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MOBILE TECHNOLOGY IN COMPLEX EMERGENCIES:

A study of digital data collection in the Norwegian NGO relief sector



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Abstract

This thesis presents a study of digital data collection amongst the five largest humanitarian relief organizations in Norway – with data from each actor. More specially, it examines the *potentials and challenges in the implementation and diffusion of mobile technologies for the Norwegian NGO relief sector*. The term mobile technology is used to describe the various mobile devices used for data collection including mobile phones, tablet computers, laptop computers, and so on. Within the confines of this study, social media was largely excluded.

In this thesis, an integrated diffusion/implementation model is presented and applied in the analysis of how mobile technology spread (diffusion) and are applied (implementation). Integrated into this model, are components of sensemaking (ambiguity & uncertainty) and different images of decision making in relief work. The purpose of this model is to explore and highlight the uses and experiences of mobile technology for data collection amongst the different organizations in presenting the matters of diffusion and implementation.

The findings suggest that mobile technology is a recognized humanitarian innovation that is diffusing within the Norwegian relief sector. Data collection is becoming faster, cheaper, more efficient, and is providing higher quality data with better oversight. At the same time, with the ease of data collection presents the challenges of data overload, competing solutions, administrative constraints and making sense of the data that is collected.

In conjunction with these findings, the thesis concludes that mobile technology is improving the efficiency for collecting information but is not a solution that is effective in all situations and all places.

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Abbreviations

ALNAP	Active Learning Network for Accountability and Performance in Humanitarian Action
CCCM	Camp Coordination and Camp Management
DC4IDP	Data Center for Internally Displaced Persons
DTM	Displacement Tracking Matrix
ETC	Emergency Telecommunication Cluster
GIS	Geographic Information Systems
HDE	Humanitarian Data Exchange
IASC	Inter-Agency Standing Committee
ICT	Information Communication Technology
IDP	Internally Displaced Persons
IFRC	International Federation of Red Cross & Red Crescent Societies
IOM	International Organization for Migration
ITU	International Telecom Union
MDC	Mobile Data Collection
MDCS	Mobile Data Collection Systems
NCA	Norwegian Church Aid
NGO	Non-Governmental Organization
NOMAD	Humanitarian Operations Mobile Acquisition of Data
NPA	Norwegian Peoples Aid
NRC	Norwegian Refugee Council
OCHA	Office for the Coordination of Humanitarian Affairs
PDA	Personal Digital Assistant
STC	Save the Children
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Programme
UNHCR	United Nations High Commissioner for Refugees
WFP	World Food Program

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“Mobile technologies are opening new channels of communication between people and governments, potentially offering greater access to public information and basic services to all. No other technology has been in the hands of so many people in so many countries in such a short period of time” (UN Development Programme, 2012).

1.0 Introduction

Chaos and disorder often characterize complex emergencies and create multidimensional complications for humanitarian relief organizations trying to provide assistance (Sharp, 2012). A major challenge for these relief organizations is a lack of reliable information, as well as the inability to ‘make sense’ within a complex emergency (Maxwell, et. al, 2011). Complicating matters, there has been a discrepancy between formal organizational humanitarian decision making and actual decision making in practice – meaning a lack of knowledge for decision makers and a lack of authority for those with knowledge (Dekker and Suparamaniam, 2005). Better data collection during the time of emergency is a critical tool to help close the gap between authority and action. The primary function of data collection is to gain insight into the crisis situation, the needs of those affected, which allows for a more timely and effective humanitarian response for humanitarian decision makers. Traditionally, data collection has been completed by pen and paper (Selankikio et al, 2002). However, over the past decade many humanitarian relief organizations have started incorporating mobile technology for data collection into their practices changing the future course of humanitarian relief.

To understand how new technology is changing the humanitarian response to emergencies, it is helpful to revisit the progression of technology of the past decades. ‘Modern’ mobile technology in the humanitarian sector can be traced back to the late 1970s with the introduction of the mobile phone and more recently to the 1990s with the introduction of the laptop computer and (WDR, 2013). For the first time, laptop computers and mobile phones allowed for personal computing functions and telephone communication could be used outside the office and be brought into ‘the field’ (Selanikio et. al, 2002). Telephone communication, data entry, data

analysis, and word processing and all of the other advantages of personal computing could be done nearly anywhere with the use of these tools (Ibid., 2002).

Early technology had certain limitations in their mobility - laptops require a considerable financial expense, and a regular power supply. Therefore, these limitations made laptops impractical in much of the developing world, and especially in the event of a disaster or complex emergency. In addition, laptop adoption was never realized amongst rural or disaster-disrupted areas of the developing world (Ibid., 2002). The early adoption of the mobile phone was plagued by similar challenges and the added challenge of nascent infrastructure - especially across rural and developing parts of the world.

