from there on having external actors or NGOs coming in, or anyone who is interested in crisis management" (Crisis Mapper, Informant 5, Spatial Collective).

"By tweeting an event or report, you can take ownership of the information. Social media is about social engagement and it's not about me, it's about you, the beneficiary. Most organisations are not thinking about this; they only speak about themselves and what they do, but they don't really think about how they can engage beneficiaries and give them value add" (Crisis Mapper, Informant 7, KRC/UN).

5.1.3 Decentralised diffusion

Concerning the distribution of the tech-communities' ideas and products, the V&TCs are known for having flexible and flat organisational structures. Some use what is known as the commons-based peer production model to work with large groups of volunteers, delivering a series of information products and services without central guidance and coordination (Capelo et al., 2012). A diffusion strategy may be to constantly remind the potential adopters about the fact that broad communication is already happening, recent proof being the tremendous success of platforms such as Facebook and Twitter, and digital maps are also becoming more open and "social" as the everyday use of maps in modern communication and media is increasing (Meier, 2009; Engum, 2014). In that sense, crisis mapping and crowd innovation promotion is simply a matter of answering the requests of the people. As expressed in a paper by one of the co-founders of a global crisis-mapping network, Jen Ziemke (2012),

> "Although technology facilitated the rise of crisis mapping, it was actually *changing social practices* around the new use of these tools that drove these developments, not technology. *The crowd* continually learns from itself, by watching individual behavior and then copying and adjusting that behavior for personal preference. For example, over the past year the world has learned they can share their story about what is happening to them in real time through SMS, twitter, and other social media… No single organization or network has tried to convince everyone in the world to converge on a certain set of norms or behavior. Rather, the crowd has learned to adopt these practices over time on their own" (p. 4).

Through my interviews, I discovered similar notions of convenience and popular interest fuelling the diffusion of innovations using digital means, like in this statement about the introduction of a method known as RAMP, or the Rapid Mobile Phone-based survey concept:

> *"Some of the success of the RAMP is due to the adoption of the mobile phone technology by the community and branch members who took part in the piloting in Malindi. Because, you know, in Kenya mobile phones is something very common, and so people have an interest in using mobile phones…(and) if something is not working, the community will automatically reject it"* *(Management Level, Informant 1, KRC).*

Asserting the importance of client-control in diffusion of another mobile phone-based platform, the FrontlineSMS, another informant said,

> *"So for example, the Philippines Red Cross has been using FrontlineSMS for over a year… they just downloaded the software and off they go, and that is really what we wanted to achieve; to build something that was so easy that they didn't need to talk to us before they could start using it. Because we don't believe that in order to start using such a service you would need to talk to a western consultant"* *(Crisis Mapper, Informant 1, FrontlineSMS).*

5.1.4 Enthusiasm for partnerships

While these decentralised diffusion structures could signal a direct and outspoken opposition to conventional top-down innovation processes of traditional communities, their approach might just as well be to portray themselves as essentially user-oriented and flexible. Having been accused of fuelling a radical paradigm shift in which technology is enforcing new risks on the humanitarian sector and their beneficiaries, the communities are seemingly seeking to reduce the radicalism in their innovation messages, while accentuating their enthusiasm for partnerships. As expressed by one informant,

> *"You know, we are not trying to occupy a space that excludes other NGOs; We are simply aiming at developing a tool to support efforts of reconnecting refugees, and because we don't have the level of staff or outreach that larger organisations and UN organisations have, we would love to be a resource to those organisations and to partner with them"* *(Crisis Mapper, Informant 3, Refugees United).*

Another participant said, *"We would be the ones behind the scenes building the tools necessary to help those who work on the ground in humanitarian settings. And that is why we focus a lot on taking in the feedback that we get and develop whatever tools they need to do their jobs"* (Crisis Mapper, Informant 2, Ushahidi).

In general, Capelo et al. (2012) express the benefits of collaboration between the V&TCs and the traditional humanitarian communities, as followed:

> "Information-related products and services are the main outputs of V&TCs. In that sense, partnering with formal humanitarian organizations provides V&TCs with an opportunity to align their skills and expertise towards making a real-world impact on people in need. Collaborating with large organizations allows V&TCs to become more credible and professionalized. In turn, V&TCs can generate an environment of innovation and growth for humanitarian organizations, giving them the chance to experiment with new ways of collecting, analyzing and managing information" (p. 9).

The need for formal collaboration with traditional aid and emergency organisations has gradually become a priority of crisis-mapping organisations:

> *"When the first portals were established by tech-enthusiasts, they didn't think that they actually needed to link up with the humanitarian organisations – I mean, it was done after some time but not immediately. But then I think the tech-community has also learned from that experience and they are not really doing it that way anymore; so instead, now, they usually team up with the humanitarian organisations preceding the implementation of new tech-tools and platforms, as was done in the collaboration between the Standby Task Force and UN-OCHA"* (Crisis Mapper, Informant 4, CartONG).

5.1.5 Acting as intermediaries

In the above sections, the crisis mappers' efforts have been described as directed at, on the one hand, the beneficiary communities or the general public and, on the other hand, at the more professionalised actors from the traditional humanitarian sector. The below statements suggests that the crisis mappers even take on the role as intermediaries, forwarding information from beneficiary populations to humanitarian responders. One of the informants saw it as their responsibility to help beneficiary populations hold large-scale responders accountable: *"We do*

whatever we can to hold the government and our partnering organisations responsible for actually responding to events that are being reported" (CM8, UNESCO/Mathare). Another informant also felt it as his obligation to make sure that the beneficiaries receive the help they need: *"If it needs intervention, we contact other organisations that we partner with, like the Red Cross or another response organisation. So we don't just report, we also take action" (CM6, MapKibera).* The informant added:

> *"If you are a peace builder in your community, you have a strong sense of justice and sometimes you need to use unconventional methods to deal with reality. At the same time, you need to stay on the right side of things. But what can you do? People trust you with this information" (CM6, MapKibera).*

Similar statements were also made in terms of offering a reliable service and a service capable of "closing up the feedback" between the helpers and the helped. As emphasised here: *"Giving value add (to the beneficiary populations and providers of information) is about the public seeing real-time – if I report an accident, an ambulance will be dispatched, a response team will be dispatched" (CM7, KRC/UN).* Or, as the next statement accentuates: *"We have to … make sure that we are actually closing up the feedback, because, if you are just collecting data, you also have to be able to forward that message to someone who can actually do something about it" (CM2, Ushahidi).*

5.1.6 Limitations

As stated by Capelo et al. (2012), most V&TCs are keen to innovate and they have a remarkable capability to adapt to new situations. However, when it comes to actual humanitarian deployment, the fact that the tech-communities exist outside the humanitarian field, and therefore lack access to resources and well-established traditional information flows highlights their need for the traditional communities' guidance and support (ibid.).

My informants expressed this in terms of resources. One said: *"At the moment we don't have funding to do too much proactive stuff so by and large it tends to be people just getting on with using FrontlineSMS as they see suited. But like, there definitely are areas where I would like to see more happening" (CM1, FrontlineSMS).* Another participant said:

> *"It is easy to get people to agree on doing a pilot, but then, incorporating and expanding that project to make it into a more long-term thing, that is something else... It's like, adding a new tool is only valuable if it actually decreases the workload on something else instead, and it may sound quite logical, but then it can often be hard to achieve. So, the maintenance of things is often underrated, and also having someone committed and for the response"* (CM4, CartONG).

Another limitation might be challenges related to receiving feedback on the workings of the crisis mappers' innovations, especially as diffusion is becoming more decentralised and digitalised: *"So often when people go ahead and uses FrontlineSMS we usually don't know about it and don't have the opportunity to have an opinion about it"* (CM1, FrontlineSMS). The feedback is largely voluntarily:

> *"What we would like …, if they feel comfortable, is to tell us about their experiences with using the platform…, because we do not monitor any of the communication... so the ideal situation for us and what we are looking for – because we want to improve our service and the platform – is really the reconnection stories, not as figures and quantities, but as kind of profiles and qualitative data. And this is their stories, it's not about what we did or what they have received from other aid actors, it's about their life and their experiences"* (CM3, Refugees United).

Getting the organisations' support may be difficult due to issues of trust and increased ethical risks, which will also be addressed in more detail as I go on to the present and discuss the different innovation products and their presumed implications in the below sections. Discussing the issue of trust and scepticism with the crisis mappers, one said,

> *"We do have some partnerships with a few organisations but, you know, a few organisations still think of it as a new concept and they don't really trust it before they see it succeeding elsewhere, and that is our biggest – (pause) – threat. They only do it to make a case, to make us an example case. It is not yet an integrated part of their work, they do it occasionally, and they want to see whether it can work"* (CM6, MapKibera).

But then, another said: *"Yes, large agencies can be sceptical especially of crowdsourcing but what we do is actually not crowdsourcing, so it's easier to trace back, so it might be more easy to trust"* (CM5, Spatial Collective).

The different strategies and methods will be further addressed below (5.1.7). First, to complement the informants' accounts on the issue of trust, or rather, the *lack* of trust from traditional organisations concerning the use of crowd innovations, and especially crowdsourcing, I find it necessary to quote the key findings in a study by Tapia et al. (2011). Tapia et al. (2011) researched attitudes towards the use of micro-blogged information from beneficiary populations, interviewing staff from 13 leading international relief organisations. The result was unprecedented:

> "All subjects believed that the data produced through microblogging was untrustworthy. Equally strongly, the subjects stated that the veracity, accuracy, and legitimacy of data were the most important factors in data used in organizational decision-making. In addition, while the speed of gathering data was mentioned, it was not to be achieved at the cost of veracity" (Tapia et al., 2011, p. 4).

Building on similar findings by others (Coyle, 2009; Wild, 2010, as cited in Tapia et al., 2011), Tapia et al. (2011) accordingly points to the lack of perceived authentication to explain why large-scale responders have been reluctant to incorporate micro-blogged information into the process of assessing a disaster situation and the subsequent decision-making process to send aid workers and supplies to disaster locations.

5.1.7 Delivering and adjusting tools

Another way of characterising the crisis-mapping community is to look at their products, and their potential benefits or impacts. In section 5.1.2 I presented the crisis mappers' efforts directed at making information available to the public. Another word for this is crowdfeeding. In this section I present the informants accounts of the potentials and challenges of harvesting information from crowds, using either crowdsourcing or crowdseeding. Secondary data from previous research is included to supplement the informants' statements about these methods. In a report by van der Windt & Humphreys (2013b), which examines a crowdseeding project in the Democratic Republic of Congo (DRC), crowdsourcing is described as the strategy "in which anyone with the interest and ability can send an SMS message to a central platform" (p. 48). Crowdseeding, on the other hand, "makes use of identifiable users" (ibid., p. 48); only the pre-selected reporters can contribute information.

Looking at some organisations that have started using these innovations, the need for information from crowds to *plan for a response in hard-to-access or remote areas* is a commonly stated benefit of crowdsourcing. In an article describing the crowdsourcing mission of the Digital Humanitarian Network (DHN) and their partners in support of the Yolanda response operation in 2013, David Carden, head of OCHA in the Philippines, reported that "Thousands of data bits gleaned from tweets in the first 48 hours were used in OCHA's fourth situational report on super Typhoon Haiyan" (IRIN, 2013, para. 17). According to informants from the KRC IT-department, social media is useful for *taking pressure off Hotlines*, which is especially valuable during large events such as the Westgate Mall attack in 2013. In remote areas, they use what they call the IVolunteer, a crowd of digital volunteers who are assigned to report any event they come across through a digital platform. Commenting on this platform, an informant stated that *"With the IVolunteer we have an eye on every corner of the country" (CM7, KRC/UN).* Another participant said: *"The IVolunteer is for one helping us to get rapid information on what has happened and where, and two, it helps us to plan for response missions in remote areas where we do not have direct communication with the community" (ML1, KRC).*

When it comes to verifying information, digital technologies and social media platforms are for the most part supplementing existing verification tools and strategies. Asserting the benefit of using crowdsourcing for *cross-verification*, it was stated that: *"If there is a report of a blast, within an area, you actually search the social media for reports on "blast", "Mombasa" etc, If you find similar reports on Twitter, Facebook and so on, this is a strong indication that this has actually happened" (CM7, KRC/UN).* A majority of my informants also spoke of the importance of harvesting *geo-tagged information*[12]: *"You know, a lot of organisations collect information without necessarily knowing where that information came from" (CM5, Spatial Collective).* Another claimed advantage of crowdsourcing is the widespread *documentation* of events and the opportunity for people to *"tell their stories" (CM6, MapKibera).*

The drawbacks, on the other hand, are said to be the digital exclusion of vulnerable population groups, dangerous information and information overload. Concerning the *digital divide*, one of the informants responded that:

> *"The choice of the platform effectively limits the access to information sharing to the people who can access the platform that you are using; it might*

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[12] Geographically marked information

> *be SMS, radio, whatever. You need to know who you are missing and you*
> *need to take additional steps to reach those people" (CM1, FrontlineSMS).*

Not all information is useful. As stated by a former KRC representative, who spoke of *"dangerous information"*: *"So we are not supposed to publish or re-tweet police-related information, because it could be dangerous" (CM7, KRC/UN).* According to another informant, the KRC could potentially benefit from being even more restrictive: *"the KRC is very fast to post information online, and so you need to be a bit careful about what you tell them right away (what information you give), because it could lead to spread of misinformation" (Management Level, Informant 6, MSF).* Regarding the *information overload*, an informant emphasised this as a "major problem", and added: *"for instance, during the Westgate-incident, we received around 15,000 reports, and that was day one. And in a normal day we receive around 3,000, so you can imagine that amount of information coming in, and it was not easy to actually go through everything" (CM7, KRC/UN).*

The ICRC, doing remote monitoring in Somalia, are closely following the trends in the field of crisis mapping and community-generated data. However, because of fear of misinformation and general mistrust in the data, they are not themselves ready to open up their own systems of communications. Instead, the ICRC has taken independent steps to digitalise their geographical information systems and they use what the informant called "in-house crowdsourcing". In each of the areas in which they work, they have on-the-ground representatives who are employed by the ICRC to manage and report on projects and operations to their colleagues in Nairobi. The reporters can access the digital maps from where they are located and they can add to those maps up-dated information from the field.

But the crisis mappers have also taken steps to adjust their innovations to make them more compatible with existing tools and practices. An important turning point for the community was their involvement in the Haiti-response. These efforts have been widely studied and several informants referred to the #4636 mission[13] in Haiti. An independent evaluation of the Haiti crowdsourcing mission has reported "some general "suspicion of the crowd" and related questions about the representativeness and quality of the data" (Morrow et al., 2011, p. 5). Moreover, the general challenge of information overload overwhelmed the responders, and

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[13] This number was set up so that people could use text messages and micro-messaging to report events to a team of professional responders.

there was also a problem of failing to monitor the service and the reports on a regular basis (ibid.). This led many to conclude that the crowdsourcing method used in the Haiti-case was unsuited for reporting real-time emergency information. As stated by one informant:

> *"Most humanitarian actors act on the information provided by their own needs assessments or by trusted actors like the UN or like local responders … They can use cluster of reports and use them as a trend indicator. That might be enough to send out a team to verify those reports and carry out needs assessments, but the primary thing that they act on is still needs assessments. They would never act on unverified reports or unverified reports from a non-credible source. So, that is overblown as a use case.*
>
> *What we do see is a lot of crowdseeding, which is a different approach; it is not crowdsourcing from the community, but using actors who are trusted and credible and using their reports and putting those into the mix, and you see World Vision doing this with the speed evidence project.*
>
> *So, in a situation where the beneficiaries have very limited power or airtime and they use this to provide information that may or may not be acted on by agencies, you need to ask very serious moral questions about how you are positioning that kind of service. Crowdseeding can be potentially much more useful in the sense that the actors providing the information is both credible and they are doing this because they have been asked to do it and not because they need help" (CM1, FrontlineSMS).*

In the report by van der Windt & Humphreys (2013b) it is stated that: "The Voix des Kivus project chose to use 'crowdseeding', i.e., it selected villages through random sampling and identified specific reporters in each village" (p. 48). Crowdseeding was found to offer not only representativeness, but also credible reports, and the reporters are incentivised to engage regularly (ibid.; van der Windt & Humphreys, 2012). In addition to the perceived advantages of crowdseeding stated above, these attributes are relevant to explain the decision to adopt crowdseeding. "A key disadvantage however is that precisely because reporters are part of the system they may be at greater risks if groups oppose the data gathering project" (van der Windt & Humphreys, 2012, p. 2)

5.2 Implementation of crowd innovations: Experiences from the URR-initiative

The matching of needs and solutions is crucial in order for the innovation to find a home among the members of the adopting organisation. Therefore, as a key phase in the innovation process,

I first establish the reasons for initiating implementation of a new technology or strategy (5.2.1). The URR-program is used as an example case. Therefore, most of the data for this section originates from my inquiry of this program. Similarly, as I turn to the post-adoption implementation phase, I demonstrate the efforts made to implement and sustain the URR-program, looking at prerequisites in redefining/restructuring (5.2.2), clarifying (5.2.3) and lastly, routinising (5.2.4).

5.2.1 Agenda-setting and matching

The innovation decision is driven by a perceived need for an innovation or a performance gap that triggers change. Serving a population of almost one million slum inhabitants in Nairobi, Kenya, the URR-program has aimed to address the most severe threats facing those communities, including incidents of fires and floods. In figure 17, the main features and actors included in the URR-system are displayed.
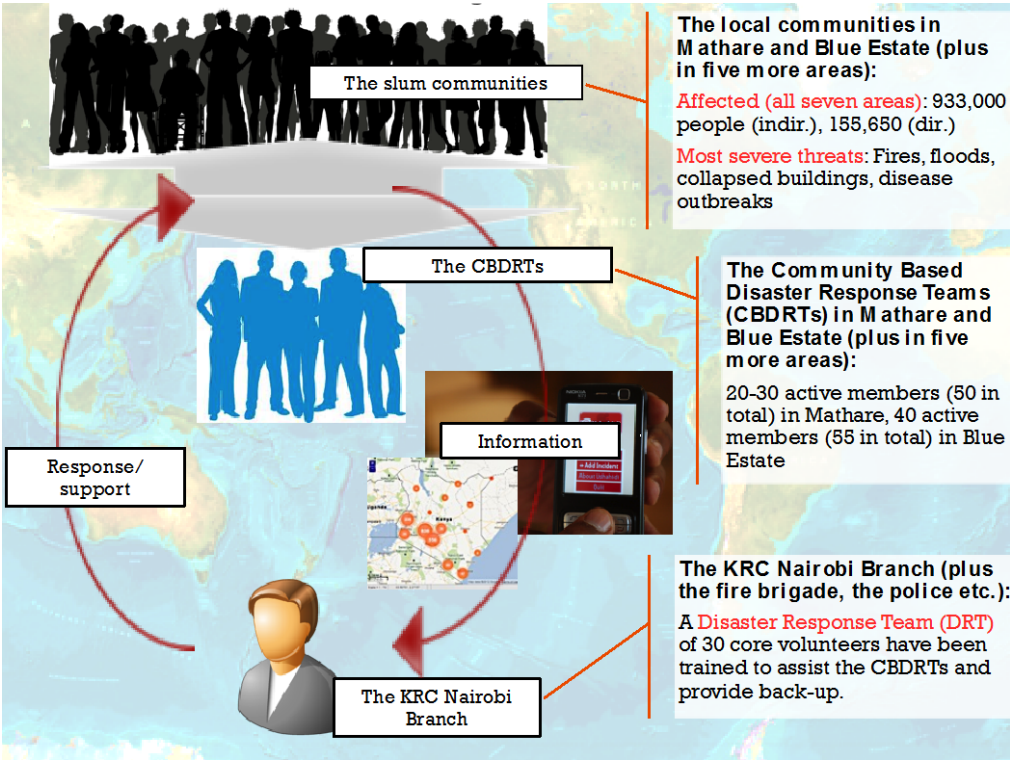

Figure 17 The URR-initiative: Main features and actors

Starting with Community-Based Disaster Response Teams (the CBDRTs), the empirical data suggests a number of 20-30 active members (50 in total) assisting the KRC in Mathare, and 40 active members (55 in total) doing the same in Blue Estate. In addition to those teams, five

more teams have been set up to serve a similar function in the remaining 5 areas included in the URR-program. The tasks of the CBDRTs are to report and assess emergency events and needs, provide immediate response and call for back-up if seen as necessary. In addition, other tasks related to prevention, mitigation and preparedness have also been handed to each of the teams for a holistic approach. At branch level, a Disaster Response Team (DRT) of 30 core members assists the chairmen of the local teams when they contact the KRC Nairobi branch to leave a report or to ask for back-up. The back-up can be provided by the KRC Nairobi branch themselves or in collaboration with other response agencies such as the police and the fire brigade. Not least, an important part of the initiative is the exchange of support and feedback in-between emergencies for the sake of short-term improvements in response time and outreach; in the longer run, the goal is to make the CBDRTs more independent.

Adoption is often determined by whether an innovation is perceived as suitable according to the adopters' needs and/or by whether it is perceived as better than the technology it supersedes. Compared to other solutions or systems for harvesting emergency-related information, the URR-initiative is customised to serve the context of the informal settlements. The IVolunteer, for instance has helped the KRC in addressing connectivity challenges in rural areas, but it has not yet reached the units in the slums. Similarly, although the KRC has access to security cameras in downtown Nairobi to support them in their search for information, this access do not exist in the slum areas. What the KRC wanted was to have information that could contribute to a more targeted response, and they wanted a reliable system.

The challenge was how to get people to stay with the project:

> *"There is quite a lot of dynamics and mobilisation in the slum areas. So, what we did was that we identified the persons who were actually able to get their own spot where they could live, because a lot of the slum inhabitants are forced to pay rents to landowner … So because this person is owning his or her land, he or she would be more motivated for contributing with information" (Management Level, Informant 3, KRC).*

Moreover, stability has been sought through training and through inviting the slum participants to events and small gatherings hosted by the KRC: *"We train them, give them satisfaction, certificates. We even take them for lunch, hold meetings with them – those kinds of small things that keeps them busy, make them feel appreciated" (ML3, KRC).*

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Regarding the slum communities, these have been found to be disadvantaged in several ways. For example, it is difficult for the KRC and the fire brigade to penetrate those areas with their vehicles, because the paths leading into the slums are too narrow. Also, they have been found to be particularly vulnerable to severe threats like fire and floods. Access to water and overpopulation is another aspect to take into consideration, and, although the mobile ubiquity in those areas is relatively high, *"a lot of people complain that they don't have the right numbers to call" (ML3, KRC).* This in turn, suggests the need for enhanced communication.

Another thing is the issue of power and trust. In the informal settlements, even if someone would call the fire brigade, the fire fighters may not respond, either because they fear being attacked, or because they for other reasons feel reluctant towards responding to informal settlements. In that regard, it might not be enough to have people who can call in, if the will to respond is not there. So, with the Urban Risk Reduction program, the KRC have managed to target a variety of issues concerning connectivity and access to the areas in question. In addition: *"This is an opportunity to learn, because, we learn like "oh we have had so many fires in this particular area", and then we can do campaigns and concentrate our efforts on prevention work within this particular community" (ML3, KRC).*

5.2.2 Redefining/restructuring

Redefining/restructuring is about finding practical solutions for the organisation of the innovation. The innovation in this case is the establishment of the Community Based Disaster Response Teams (CBDRTs) in Mathare and Blue Estate, plus in five more slum areas in Nairobi. *"The reason why we have the units at the community level is to target disasters and to create a link between us and the community, so when there is an emergency in these sites, there is also a response" (ML3, KRC).* Before this project, *"we just ran to the office and went straight to Mathare" (ML3, KRC).* Today, *"We have the community officials with a chairperson and five team members who, if they want to report an event, is linked to a specific volunteer here at the Red Cross Nairobi Branch" (ML3, KRC).* In case of an emergency, the chairperson closest to the affected area will call a volunteer at the Nairobi office: *"So if needed, the volunteer will arrange to give back-up assistance to the community response team" (ML3, KRC).*

The initiative started in 2007/2008. It was decided that the CBDRTs would become part of the KRC system of response, and shipping containers were donated and set up to function as offices

for the units. Through including the CBDRTs in the response, the KRC could outsource the task of reporting events and improve the time it takes to respond:

> *"Because for me, it will take some time before me and my team can reach an area like Mathare, but these guys, if there is a fire outbreak for instance, they will be able to respond to that fire, so with this structure we have actually managed to reduce response time from around 15 minutes to around 5-6 minutes"* (ML3, KRC).

In addition:

> *"We try to reduce the amount of risks and manage the impact of those risks and ...we engage with the community to build resilience and strengthen local capacities so that we empower them, at the grassroots"* (ML3, KRC).

Internal mobilisation and recruitment

The way the CBDRTs have chosen to arrange their internal mobilisation and recruitment make up an important adjustment to how response is organised in the slum communities:

> *"The way we have recruited is very unique. Because, if you talk about fire in Mathare, you are not talking about fire in a particular place, you are talking about fire in the whole of Mathare...You need to recruit from every area so that all 12 villages of Mathare are actually represented in the team... We recruit at least two representatives from each village, to complete the 40 members"* (Community Level, Informant 4, Mathare).

The continued task of recruitment is furthermore an important prerequisite for the ability of the CBDRTs to deliver the tasks assigned to them by the KRC: *"You see, this team is formed on voluntary basis, and nobody is paying you, and generally, we engage the youths who are not employed, which means, if this person gets employed somewhere, this person will automatically leave this team"* (CL4, Mathare).

External mobilisation

External mobilisation is done according to the agreement between the KRC and the CBDRTs, but also here, the CBDRTs are the ones making the judgement on when external back-up must be mobilised and by whom. The access problem is an important factor when considering who

to call, and also the issue of economic costs. The CBDRTs have agreements with the KRC to use their ambulances, and they normally use them to give support in displacement situations. In times of fire, they call the fire brigade closest to the scene, but they are often challenged because the paths are too narrow and the fire fighters are for various reasons hesitating to respond to the slums. These issues have been addressed with the help of the KRC. But overall, it is the responsibility of the CBDRTs themselves to make arrangements with external partners, and they are also actively seeking to influence decisions of politicians in their areas to make changes to infrastructure that can facilitate a more rapid response.

Assessment and communication training

The outsourcing of the assessment task makes up an important element or function of URR-initiative. When I asked the Nairobi branch team what they have done to facilitate the outsourcing of this task to the CBDRTs, one informant said:

> *"We train them, and then, the only thing we do is verification. So when they are doing assessments, we have two or three people from the branch supporting them and making sure that every data they collect is the right data. So the copy is forwarded to us at the office and then, we need submit copies to the regional head quarter and then the local chief (politician) also remains with a copy, so you find that the information originates from them but are shared among the relevant stakeholders" (ML3, KRC)*

Another participant said:

> *"When we go to a scene, we need to get information about the incident, but also about impact, what has been done to assist the affected population, what kind of needs they have – shelter, food, education, beddings, blankets, traumatising, and so on. Then, when we go back to our office, we write the report and that report is what now generates the distribution of resources and relief to those who are affected" (Management Level, Informant 4, KRC).*

It should be noted however, that the training given to the CBDRTs on how to do assessments, and to the branch volunteers as well, is largely limited to instructing the members on how to fill in the standardised assessment forms provided by the KRC – one of which is designed for a 24 hours assessment; the other, a more comprehensive and detailed assessment, which needs to be ready in 72 hours. When it comes to giving training in communication, this too is limited to knowing the KRC's instructions about who should be warned and in what order. For internal,

on-scene communication, the volunteers are trained in how to use radios. The CBDRTs have been given mostly low-tech equipment for communication and early warning (whistles, sirens, megaphones), and in addition they use the mobile phone for both internal and external reporting.

Response training

The training given to help with the physical response is given so that the community can take immediate action to act on behalf of the Nairobi branch. They are trained according to what are the tasks and predominant risks facing each of the community based units:

> *"Like in the slum areas there is a lot of fires, so we train them to fight fires. Other risks are traffic accidents and floods, so we prepare and train them according to what are the predominant risks in the particular society. Also, remember that these settlements are located at the lowlands of Nairobi so when it rains on the opposite part of the city, then all the water will come and likely cause problems. Therefore we train them to prepare for floods ... So with that you can save a lot of lives and also property" (ML3, KRC).*

While training is also an incentive and a prerequisite for having previously inexperienced volunteers working together with experienced responders to support them, it is also a way of making sure that this outsourcing is done responsibly: *"because we are trained, we are informed and we know what needs to be done. Without proper training, we would risk a lot more people getting hurt, including the members of the team" (CL4, Mathare).*

Time and resources – prerequisites for flexibility and sustainability

When planning for sustainability, it is clearly an advantage that the CBDRTs have the liberty and responsibility to act independently to take ownership of the processes presented in this section. To allow for adjustments and continued adoption, the KRC has stretched the time limit for the project and training has been expanded to include several aspects of a typical response, including coordination and collaboration. One challenge however, is that the CBDRTs are lacking financial means and resources to partake in trainings located outside or far from where they normally operate: *"it depends a little on resources. We have had to cancel several meetings and trainings because they are very far and even if we dig deep into our pockets, there is no money to spend on those activities (CL4, Mathare).*

5.2.3 Clarifying

Being a new innovation, one expects divergent interpretations of the innovation to arise, and getting those interpretations to converge demands efforts of managing misunderstandings and confusion about what the innovation could mean to different users. Through the URR-program, the KRC has managed to frame the response and information harvesting task of the CBDRTs and linking it together with other tasks such as prevention and mitigation. They have for example, invited the CBDRTs to meetings concerning illegal connections in the slums, which now has become a prioritised task of the CBDRTs in the areas included in this research.

Concerning the response task, the challenge of misinterpretations and misunderstandings is evident from the divergent practice when it comes to responding to larger fires. In the official agreement made between the KRC and the CBDRTs, the CBDRTs is supposed to function as first responders to smaller events; beyond that, their role is simply to alert and give information to external responders at the KRC Nairobi branch or at the Emergency Operation Centre and nearby fire stations. In the words of one representative from the KRC Nairobi branch: *"we want to make the communities resilient to disasters. So, even today, we only respond if they are overwhelmed, … we wait for the first responders to respond first, and then, if the situation gets out of hand, we send our back-up team"* (ML3, KRC).

When talking to another member of the Nairobi branch, he saw it as ideal if the slum communities could serve first and foremost as reporters and providers of information to feed the response of the branch, but he agreed that it largely depended on the scope of the event:

> *"Sometimes in Nairobi we have three or four responses at the same time, and now, … if I have twelve households that has caught fire, and I have another fire in Mathare burning down five hundred households and then I have another one in Mukuru affecting, say, three households, which one will I go to? … I would not worry about the three, because I know that the community, using their buckets to get water, easily handles a fire of such a small magnitude. Now, with the five hundred households, I might be looking at a bigger damage within a very short time frame"* (ML4, KRC).

Correspondingly, the members of the CBDRTs described their role and the role of the KRC Nairobi branch as complementary, whereby the CBDRTs can manage events up to a certain magnitude, but if the event is too large, they need the support of the Nairobi branch to mobilise enough resources:

"We have the people on the ground who have been trained just like their volunteers there. But then, if there is very large incident, we will have to include them so that we combine…They can also line up with other organisations to get the resources. Or they can also direct us: "can you address such and such organisations on the ground, so that they can help you respond?" … So, you see? We can't rule them out, because, like I have said, there is a lot of things we cannot do without them, like relief" (CL4, Mathare).

In practice however, it is not all that clear who is actually doing what, where and when. When I asked the leader of one of the community teams about how they normally respond in cases where there is a large fire and where there is no immediate sign of a fire fighting team coming to their rescue, his answer was that they responded to the best of their ability, with what they had, until a fire truck was at the site and professional fire fighters could step in. He told me about the challenges facing the members of the team when trying to rescue people who are wounded or trapped inside a burning house because of the houses being built so close together in the slums. I asked if he ever had gone inside a burning building to rescue someone, and he answered: *"yes, many times"* (Community Level, Informant 1, Blue Estate). Thus, the sacrifices made to do whatever they can to help during incidents of fire, seems to exceed far beyond what is expected of the community teams as a team supporting the external response of the KRC and professional fire fighters. The experience of another community volunteer leave a similar impression: *"you know, we are not trained to fight fires, we are just volunteers. But you know, we live here, so we have to participate, and I normally stay here. So I have to do what I can to help the community"* (Community Level, Informant 2, Blue Estate).

While this might not be what was originally intended, the CBDRTs are seemingly taking on a lot more responsibility when it comes to responding to fires than what they are equipped and trained to do. Now, this burden may have be placed on the CBDRTs by themselves or by the external firefighting teams; *"Sometimes when they (the fire fighters) come here, they give us the pipes; they say, "take the hosepipes, do what you want". Because, you know, we know this place very well"* (CL1, Blue Estate).

From the viewpoint of the NYS, it is nonetheless the main responsibility of the KRC to make sure that the community units are sufficiently prepared to participate in response operations: *"What I saw, they need to be given the protective clothes so that they can respond to fires to keep them from spreading, because, sometimes when we arrive, they have already put off the*

fire" (Management Level, Informant 5, NYS). I asked the NYS representative if he had witnessed the community based teams being involved in fighting large fires, even though they are only expected to respond to small fires: *"Yes they are. Now, the problem with those people is that they cannot be involved in a big fire, because they don't have the equipment… The first 2-3 minutes it is very important that they try and put out the fire, but if it evolves from there, they can do nothing" (ML5, NYS).*

In recognition of this lack of equipment and training, the KRC are now planning to increase their support to the CBDRTs and their firefighting capabilities*: "What we are doing right now, we are trying to establish the community fire stations, so once that is done, they will be provided with water tanks, we will arrange for firefighting trainings…" (ML4, KRC).* Thus, while the gap in meanings about the responsibilities in responding to larger fires may have grown larger as a consequence of misunderstandings and miscommunication over some time, the introduction of the community fire stations could potentially represent an important measure in addressing this gap.

5.2.4 Routinising

Local leadership

Concerning routinising, or the sustaining of an innovation beyond the point of securing initial adoption, the URR-initiators regard local leadership as particularly important for the CBDRTs' independence:

> *"I think that Mathare has been a bit more active and also Blue Estate and Mukuru, I am not saying that the others are not working, but in comparison the participation is lower…the different teams have their own way of operating, so they have their chairperson, their administration and so on. So you find that one chairperson is not as aggressive as another, and you know, when the leader is not aggressive, the rest of the team tend to be a bit slow. So that is one of the many reasons" (ML3, KRC).*

Ownership and independence

Routinising is often associated with users taking ownership of the innovation or the ability to operate the innovation independently of the change agents' support. According to the URR-initiators, the CBDRTs proved their independence during a transition period in 2012-2013:

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"We had a gap in 2012-2013 and the funny thing is, because... that is when we went from specific hazards- to multi-hazards programming... so there was a gap in terms of supporting the activities monetary wise, but you see, they continued with their activities, and this shows that they now owned their projects, they see "this project is ours" (ML3, KRC).

Notwithstanding the potential challenges ahead, the KRC has gained hope for future closure of this initiative:

"One of our main goals is for them to be independent, and so the fact that they continued their work (during the 2012-2013 period) should indicate that they would actually be able to run their projects even when this collaboration comes to an end ... So, yes, by the time we finish the projects, because we still have 2-3 years, so we will ... make sure that by the end of this project, all the teams will be able to sustain themselves. So if not, during the mid-term evaluation, we will gear up our support" (ML3, KRC).

Demonstrating financial independence

On the other hand however, there are still challenges to be addressed before these units could call themselves self-sustaining. Financially, the CBDRTs are still highly dependent on the support from the KRC, at least in the eyes of certain stakeholders: *"They give us very good information and I urge the Red Cross to assist those people. Because, Red Cross is capable, they have the resources to provide them with whatever they need, because these units are under the Red Cross" (ML5, NYS).*

Admittedly, the KRC faces a challenge when trying to disassociate themselves from the CBDRTs to signal the need for external donors to come in with additional support:

"What we normally do, we emphasise to other stakeholders that we are only facilitating ... and that any donation that you (the other stakeholders) might have is welcomed. So we make it clear to them through letters, because every time that they (the CBDRTs) want to approach someone, they usually come to the office to talk to us" (ML3, KRC).

Overall, the CBDRTs seem to be thinking in terms of seeking resources and support from a broad range of actors rather than depending on the donations from the KRC alone. Financial independence is thus sought as the engine that will also drive independence in other areas:

> *"I think we can all agree that an organisation without resources is not an organisation. Like now, when we respond in a scene of accident – a vehicle accident or a fire – then automatically we have injuries, and once people are affected and if you are not able to help materially, then you cannot call yourself an organisation" (CL4, Mathare).*

Reflecting on where to get resources in the future, the informant said: *"We need to find ways to do this locally, because, as an organisation, you have to … work together with local partners to actually achieve what you want to achieve for the community" (CL4, Mathare).* The informant added: *"The Kenya Red Cross initiated this project, but now it is left to the community … So, when discussing where the money should go … if we get the resources that we need, we can respond, you see?" (CL4, Mathare).*

Demonstrating organisational independence

In terms of building trust and recognition from the surrounding communities and other actors, the CBDRTs are gradually making themselves known to other actors, but for the time being, they still depend on the good name and reputation of the KRC: *"For the moment, someone may not trust the data, not unless it is made reliable by the KRC" (ML3, KRC).* The KRC has served as a link between the professional firefighting teams and the community:

> *"Today, if we call a private fire engine, they will not charge us, because of the name that we have created, and look at the Nairobi City Council, the old fire brigade used to have stones thrown at them when they responded, but now they are not, because the community now understands" (ML3, KRC).*

Another ownership challenge was demonstrated through a donation and launching of sirens given to the CBDRTs in the preparing for the rain season of 2014. The sirens were given to the CBDRTs in good time before the rain season, but when I asked the CBDRTs if they had started using it, only the unit in Blue Estate had done so; the Mathare Safety unit was still waiting for the KRC to officially launch it: *"You know, it is just a new system now, so we did not want to*

launch it, because we are still waiting for the Kenyan Red Cross to launch it officially. Maybe they have the plan to do it soon" (CL4, Mathare).

The answer I got from the KRC, on the other hand, revealed a misunderstanding about when the CBDRTs could start deploying this new alarm system. I asked a member of the branch why they did not launch it the minute the sirens were given to the CBDRTs:

> *"It is in fact funny that these guys are still waiting for this to be launched, because, the fact that we gave them those sirens, that means that they are now the owners of that siren, and I told them, "the reason why we are having a launch is so that the community will have time to know about the sirens and how to act if the alarm is set off", so by the time of the launch, they should be able to start using this, but if they are ready to start using it now, they should not wait" (ML3, KRC).*

Thus, what the KRC wanted the CBDRTs to do, was to inform the community about this siren by going house-to-house to explain how this new alarm system worked and what actions should be taken by the community when they heard the signal. When talking to another member of the KRC Nairobi branch about the launching and why it was not done right away, he told me: *"Yes, we will need to launch them, but for us to launch them, we will need to a proper strategy, because first they need to sensitise the communities and inform them … in the meantime, they can use the whistles" (ML4, KRC).*

Still, the Mathare Safety unit had not included the information about the siren in their house-to-house sensitisation:

> *"We are doing the house-to-house, but we have not informed them about the siren, we have only told them that we have the siren and that it is soon going to be launched by the Red Cross. But we have not started using it yet because it is very important that we don't break the chain of command. So if they have given us the information that we have to wait, and they will come for the launch, we need to wait for that" (CL4, Mathare).*

The fact that the rain season came earlier than what is normally the case, posed additional challenges to the CBDRTs, and so I asked if this should not justify an exception from the "rule" to wait for the permission from the KRC to officially start using new equipment to improve

their flood response: *"Well, if the flood comes, we need to do anything at our disposal; use that thing (the siren) and then give the rest of the information to our members"* (ML4, Mathare).

What this example indicates, and what the KRC confirmed when I confronted them with this misunderstanding, was that the message about the launch of this siren had not come across as they had intended to all units. Ultimately, the KRC saw it as the independent choice and responsibility of the CBDRTs to decide when they wanted to start using it and how. Yet, as this misunderstanding indicates, independence was clearly misjudged, and so it could suggest that it is still a challenge that needs to be addressed more generally.

Closure and feedback

Closure in the case of the URR-initiative requires efforts to increase the evaluative ability of the CBDRTs. As of today, although information is shared openly among the KRC and the CDRTs (and this will probably continue), it was mentioned as a challenge by one of the informants from Mathare, that they had little chance of knowing how exactly information that they give, feed back into the program:

> *"I was telling you that the Kenya Red Cross is our partner, but what they do is that they come here for information and we never know how that information is actually feeding back to our organisation, because, the Kenya Red Cross is a very large organisations and it covers the whole country, and so it is not always visible what the information generates in terms of benefits coming back to us"* (CL4, Mathare).

As of today, there have been taken steps to allow the CBDRTs to sell information to external partners and thus claiming at least the legal or formal right to this information. What is lacking however, is the ability of the CBDRTs to take charge of the information management and learning from evaluations. Most evaluations are done in order to improve the work of the KRC, but as one informant also said: *"we should absolutely sit down with them (the CBDRTs) and discuss how they too can learn from the assessments."* (ML3, KRC).

In terms of technology hardware, there are also obvious challenges. For instance, the Mathare unit has bought their own computer, but other units have not. I was told that the initial idea was to find support to buy computers for all the community based teams, but due to several

challenges that became obvious to the branch as they began planning for this support, they had to reconsider it:

> *"First of all, you need power and we didn't want to be responsible for putting up illegal connections – that is something they are at liberty to do themselves, but we didn´t want to contribute to that, and we didn't have room in our budget to actually establish a system of formal power. And then, if we just bought them the computers, it would be us buying them computers, and not something they bought for themselves, and so we didn't want to do that"* (ML3, KRC).

Discussing this matter with a member of the Mathare unit, he said: *"So, you see this computer, this is my own initiative, not the initiative of the Red Cross, so with this we can hopefully get some information out about what we are doing, plus we can use it to connect with other organisations" (CL4, Mathare).* An informant from the crisis-mapping community confirmed the need for increased access to communication technology tools:

> *"That I can say of the Kenya Red Cross and the URR response team is that they have almost no equipment, no computers, no internet, no nothing, so what we also did was to work with the team in Mathare and we gave them at least some technical skills and taught them how to use very basic communication tools, like the FrontlineSMS mobile application" (CM8, Mathare/UNESCO)*

Certainly, technology (hardware and software) is not everything, but if the CBDRTs are going to function as independent units and also communicating and sharing information with others, the CBDRTs will need to have the means of communication necessary to do this. The question is from whom the support will be given to realise this goal, and whether it will be given in time for the separation of the KRC and the CBDRTs.

6.0 Discussion

In this chapter I seek answer the research problem(s) posed in the introduction by reviewing the empirical data in light of the theoretical framework presented in chapter three. This chapter is divided into two sections. The first section (6.1) examines the challenges and potentials in diffusion of crowd innovations. More concretely, the diffusion efforts directed at individual adopters are discussed in comparison to the diffusion efforts directed at organisations (see also 3.2.2). This in turn, will prepare the answers to the first sub-question posed in the introduction: *What are the key challenges and potentials in the crisis mappers' diffusion of crowd innovations to and through organisations (as compared to direct diffusion to individuals)?*

The second section (6.2) addresses each of the phases in Rogers (2003) model for innovation processes in organisations, and these phases combined provide the answers to the second sub-question: *What have been the key challenges and potentials in the KRC's implementation of the URR-program (a crowdseeding-like initiative)?*

6.1. Diffusion of crowd innovations – potentials and challenges

When discussing the diffusion to either individual users or organisations, I refer to the first and second level in the diffusion model presented in chapter three (3.2.2). For the sake of illustration, a scaled-down version of that model is shown below.
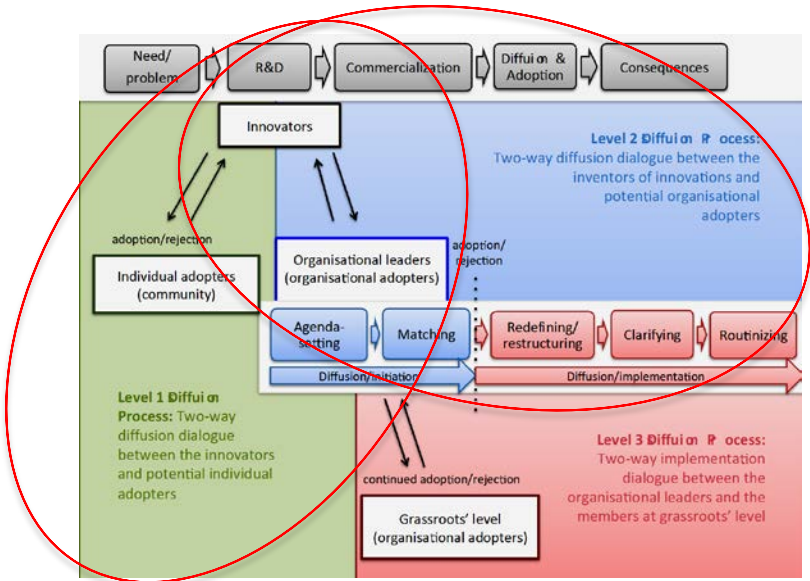

Figure 18 The Three Level Diffusion Model. Scaled-down version 1

In the first level diffusion process, the promoters can address the individuals qualified to serve as members of a crowd directly, without involving the organisations and their leaders (in this case, the professional response apparatus). In the second level diffusion process, the promoters can diffuse via organisational leaders to have them adopt the innovation of crowds for their own specialised purposes. Thus, what the former strategy represents is that of a decentralised diffusion and implementation process, in which the tech-communities help facilitate the self-organising of individual users around crowd innovations and related technologies. The latter strategy, on the other hand, assumes a more centralised process in which the organisational leaders carefully supervise the diffusion and implementation of new innovations.

6.1.1 Level 1 diffusion – to individuals

A fundamental prerequisite for successful diffusion is the promoters' ability to portray their ideas and technologies as reliable tools that can support the users in achieving their goals. From a diffusion perspective, this process of building trust in new technologies can happen either from the top-down or from the bottom-up (Rogers, 2003). Accordingly, it is assumed that promoters can choose between diffusion via organisations and their leaders, or targeting individual adopters directly to "push" for technological change at management level. In the digital age, the growing use of new media and digital platforms is said to have facilitated new opportunities for bottom-up diffusion (Rogers, 2003; Scarbrough & Corbett, 1992). These opportunities are voiced by the crisis-mapping representatives, pointing to "the people's" (also expressed as "the crowds'") demand for new communication tools and their ability to express this demand through a new set of platforms. In fact, a majority of the crisis-mapping informants seemed to believe that through their efforts to leverage broad and open communication platforms, people can at least have immediate access to information and a tool to help them determine their own needs; and, in the longer run, organisations might become convinced about what this information could mean to them. This in turn, suggests at least two potentials in bottom-up diffusion: one, the opportunity to *demonstrate to response organisations* the ability of external and non-professional reporters to contribute useful information, and two, the opportunity to *support distressed populations* through providing them with a tool to broadcast needs and to access information for increased awareness and resilience.

Diffusion for the purpose of demonstration

Concerning the potentials in diffusing for the purpose of demonstration, Rogers (2003) mentions observability, the degree to which the attributes of an innovation is visual to potential adopters, and trialability, the degree to which it is tested out in a limited scope to begin with, as two of the factors promoting successful diffusion. As the empirical data reveals, the tech-promoters are keen to demonstrate the fact that broad communication is already happening, recent proof being the tremendous success of platforms such as Facebook and Twitter. The organisations, on the other hand, "*don´t really think about this... (and) how they can engage beneficiaries" (CM7, KRC/UN).* In that sense, the tech-promoters role remains one of exploring the potentials in expanding communication with beneficiaries *before* approaching the relevant organisations. Such experimentation could also result in feedback and technological improvements, which again could ease promotion to other units and organisations seeking solutions to enhance beneficiary communication.

Diffusion for the purpose of broadcasting needs

However, while demonstration could be a long-term potential of bottom-up diffusion, there is still a need to address the more direct or immediate implications of not including the organisations in the diffusion and implementation process. Regarding the crisis mappers' wish to support distressed populations through offering tools for broadcasting needs, it requires that someone will agree to respond to those needs. Apparently however, this is made difficult by a lack of trust in community-generated data. Tapia et al. (2011), for example, displayed widespread reluctance among large-scale responders to incorporate information from external and unknown sources in their decision-making and response, the reason being perceived lack of authentication. Morrow et al. (2011) reported a general "suspicion of the crowd" among traditional responders after the earthquake in Haiti in 2010. Adding to this limitation is the realisation that situation awareness is inherently goal-driven and, unlike information itself, not easily shared among multiple actors (Endsley et al., 2003). The need for systems that are widely recognised as a reliable tool among both providers and receivers of emergency information is therefore crucial to support situation awareness.

According to the informants interviewed for this thesis, the tech-promoters have become increasingly occupied with getting the traditional organisations committed and for the response, and much attention is directed at designing methods for authenticating information. At the

same time, when it comes to diffusion, there might still be a tendency to underestimate the need for centralised processes and formal agreements, or at least there is a tendency to argue that information is valuable almost regardless of the organisations demand for this information. As expressed by one informant, *"You know, let's talk about validity after we have some data at least. And then, let us also find out if that community agrees with the data and believes in it. The organisations can only come in and supplement" (CM6, MapKibera).* However, when crisis strikes, there is hardly time for discussing validity, and the consequence could be that the organisations fail to act to supplement or support the community.

Diffusion for the purpose of building resilience

In a discussion about diffusion to lower-status populations, Rogers (2003) points to a paradoxical effect of previous diffusion efforts: the users that most need the benefits of a new idea (the less educated, less wealthy and the like) are also the last to adopt. This paradoxical relationship between access to and need for an innovation tends to widen socio-economic gaps between the higher- and lower-status individuals in the system (ibid.). In that regard, the crisis mappers are making a positive contribution by targeting those who potentially have the greatest need for innovation to include them in the innovation process. In a report describing the new tech-communities, Capelo et al. (2012) emphasise their wish to help distressed populations through making information publicly available to increase awareness and resilience. As uttered by one informant: *"We try to encourage the community members to express their views and ideas and to make their own decisions" (CM5, Spatial Collective).* Also, seeing these populations as active participants and not as passive receivers of aid and response, is acknowledging the fact that most lives in emergencies are saved by non-professionals (Dynes, 1993; Palen et al., 2010), so why should non-professional helpers not have access to tools and information to help them make better decisions for themselves?

The problem is that accessing tools to give and receive information is not equal to accessing a sound and committed response, and while the help-seeking populations may be able to give and use information to aid response operations, they still depend on the support from professional responders. This challenge is obvious from the empirical data, displaying the innovators' active role in forwarding information from the community-reporters to the traditional humanitarian responders. In essence, rather than reflecting the empowerment of beneficiary communities, this intermediate position could instead mirror the growing influence of innovators. Moreover,

the limitations to claiming increased resilience for beneficiary populations have been discussed in several reports on humanitarian technology (Duffield, 2013; van der Windt & Humphreys 2013a; Sandvik 2013, 2014). In one of these reports, concern is expressed with regard to the engagement with technological innovations "pushing the resilience agenda further in the direction of making those in need more responsible than well-paid humanitarian actors for providing humanitarian aid" (Sandvik, 2014, p. 27). Another related challenge is the claimed "digital divide", which inevitably excludes the least digitally able population groups from partaking in the technological shift suggested by the new technological communities (Vinck, 2013). Thus, while the diffusion of crowd innovations and technology to individual users could enable more people to express their needs to relevant responders, the empirical data and previous research show that there are also limits to this potential.

On the one hand, because there is no implementing organisation from the humanitarian community involved, bottom-up diffusion can be seen as an opportunity to carry through with the development and implementation of crowd innovations; not awaiting the humanitarian organisations' demand for these developments. On the other hand, the consequences of not going via the adoption by relevant large-scale organisations could imply failure to achieve the organisational changes necessary to have a committed professional response. Centralised diffusion and organisational implementation is not only effective when the change must be immediate; in addition, the organisational implementation is characterised by a mutual adaption of organisations and innovations, which is crucial for the continued adoption of an innovation (Rogers, 2003; Guvenis, 1989).

This in turn, suggests a more internalised process in which the organisations agree to adopt and implement the crowd innovations for their own, targeted deployment. At the same time, the challenges in both second and third level diffusion must also be considered for a balanced understanding of what promotes and limits crowd innovations diffusion and implementation.

6.1.2 Level 2 diffusion – to organisations

As suggested above, diffusing to organisational adopters embodies an opportunity to safeguard a committed response, thus increasing the chances for the information collected to actually lead to concrete improvements in response time and outreach. The promoters can adjust their innovations and innovation messages according to the needs and problems of a particular

organisation to "translate an intent into action" (Rogers, 2003, p. 370). This however, is a complex and difficult task as implementation involves a number of individuals, perhaps including both champions and opponents of an idea. Further, implementation amounts to mutual adaption between the innovation and the organisation (ibid.). Ideally, the promoters would be able to calculate how the innovation might influence the organisation positively and negatively, but innovation effects are difficult to measure and especially long-term effects (ibid.).

When explaining diffusion success, an important factor is the degree to which innovation messages are shaped according to social norms and traditions of the adopting unit or organisation (Rogers, 2003). More so, adopters will look for solutions that are compatible with their needs, and it is also decisive whether or not the innovation is perceived as better than the one it supersedes (ibid.). This thesis acknowledges the adjustments made by the crisis mappers to fit the needs of the traditional humanitarian and emergency actors, and particularly noteworthy is the crowdseeding method, having been described as a compromise between traditional assessment methods and the crowdsourcing method (van der Windt and Humphreys, 2013a; see also 6.2.1). At the same time however, it is not enough to seek ways to combine efforts that are both old and new if one is not also able to reflect this balance in the innovation message reaching the potential adopters. Below I discuss this as a challenge resulting from lack of knowledge about consequences (particularly long-term consequences) as well as from competing criticism from sceptics and doomsayers claiming that what the promoters are suggesting will fundamentally transform humanitarianism as we know it.

Dealing with uncertainty

As stated by Rogers (2003), there is a need for information to reduce the uncertainty created by the "newness" in innovation messages. The empirical data reveals access to information about short-term consequences, but not necessarily access to information about long-term consequences, which would entail overseeing and receiving feedback on projects over longer periods of time. Commenting on the challenge of diffusing for the purpose of long-term implementation and feedback, one of the informants stated that: *It is easy to get people to agree on doing a pilot, but then, incorporating and expanding that project to make it into a more long-term thing, that is something else" (CM4, CartONG)*

In the age of the Internet, innovators are able to reach their target groups and organisations with less money and less effort than what has been possible before the introduction of the web (Rogers, 2003). Describing the diffusion of the FrontlineSMS to the Philippines Red Cross, one informant advertised: *"they just downloaded the software and off they go, and that is really what we wanted to achieve" (CM1, FrontlineSMS).* At the same time however, while the internet might be suitable for a rapid launch of the innovation, there are also indicators of blockage to feedback, because the crisis mappers *"usually don't know about (adoption) and don't have the opportunity to have an opinion about it" (CM1, FrontlineSMS)* or because they *"do not monitor any of the communication" (CM3, Refugees United).*

Dealing with criticism and resistance to change

Uncertainty can result from lack of information, but also from mixed messages in the subjective evaluations of individuals and groups in the adopters' surroundings. The information received through interpersonal communication with peers and partnering organisations is often more decisive for the decision to adopt than general information and advertisement that appears in broadly accessed medias (Rogers, 2003). Similarly, the empirical data show that while many organisations express a general interest for crowd innovations and crisis maps, many *"still think of it as a new concept and they don't really trust it before they see it succeeding elsewhere" (CM6, MapKibera).* Additional findings also point to the perceived need of organisations to have their innovation decisions backed by peers. This suggests that diffusion efforts are unlikely to succeed unless they include the perspective of influential actors in the adopters' surroundings.

Rogers (2003) finds innovations to be both independent and interdependent. The challenge of interdepended innovations entails limitations to diffusion of one innovation that is somehow associated with another innovation with negative consequences (ibid.). Discussing this challenge with the informants, one of them said: *"Yes, large agencies can be sceptical especially of crowdsourcing but what we do is actually not crowdsourcing, so it's easier to trace back, so it might be more easy to trust" (CM5, Spatial Collective).* Moreover, the theory of the social construction of innovations suggests that one and the same innovation could be perceived as both an "unsafe machine" and a "macho machine" (see also 3.1.2). This "interpretive flexibility" could potentially explain why the newness of innovations can

contribute to spur both enthusiasm and apprehension about crisis-mapping artifacts and their implications.

Having been accused of fuelling a radical paradigm shift in which technology is enforcing new risks on the humanitarian sector and their beneficiaries (Duffield, 2013; Sandvik, 2013), the tech-communities are keen to reduce the radicalism in their innovation messages, while accentuating their enthusiasm for partnerships. One of the informants from the crisis-mapping community made it very clear that their aim is not at all to *"occupy a space that excludes other NGOs" (CM4, CartONG)*. Another informant described the role of the tech-promoters as merely working *"behind the scenes building the tools necessary to help those who work on the ground in humanitarian settings" (CM2, Ushahidi)*. At the same time, these efforts to reduce the radicalism in the innovation messages are nevertheless forced to compete with the opposing views of doomsayers and sceptics. According to Duffield (2013), the emerging tech-communities should be regarded as promoters of a daunting and inherently progressive cyber-humanitarianism. As he states, "While some may consider cyber-humanitarianism as offering incremental or additional tools for existing aid agencies, the logic of cyber-humanitarianism is that of a radical paradigm shift" (ibid, p. 23). This shift is described as mirroring a replacement of long-built trust and face-to-face communication with face-to-screen communication technology, "with the expectation that it will help surveillant-subjects adapt to a life of uncertainty" (ibid, p. 22). As a result, digitalisation could rationalise an increasing bunkerisation of humanitarian workers (e.g. in conflict settings or in a refugee camp context) and subsequently, an abandonment of help-seeking populations.

If left unanswered, this criticism could actually be enough to scare off potential organisational adopters, as they may feel apprehensive about the "new" threatening the "old". Knowing how to spread the positive message about the innovation, but also how to address and answer criticism, is therefore decisive in order to motivate adoption. Moreover, although technical prerequisites are not the main focus of this discussion, it is worth mentioning that OCHA (2013a) found the lack of ICT knowledge and capabilities to be a universal problem facing the humanitarian sector. In addition to competing criticism and resistance to change, this might also contribute to explain the limitations to diffusion of new technology.

6.1.3 Summary of discussion 1: Diffusion to individuals vs. to organisations

This section has addressed the potentials and challenges of either sidestepping or including the traditional response agencies in the diffusion of crowd innovations. While the first strategy could be useful for demonstrating the potentials in crowd-communication systems and for broadcasting the needs of beneficiaries, it does not offer a system that automatically responds to broadcasted needs. Two main factors were discussed in regard to this realisation: one was the need for information that meet the standards of the traditional humanitarian actors; the other was the disputed suggestion that the crowds can be fed information to make them less depended on external, professional help. The alternative – diffusion via traditional response organisations and their managers – has a greater potential to produce information that actually powers a more rapid and targeted response. However, for this to happen, the organisations must be convinced about adopting the tools to communicate with crowds. Again, two main factors or prerequisites were identified and discussed: one was the need for documentation and messages that address the complex needs and problems of the relevant agencies, short-term and long-term; the other emphasised the barriers created by the competing criticism of crowd innovations sceptics.

6.2 Crowd innovation implementation – potentials and challenges

This section discusses the third level in the three level diffusion model (see also 3.2.2), which is re-presented in a scaled-down version below:
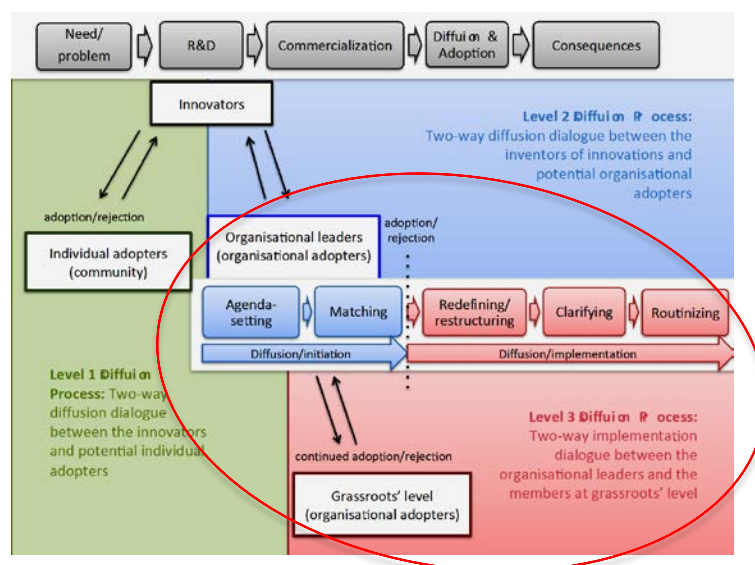

Figure 19 The Three Level Diffusion Model. Scaled-down version 2

In accordance with this model and the theory by Rogers (2003), a first role of the implementer is to set the agenda and match solutions to the organisations problem. Secondly, once the decision to adopt is made at the management level, the rest of the organisation, i.e. member staff and individual users at the grassroots level, must also be included in this decision. That, in turn, requires a two-way diffusion and implementation dialogue in what Rogers (2003) defines as the redefining/restructuring phase (6.2.2), the clarifying phase (6.2.3) and the routinising phase (6.2.4). In the following each phase will be discussed in terms of potentials and challenges, starting with the "agenda-setting and matching" phase (6.2.1).

6.2.1 Agenda-setting and matching

Agenda-setting refers to seeking out general organisation problems that may create a perceived need for innovation. This entails identifying needs, problems and issues in an organisation, and then, searching for compatible solutions in the organisation's environment (Rogers, 2003). *Matching* refers to the organisation's attempt to determine the feasibility of the innovation in solving the organisations problem (ibid.). Earlier (see especially 5.2.1), this thesis conveyed the basis for the URR-initiators decision to outsource some of their tasks to fulfil their need for increased connectivity and collaboration with the slum communities. In this section, the URR-initiative is compared to the method of crowdseeding (see also 5.1.7). But first, for a better understanding of this link, a general discussion is given on the benefits of crowdseeding and why this is a suited strategy for response organisations targeting hard-to-access areas.

As concluded in the above section, diffusion to and through organisations gives the organisational leaders an opportunity to make an informed choice on whether or not to adopt and innovation, and exactly which innovation to adopt. Two selection criteria that are often used are compatibility and relative advantages. *Compatibility* is defined as the degree to which an innovation is perceived as being consistent with the existing values, past experiences and needs of potential adopters. *Relative advantage* is the degree to which an innovation is perceived as better than the idea it supersedes, either in economic terms, in terms of social prestige, convenience or satisfaction. It does not matter whether an innovation has a great deal of objective advantage. What does matter is whether the user perceives it as advantageous according to the user's needs (Rogers, 2003). The choice between crowdsourcing and crowdseeding for example, is a decision about whether one is willing to accept information from random sources or if one is only willing to accept information from known sources. In a

report by van der Windt & Humphreys (2013b) it is stated that: "The *Voix des Kivus* project chose to use 'crowdseeding', i.e., it selected villages through random sampling and identified specific reporters in each village" (p. 48). Crowdseeding was found to offer not only representativeness, but also trust in information, as the reporters were incentivised to contribute truthful information. And, relative to crowdsourcing, it did not exclude certain vulnerable groups (ibid.). Crowdsourcing, on the other hand, is found to suitable for the introduction of systems "in which anyone with the interest and ability can send an SMS message to a central platform" (ibid., p. 48). SMS or digital information travels fast, and the advantage of large crowds is said to be the opportunity to cross-check information and the opportunity to have real-time updates on events (Zook et al., 2011; Veil et al., 2011; OCHA, 2013a).

Looking at the informants' accounts of the benefits of crowdsourcing as compared to traditional methods, the benefit of cross-verification was mentioned together with the opportunity for remote control and early warning. Commenting on a platform for online reporting to all 64 branches of the Kenya Red Cross, the IVolunteer, an informant stated that: *"The IVolunteer is for one helping us to get rapid information on what has happened and where, and two, it helps us to plan for response missions in remote areas where we do not have direct communication with the community" (ML3, KRC).* In addition, the IVolunteer has been seen as useful for taking pressure off Hotlines. Other benefits or areas of deployment mentioned were the creation of digital maps and for giving beneficiaries the chance to "tell their stories". The drawbacks, on the other hand, were said to be information overload, the risk of "dangerous information" and, as was also discussed in section 6.1.2, the limitations resulting from the so-called "digital divide".

Though some of these potentials and challenges could prove relevant also for instances of crowdseeding deployment, the fundamental difference between the two methods is the careful and targeted selection of information sources suggested by the crowdseeding method. Unlike crowdsourcing, crowdseeding entails outsourcing tasks to a specific agent (Aitamurto et al., 2011). For organisations facing limitations to access, these agents, or crowds, can function as the organisations' "extended arm" and "eyes on the ground". The organisation can train and instruct the crowds to report certain information, thus increasing the chances of receiving information according to the responders' goals and problems (van der Windt & Humphreys, 2010). In addition, information coming from known sources is more likely to be trusted than information from unidentified or random sources (ibid.; Seltzer & Mahmoudi, 2012). In

contrast, while "decision makers want to know who their stakeholders are … crowdsourcing does not necessary lend itself to making that known" (Seltzer & Mahmoudi, 2012, p. 14). Crowdseeding is moreover beneficial because it does not feed on the vulnerable situation of victims. The reporters are part of the target community, but their role as members of a crisis-affected population is not taken advantage of as the predominant or only motivation for reporting events. An informant expressed this mutual benefit as followed: *"Crowdseeding can be potentially much more useful in the sense that the actors providing the information is both credible and they are doing this because they have been asked to do it and not because they need help" (CM1, FrontlineSMS).*

Similar accounts can be found concerning the initiation of the URR-program; the initiator, the KRC, needed to get information to direct their efforts at emergencies in hard-to-access slum areas, and they needed credible and reliable sources that could stay with the project for a longer period of time (see also 5.2.1). The result, as displayed in figure 20, resembles a crowdseeding system:
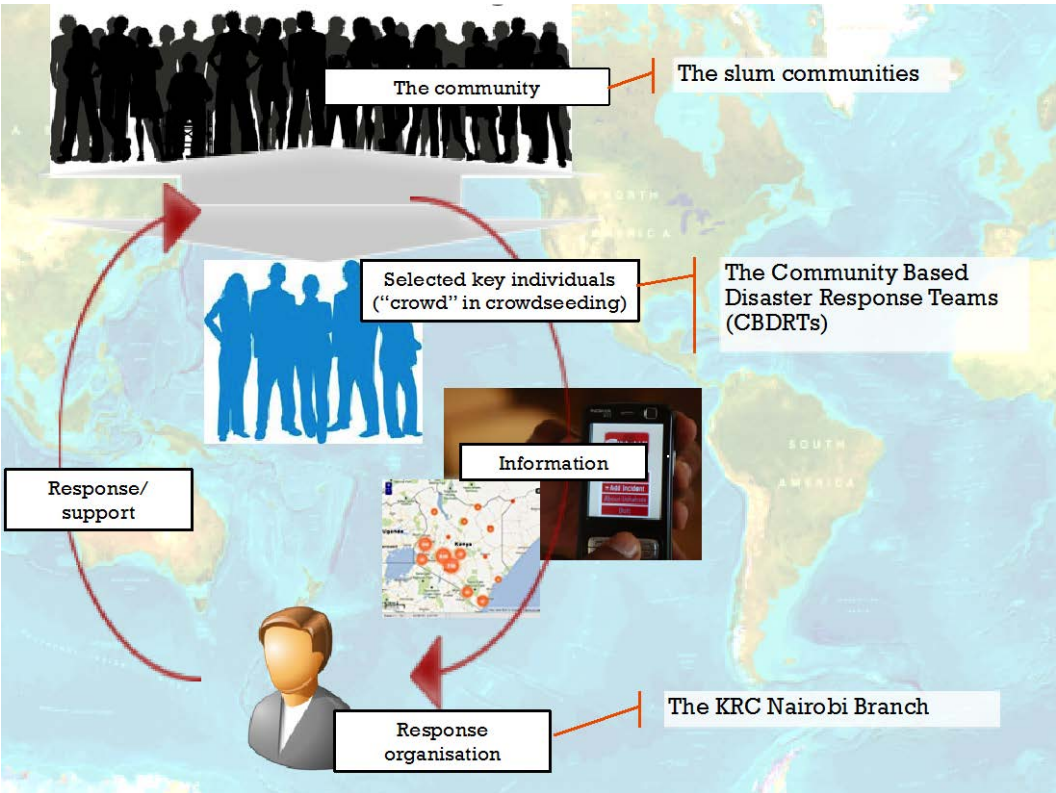

Figure 20 The URR-initiative: A crowdseeding-like structure

Analogous to the crowdseeding strategy, key individuals have been selected from a larger beneficiary *community* to serve as a *crowd* or team of reporters and the extended arm of some *organisation*. The organisation, in this case the *Kenya Red Cross Nairobi branch*, have prepared the pre-selected crowds for the next emergency by giving them the instructions, training and equipment necessary to partake in various operations. The crowd, in this case the *Community-Based Disaster Response Teams (CBDRTs)*, can request response or support in exchange for information and up-dates from the field. And, through this exchange, the *slum communities* can expect increased response time and a better service.

Effective matching is key to whether the new idea is sustained over time (Rogers, 2003). The challenge is of course being able to anticipate the implications of the innovation once it is implemented; many effects, and especially long-term effects, are unanticipated and difficult to measure (ibid.). In the Voix des Kivus-project, for instance, there was no actual proof of improvements made to benefit the community as the result of the crowdseeding efforts (van der Windt & Humphreys 2013a, 2013b). Likewise, there exists little documentation on the claimed benefits of crowdsourcing for increased efficiency in production and service delivery as compared to established methods and practices (Aitamurto et al, 2011). Relatedly, as the innovation process continues, the innovation is expected to change together with the adopting organisation (Rogers, 2003); the organisations members will seek to reinvent the technology to suit specific needs, and different members will give different interpretations of the innovation and what it could mean to them. What happens next, when meanings converge and the reinvented innovation becomes an on-going element in the organisations activities, is often unexpected and perhaps unwanted. In the next sections I will analyse these processes with regard to the URR-program, not for the sake of measuring effects, but for the sake of understanding *how* the implementation contributes to the reshaping of an innovation (and its implications).

6.2.2 Redefining/restructuring

Redefining/restructuring is defined as the process in which the innovation is adjusted to fit the workings of the adopting organisation (Rogers, 2003). In this section I discuss the role of recruitment and training in the implementation of the URR-program. These efforts have been pivotal in the KRC's establishment of the Community-Based Disaster Response Teams (CBDRTs) and in the later inclusion of those teams in responses targeting the informal

settlements. The selection of the participants for this program has been directed at individuals living in different locations within the targeted slum areas, and local leaders has been selected to serve as a link between the branch and the community level.

As part of the innovation process, the managers can use key personnel and leaders at the grassroots to aid the diffusion and implementation of a new system or innovation. In diffusion theory, the involvement of what is known as innovation champions and opinion leaders is seen as a precondition for the diffusion and implementation process to succeed (Rogers, 2003). From an outsourcing perspective, those "aides" (Rogers, 2003) or "super-users" (Aase, 2005) also play an important role in coordinating efforts between the supplier and the outsourcing organisation. In the case of the URR-initiative, the individuals selected to lead the community teams are highly motivated opinion leaders, who, after having been through a professionalisation process, have developed skills to also serve as super-users and active participants in the shaping of the initiative. Concerning coordination with external partners and the KRC, the chairman of each CBDRT is responsible for calling for back-up and making sure that all stakeholders involved are kept informed about the event and how it develops.

In previous sections (see also 6.1.1), the importance of building a common understanding between the providers and receivers of information has been emphasised as a key prerequisite for the creation and transferring of situation awareness. In outsourcing theory, it is found to often be a problem that many outsourcing organisations lack proper technological systems to support the exchange of information and support between the outsourcing organisations and their partners (Aase, 2005). While this will be further addressed in terms of hardware and software tools in later sections, the orgware aspect of technology, i.e. how it is managed and organised, is equally important (Brödner, 2005). Looking at the URR-case, the KRC has arranged for common training sessions together with the CBDRTs to facilitate apt communication and collaboration between the two stakeholders. One challenge however, is that the CBDRTs are lacking financial means and resources to partake in trainings located outside or far from where they normally operate. Trainings are also limited in the sense that they are largely focused on short-term achievements and responsibilities, and in some cases the result has been that the CBDRTs feel that they are lacking training in some of the tasks that they perform during actual events. Thus while the overall picture is continued trainings and professionalisation, there are still gaps to be filled, for instance when it comes to firefighting training (see also 6.2.3).

A general challenge related to training and professionalisation is that it might jeopardise the very heterophily-bridging function for which the para-professional aides are originally recruited (Rogers, 2003). As explained by Rogers (2003), if aides are turned into something that they are not or if they leave an impression of taking on the mask and the dress of professionals, the close ties between those individuals and their social peers could actually be destroyed. A potential benefit in this particular case might be that the KRC is widely acknowledged for being a reliable servant of the public, and so the fact that the CBDRTs are closely associated with the KRC is probably more a benefit than it is a problem in terms of trust from the surrounding populations. An example to demonstrate the benefits of the KRC's good name and reputation is found in the KRC's efforts to re-establish trust in the fire brigades, who used to have stones thrown at them when they entered the slum areas. As stated by one informant: *"We have actually been the link between the fire brigade and the community" (ML3, KRC).* Moreover, this underlying recognition and support is probably also important for the continued adoption and recruitment to sustain the program. An innovation that can find wide support among not only the organisation's members but also among their clients and partners, is more likely to be sustained than one that is perceived as being enforced upon people from external promoters (Rogers, 2003).

A common problem in outsourcing projects occurs when the project and its runner is not sensitive to how the outsourcing might affect the personal and professional lives of the individuals involved in the project (Aase, 2005). As chapter five uncovered (5.2.2), this effect might be positive for each individual volunteer receiving valuable training from the KRC. At the same time, this demonstrates the limitations in using training to boost motivation, as it is likely to lead to high turnover. At the branch level, members are offered an opportunity to apply for an internship after two years of volunteering, and many see volunteering as first and foremost an opportunity to improve their chances at the job-market. The way that recruitment is managed at the level of the CBDRTs, it might be suitable for covering the areas of responsibility, but also here, turnover is high and so there might be a need for additional motivational measures to maintain the crowds: *"we engage the youths who are not employed, which means, if this person gets employed somewhere, this person will automatically leave this team" (volunteer, CBDRT).* Looking at crisis-mapping projects in general, this seems to be a pattern across most projects, suggesting a need to rethink the way trainings are structured to prepare for a sustaining of such projects.

Often, the outsourcing organisations are more focused on how they can save time and money on outsourcing, and less on what is required on their part to facilitate those benefits, while the outsourcing partner is found to underestimate the complexity of the task it is asked to perform (Aase, 2005). Reinventions will and should be encouraged to originate from the bottom-up, but if instructions are not given on tasks designed to fit the information needs and outsourcing needs of the outsourcing organisation, the organisation may not receive the information that they need from their partners, and the outsourcing partners may be exposed to risks due to lack of instructions and training. Choosing the right people to aid this process, but also balancing the need for professionalisation with the need for widespread participation and support from the lower-status users and their surroundings, is obviously crucial at this stage.

6.2.3 Clarifying

Clarifying innovations is often a difficult task, and one that is often underrated. During the clarifying phase, the relationship between the organisation and the innovation is defined more clearly, so that the meaning of the new idea gradually becomes clearer to the organisation´s members. The managers can only partly control this process, and often the result is role confusion (Rogers, 2003; Aase, 2005). Overall, the KRC has succeeded in framing the response and information harvesting task of the CBDRTs and linking it together with other tasks such as prevention and mitigation. They have for example, invited the CBDRTs to meetings concerning illegal connections in the slums, which now has become a prioritised task of the CBDRTs in the areas included in this research. However, concerning the response task, role confusion and miscommunication is evident from the divergent practice when it comes to responding to larger fires. On paper, all stakeholders agree that larger fires necessitate a more influential response than what can be provided by the CBDRTs alone. An informant from the KRC asserted their role as followed: *"we wait for the first responders to respond first, and then, if the situation gets out of hand, we send our back-up team" (ML3, KRC)*. A CBDRT representative affirmed this division of labour: *"if there is very large incident, we will have to include them so that we combine" (CL4, Mathare)*. In practice however, this divide between large and small fires is not always that clear, or the teams will end up doing whatever they can to help, sometimes regardless of magnitude; as expressed by one informant: *"we are not trained to fight fires, we are just volunteers. But you know, we live here, so we have to participate, and I normally stay here. So I have to do what I can to help the community" (CL2, Blue Estate)*

In sum, while the KRC has managed to introduce new elements to the URR-initiative, there have also been limitations to the communication about what the initiative could or should mean to each of the stakeholders. Because meanings can take years or longer to converge, challenges are expected to occur as the result of different interpretations. But, while it might be easy to accept this as a scientific fact, its implications may not be as easy to accept. As shown in the URR-case, poor management at the clarifying stage is not only a peril to the innovation process; moreover, it is a peril to the subjects and potential users of the innovation: The gap in meanings about the responsibilities in responding to larger fires seem to have increased as a consequence of miscommunication between the CBDRTs and the KRC over some time. There are signs of this gap being addressed through the introduction of community fire stations (see also 5.2.3). If, on the other hand, this gap had not been addressed, one could easily end up with the CBDRTs being exposed to unacceptable danger. Thus, seeking out solutions to address a broad set of implications of a new system or innovation could ultimately mean the difference of life and death, and although a time- and resource-consuming task for the technology organisations, this should not be underrated as an important element in the diffusion and implementation process.

6.2.4 Routinising

In routinising, the innovation becomes an on-going element in the organisation´s activities, and loses its identity or "newness". A closely related concept to routinising is "sustainability", defined as the degree to which an innovation continues to be used after the initial effort to secure adoption is completed (Rogers, 2003). Another closely related concept is that of "closure" (Bijker, 2009). "Closure" (Bijker, 2009) or "sustainability" (Rogers, 2003) is more likely if widespread participation has occurred in the innovation process, if reinvention has taken place and if an innovation champion was involved (Rogers, 2003). In the case of the URR-initiative, a key explanation to why the URR-initiative has succeeded more in some slum areas than in others is said to be *local leadership*. Regarding the aims of the initiative, the adjustments in the *redefining/restructuring* phase have resulted in gradual expansions of the program and of the CBDRTs' responsibilities. This in turn, has required increased *participation* from the CBDRTs in determining the future of the program and how it should be managed. Appropriately, such participation or ownership is actively sought and encouraged by the initiators at the KRC.

According to the URR-initiators, the CBDRTs proved their independence during the transition period in 2012-2013, when they continued with their activities despite the deactivation of the

formal collaboration with the KRC. At the same time, there are also challenges and work to be done before this independence can be fully achieved. Financially, the CBDRTs are still highly dependent on the support from the KRC, at least in the eyes of most outside partners and donors. Moreover, although both the KRC and the CBDRTs are trying to change this attitude or view in order to convince external donors to support the CBDRTs as individual units, they seem to be up against a difficult task. From the viewpoint of the KRC: *"we emphasise to other stakeholders that we are only facilitating ... and that any donation that you (the other stakeholders) might have is welcomed" (ML3, KRC).* From the viewpoint of one external or "other" stakeholder: *"Red Cross is capable, they have the resources to provide them with whatever they need, because these units are under the Red Cross" (ML5, NYS)*

From an organisational perspective, another ownership challenge was demonstrated through a donation and launching of sirens given to the CBDRTs in the preparing for the rain season of 2014. What motivated this donation was the need to strengthen the capabilities of the CBDRTs and their own systems for communicating hazards to their surroundings. Unfortunately, the miscommunication between the KRC and CBDRTs hampered the realisation of these benefits, at least for the Mathare Safety unit. While the team in Blue Estate was starting to prepare for the launching of the siren right away, the team in Mathare waited for the official permission to start using it from the KRC. The KRC had informed the units that they were planning for an official launch some weeks after the units had received the sirens, but they did not intend this message to be interpreted the way it was by the team in Mathare. They saw it as the independent choice and responsibility of the CBDRTs to decide when they wanted to start using it and how. Yet, as this misunderstanding shows, independence was clearly misjudged, and so it could suggest that it is still a challenge that needs to be addressed more generally.

Towards the end of the innovation process, the role of the change agent typically shifts from giving and receiving messages about the innovation into changing the position of the adopter from one of reliance upon the change agents to one of self-reliance (Rogers, 2003). This pulling out however, must be timed so that it does not destroy the potential for a thorough evaluation on impacts, and efforts should also be directed at increasing the evaluative ability of the adopters (ibid.). In the case of the URR-initiative, steps have been taken to allow the CBDRTs to sell information to external partners and thus claiming at least the legal or formal right to this information. What is lacking however, is the ability of the CBDRTs to take charge of the information management and learn from evaluations. Not least, if the CBDRTs are to become

independent units, they will need to have their own systems of communication and information management. Today, only one unit has a computer and although much information is shared between the KRC and the CDRTs (and this will probably continue), a CBDRT informant reported insufficient visibility into how exactly the information that they give, feed back into the program.

Looking at what can be learned from the efforts of crisis-mapping technologists, it has previously been described how they are looking for ways to make technology available to those most digitally disadvantaged. Although the crisis mappers may fall short of overcoming the digital divide, their drive to do so is nevertheless thought-provoking and inspirational. In the KRC hierarchy, digitalisation had not yet reached the level of the slum units, and so the KRC should consider ways to speed up this process. On a positive note, an informant from the central IT-department assuredly stated that even though *"access to... [digital] technology and even firefighting equipment and all that, ... are things that cost a lot of money, ... time and ... training, ... we are on a journey with them and we will not let go"* (Management Level Informant 2, KRC).

Routinising an innovation is about making it an on-going element in the organisation´s activities, and thus facilitating a continued use of this innovation throughout the organisation (Rogers, 2003). Overall, the participation of the CBDRTs in activities of the KRC have spurred the routinising of the URR-initiative and made it a realistic goal that the CBDRTs could act as independent units and first responders to incidents in the slums. Yet, before this can happen, the close collaboration and dialogue needs to continue to address challenges to both financial and organisational independence. Also, enthusiasm for independence should not overshadow the need to ensure the evaluative ability of the CBDRTs, and in that case, the crisis mappers strive towards increased visibility and access to communication tools for disadvantaged populations could potentially serve as inspiration. However, what these resources do not do, is determining the future of these units, which again points to the crucial role of the implementing organisation to manage and organise the innovation process.

6.2.5 Summary of discussion 2: Implementation of crowd innovations

Summing up the implementation of the URR-iniaitive, this section has discussed challenges and potentials in setting the organisations agenda and matching solutions to this agenda, which

entails anticipating not only the advantages and direct implications of an innovation project, but also long-term implications and unwanted effects. In addition, this section has discussed challenges and potentials in organising the innovation and re-presenting it to all the members of the organisation. At this stage the organisation itself will have to change. In the URR-case, the establishment of the CBDRTs has required a careful selection of individuals from the slum communities to serve as team members and leaders. Professionalisation has additionally contributed to the outsourcing of tasks to those teams. Moreover, the section addressed the challenges and potentials in the clarification of the innovation. It paid particular interest to the miscommunication about the CBDRTs' role in fighting larger fires. In the discussion concerning routinising, factors related to making the end-users independent of the change agents were identified, including local leadership, efforts to obtain external donations, and efforts to prove organisational autonomy. At the same time, the need for independence and rapid closure was balanced against the need for a responsible outsourcing and for enhancing the CBDRTs' evaluative ability. The findings suggest that the implementation of the URR-program will continue until a broad evaluation that includes all relevant stakeholders concludes that the CBDRTs are ready to act as self-sustaining units.

7.0 Conclusions

In this chapter I conclude on the findings discussed throughout this thesis, bringing together all the elements found to be of relevance to the posed research problem and operational research questions. Each operational research question will be replied separately, and together they provide an answer to the overall research problem, which reads: *What are the key challenges and potentials in the diffusion and implementation of crowd innovations for emergency response agencies serving hard-to-access slum populations in Nairobi, Kenya?* Additionally, at the end of this chapter, I suggest some themes for further research, including both the predominant and the more peripheral themes of this thesis. But first, following are the two operational questions and their respective answers:

What are the key challenges and potentials in the crisis mappers' diffusion of crowd innovations to and through organisations (as compared to direct diffusion to individuals)?

Building on the theoretical framework by recent diffusion and implementation theorists, and particularly the innovation models by Rogers (2003), this thesis suggests two channels through which crowd innovations spread, that is, either through diffusion to individual adopters or through diffusion to organisations. The potentials in the first channel or level of diffusion are reflected in the opportunity to build a crowd to produce information of relevance to emergency and humanitarian decision-making. The diffusion and deployment of crowd innovations happens more or less independently of the organisations demand for these innovations. However, for this to generate a more rapid and targeted response, one must assume that large-scale responders would feel obliged to respond to any emergency-related information regardless of the source. Alternatively, one would have to assume that the traditional response could somehow find a suitable substitute, for instance in those who are already at the scene reporting information. The findings presented above, on the other hand, signals underlying scepticism among large-scale and traditional responders when it comes to responding to externally generated information from random or unknown reporters. And, concerning the suggestion that crowds should access information to become more self-determined and resilient, one noticeable limitation to this suggestion is found to be the digital divide. Moreover, while there is the possibility of individual adoption to create a demand from the bottom-up for the adoption of

crowd innovations by relevant emergency organisations, there is also the risk that this demand is left unanswered.

Concerning the level 2 diffusion, a central argument presented above is that organisational adoption and implementation, despite its complexity and barriers, is nevertheless crucial to the realisation of the crowd innovations' potential for aiding a more targeted and timely emergency response. Being a new innovation, the promotion of crowd innovations is expected to spur widespread interest and curiosity, but also uncertainty about how a decision to adopt will affect the organisations and their performance in the future. In the crisis mappers' diffusion, uncertainty is noticeable from the lack of information and feedback from early adopters. Fuelling this uncertainty is also scepticism and criticism from doomsayers claiming that the crisis mappers' suggestions are overtly radical and directly unhelpful for the humanitarian sector. Another issue is technical capabilities and knowledge about how to adapt to new forms of communication and bottom-up decision making, which is overall found to be lacking among the traditional aid and emergency organisations. This in turn, demonstrates the need for a closer collaboration between the tech-communities and the traditional organisations to prepare for a converging of ideas and systems. Such joined processes could take time, but without the full-fledged adoption by these agencies, previous research on diffusion and emergency management indicate that responders are unlikely to turn to systems other than their own when seeking information to make vital decisions.

What have been the key challenges and potentials in the KRC's implementation of the URR-program (a crowdseeding-like initiative)?

Regarding implementation, a central objective of this thesis has been to study what happens after the launching of the crowd innovations, with particular focus on crowdseeding. In the URR-case, the implementation process revealed new potentials and challenges resulting from the organisational changes and continuous adjustments in level 3 diffusion (diffusion *within* organisations). The URR-initiative shows that crowds do not simply arise from the ashes of an emergency. However, through the careful selection and building of a crowd to serve as the responders extended arm or eyes on the ground during emergency events, great results could be achieved; not only has the URR-initiative contributed to increase connectivity and exchange of information and knowledge between the KRC and the CBDRTs, but it has also shown that additional tasks can be outsourced to para-professionals to further streamline and speed up

response. The KRC has managed to work together with the CBDRTs to facilitate this outsourcing process, making sure that the outsourcing is done in a way that is both responsible and sustainable.

Despite this being in many ways a success-story, there have also been challenges along the way, and there are still some unresolved issues that need to be addressed. First, concerning the initiation, a great challenge is obviously anticipating the future needs and problems that the innovation will face once it is implemented. Second, the continuous reinvention or expansion of the tasks outsourced to the CBDRTs has required additional training and support, but the trainings suffer from at least two limitations: 1) the CBDRTs are lacking means to participate in trainings located outside their respective areas, and 2) the trainings are more focused on short-term achievements and responsibilities, and less on learning how to manage the teams to prepare for future independence. Third, the professionalisation also suffers from high turnover, which again could lead to difficulties in building long-term capacities. At the same time, although not an apparent problem today, the need for professionalisation of the CBDRTs should not overshadow the need for safety credibility, or widespread trust from the local communities. Fourth, there is a need for further clarification regarding the CBDRTs' role in responding to larger fires. Fifth, although the routinising of the URR-initiative has been fuelled by the mutual goal of making the CBDRTs more independent of the KRC, the CBDRTs are still highly dependent on the financial support from the KRC, and another ownership challenge was demonstrated through the launching of sirens for early warning of floods or other hazards. The launch was supposed to be the independent choice of each slum unit, but this independence was partly misjudged. Sixth, insufficient visibility into the information management of the URR-program and lack of access to advanced communication tools limits the CBDRTs' evaluative ability, and thus their independence.

Altogether, the potentials and challenges in the URR-initiative suggest valuable lessons for the implementation of crowd innovations (particularly crowdseeding). Most importantly, the high involvement of the Kenya Red Cross managers throughout the implementation period has allowed for corrective actions to guide this process. For more than seven years, the KRC has followed the URR-project and maintained a close dialogue with their slum counterparts.

Further research

The findings suggest several overlapping challenges that occur at the various levels of diffusion. These include, for example, insufficient capabilities (lack of technical skills, training, equipment etc.), mistrust in crowd-generated data and lack of knowledge about long-term consequences of adopting crowd innovations. At the same time, early involvement of well-established organisational adopters could potentially power corrective actions to overcome such challenges. By customising the crowd innovations according to the needs of influential response agencies, more organisations are likely to adopt and trust these systems, and more beneficiaries are likely to receive the help that they need. Moreover, in order to detect changes that develop over time, one needs projects and leaders with a long-term perspective. By having committed organisations and leaders to supervise the implementation process, crowds can be built with guidance and support.

Similarly, research should also adopt a long-term perspective. To grasp the entire innovation process, projects must aim to study implementation over longer periods of time. Additionally, while most previous research has studied crowdsourcing directly from individual reporters without going via diffusion to response organisations and their leaders, future research should to a larger extent address aspects of involving organisational adopters at an earlier stage in the innovation process. There are also unanswered questions concerning crowdseeding and the potential for deploying crowdseeding as an outsourcing tool. Moreover, crowd innovations processes should be studied in different contexts. This could include comparisons of conflict environments against natural disasters contexts. Another interesting comparison could be to assess the similarities and differences in deploying crowd innovations in a slum setting as compared to a refugee camp setting.

Lastly, while this thesis has not addressed the ethical and normative implications of high-tech equipment for remote monitoring and subject surveillance, this is certainly an issue in need of more research and deliberation. Understandably, as most tech-specialists are concerned with exhausting the potentials in technological solutions as they develop, these solutions may not always reflect the needs and concerns of humanitarian and emergency actors. An important question is thus how the traditional response agencies will adapt to this new reality. At the same time, as assumed throughout this thesis, those actors play a decisive role as mangers of humanitarian technology, and should continue to do so in the future.

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Appendix 1: List of informants

No.	Category	Organisation/description
1	Crisis Mapper, informant 1 (CM1)	FrontlineSMS
2	Crisis Mapper, informant 2 (CM2)	Ushahidi
3	Crisis Mapper, informant 3 (CM3)	Refugees United
4	Crisis Mapper, informant 4 (CM4)	CartONG
5	Crisis Mapper, informant 5 (CM5)	Spatial Collective
6	Crisis Mapper, informant 6 (CM6)	MapKibera
7	Crisis Mapper, informant 7 (CM7)	KRC/UN
8	Crisis Mapper, informant 8 (CM8)	Mathare/UNESCO
9	Management Level, informant 1 (ML1)	KRC, HQ
10	Management Level, informant 2 (ML2)	KRC, HQ
11	Management Level, informant 3 (ML3)	KRC Nairobi branch
12	Management Level, informant 4 (ML4)	KRC Nairobi branch
13	Management Level, informant 5 (ML5)	Other (NYS)
14	Management Level, informant 6 (ML6)	Other (MSF)
15	Management Level, informant 7 (ML7)	Other (ICRC)
16	Management Level, informant 8 (ML8)	Other (UNESCO)
17	Community Level, informant 1 (CL1)	Blue Estate
18	Community Level, informant 2 (CL2)	Blue Estate
19	Community Level, informant 3 (CL3)	Blue Estate
20	Community Level, informant 4 (CL4)	Mathare
21	Community Level, informant 5 (CL5)	Mathare

Appendix 2: Interview guide

<u>BACKGROUND INFORMATION</u>

- Name
- Organisation
- Position
- Main task of organisation

<u>COMMUNITY-GENERATED DATA</u>

1. In what ways does your organisation benefit from community-generated data? In the specific case of (organisation/program), what is the end-goal of volunteered data collection? (Response activation, additional information, response activation from partnering organisation, empowerment/resilience)
2. What types of data are you interested in getting from the community? Why is that information important?

<u>GEOGRAPHICAL DATA</u>

3. Concerning location data, do you and your organisation work with geographical data? If yes, how?
4. Why is it important for humanitarian responders and decision-makers to have precise data on location?

<u>DATA COLLECTION CHANNELS/TECHNOLOGIES/STRATEGIES</u>

5. How are data normally collected? Do you use social media platforms? Mobile phone technology? Do you use crowdsourcing or crowdseeding?
6. And also, how is that information handled? What are the initial next steps you take to respond to the information?
7. From your experience, how has the spread of mobile phones and new technologies helped in the process of including local capacities in humanitarian efforts and assessment work?
8. Compared to the more formal or traditional ways of gathering information about needs, what are the main *challenges* of using digital technology together with non-professional personnel for conducting needs assessments?

9. How do you proceed to filter and verify the information? Is this process different when dealing with community-generated data than when receiving information from more traditional channels and partners?
10. What are the main challenges related to the verification process?

PARTICIPATION/MOTIVATION/TRAINING/TRUST

11. In the completed project/program, to what extent did the volunteers make individual judgements concerning data relevance and/or quality? Were they given instructions on what to look for and what to leave out?
12. In situations where you engage community members, do you normally offer money or any kind of payment to the volunteers? If they are not offered payments of any kind, what is then the motive of ordinary citizens or non-professional volunteers to contribute to this and other data collection projects?
13. What about training, are they given training? And if so, what kind of training?
14. From your point of view, what makes someone a trusted source? Are there any circumstances under which you would rely on information from anonymous sources? Would you say that training is a precondition for volunteered data becoming trustworthy and relevant for humanitarian organisations to use?
15. Can the local community participants themselves access the data? Why have you chosen an open source solution? Or: Why have you chosen to restrict the access?

FUTURE VISION

16. What do you think will be the role of digital and crisis mapping technologies in the future?

ORGANISATION-SPECIFIC QUESTIONS

Examples: Crisis mapping organisation (MapKibera)

- Why in your opinion is the MapKibera and the Voice of Kibera website useful sources of information for relevant stakeholders?
- So, would you agree with the quote from the World Bank report on the MapKibera initiative saying, "maps have the ability to tell a story that becomes very compelling and hard to argue with"?
- In your experience, are the traditional humanitarian sector open or reluctant to the idea of community-generated assessments/collaborative mapping?
- What are the main challenges facing the project and other projects targeting the Nairobi informal settlements?
- Etc.

Examples: Management level (KRC, HQ level)

- It was mentioned at the ICCM in November that the KRC are hoping to establish a digital response team. What has happened since November?
- Could you please explain why it is important for the KRC to have its own digital response team? Not having the digital response team in place, would you call that a main limitation to making full use of community-generated data?
- You have 900,000 followers on Facebook and 300,000 on Twitter. How many of those users are in fact contributing information?
- During the Westgate-incident, 10 per cent of all tweets posted related to that event were found by Meier and colleagues to be "dangerous tweets". During that event, did you ever experience receiving information with "dangerous" content or content that threatened the KRC's operation?
- Concerning the URR-initiative, would you say that it has contributed to solve the problem of access to the informal settlements? What were the main purposes of this program? What has been achieved, and what remains to be done before the initiative is closed?
- Etc.

Examples: Community level (CBDRT members)

- What are the main threats that you as a community response unit face in the slums? How do you normally respond to those threats?
- Who would you say are the most important contributors to the emergency response work in your area?
- How has the URR-initiative served the inhabitants living here?
- How do you recruit new members to the CBDRTs? What motivates you to partake in this program?
- Have you received training from the KRC? If yes, what kind of training? Would you like more training? If yes, what kind of training?
- How do you communicate with the KRC? During an emergency, who would be the first person or organisation that you contact? At what time would you call the KRC? What would be the purpose of that call?
- Other sources have told me that Mathare and Blue Estate are among the most successful teams in the program, would you agree? What explains this success?
- Do you view your team as independent or dependent of the KRC? Explain.
- The URR-initiative is supposed to close in about 2-3 years. How do you envision the future of this team? What will be the main task or challenge in the next 2-3 years? And after that?
- Etc.