Beginning in the 21st century, there has been little precedent in history for the rapid diffusion of mobile technologies on a global scale (UNDP, 2012). Fueled by diffusion of cheap mobile phones, mobile technology adoption experienced explosive growth among personal users and organizational users around the world - especially across the developing world (Nickerson et. al and Save the Children). Basic mobile phones, smartphones and tablet computers are found everywhere, and the use of apps on smartphones and tablets has become widespread. The adoption has happened so quickly that according to a report published by the UN University in 2010, more people in India have access to a cell phone than a toilet and good sanitation (UNU-IWEH 2010).

The rapid development and adoption of mobile technology has brought forth a “technological innovation” that has reconfigured the landscape of institutional and public communication structures (IRGC, 2012). These innovations have spawned new methods and mediums in which international humanitarian organizations can collect, disseminate, share, and provide information to affected populations in a crisis situation (Veil et. al). Furthermore, some of these mobile technologies can also be utilized by affected populations in an emergency to communicate amongst themselves, as well as with these humanitarian organizations on the ground. These new tools can be used in a multitude of ways depending upon the needs of those affected in an emergency situation and the organization itself.

The diffusion of mobile technologies and their varied potentials have also spread to humanitarian organizations. Mobile technology can play a strategic role in the delivery of rapid, cost-effective, and scalable humanitarian assistance (Save the Children, 2002). Mobile technologies can be used and implemented for a multitude of varied tasks ranging from mobile data collection to mobile cash transfers. Voice communication almost seems secondary to everything that can be done on a mobile device (Nickerson et. al, 2014).

There are also many limitations and challenges in the dissemination of mobile technology to be considered as well. Some of these organizational limitations include dependence upon functioning infrastructure (mobile networks and power), financial considerations, as well as the capacity to understand and respond to the data collected. The potentials and limitations of the diffusion and implementation of mobile technology within the international emergency work and crisis management of the Norwegian relief NGO community¹ will form the foundation of my thesis.

1.1 Objectives

The overall aim of this research is to examine how the diffusion of mobile technology within the Norwegian NGO relief sector has influenced the crisis management of complex emergencies in the context of data collection in the field. It has been acknowledged that data collection has often been a weak point in the work of humanitarian organizations (WDR 2013, pg. 208). Data collection, both passive and active, has been simplified and made cheaper through the use of mobile connectivity, social networks, and accessible technology. The overall aim of this research is to examine how the diffusion and implementation of mobile technology within the Norwegian NGO relief sector has influenced the crisis management of complex emergencies within the context of field data collection.

In fulfilling this objective I will explore how the international humanitarian sector is adapting their data collection methods and systems within our rapidly evolving digital age. As

¹ I will define major Norwegian relief agencies as Red Cross, Norwegian Refugee Council (NRC), Norwegian Peoples Aid (NPA), Norwegian Church Aid (NCA), and Redd Barna (Save the Children).

people around the world are becoming increasingly digitally interconnected, there are many questions to be asked with respect to the international humanitarian sector's adaptation. My aim is to look deeper to see how data from these technologies is collected, analyzed, and see what kind of problems the humanitarian sector is looking to address with these tools.

1.2 Research problem and operational research questions

The Norwegian NGO relief agencies have different functions within humanitarian work but adhere to a general set of principles and rights: the right to life with dignity, the right to receive humanitarian assistance, and the right to security and to protection (The Sphere Project, 2011). In complementing this set of universal principles with mobile technology, Justin Forsyth, Chief Executive of Save the Children UK writes, "mobile technology can become a core tool in effective emergency response, and by collaborating with mobile network operators, governments, and other NGOs we could achieve so much more." (The Save the Children Fund, 2012)

With the relationship of mobile technology within the Norwegian relief sector as a foundation, the following research problem will be addressed:

What are the key potentials and challenges in the implementation and diffusion of mobile technologies for the Norwegian NGO relief sector?

In the effort to answer this question - I will explore following sub-questions:

- 1) *What are the uses for mobile technology amongst the different actors?*
- 2) *What have been the experiences of mobile technology in the organization's work?*

1.3 Limitations

The application of mobile technology in the humanitarian relief sector is a rather broad topic. To narrow the scope of the subject matter, I will focus on the technologies categorized by

data collection, and the systems used. Mobile data collection (MDC) are the methods of structured data gathering with the use of mobile devices such as smartphones, tablets, and PDAs (Jung, 2011). Mobile data collection systems (MDCS) are the applications or technological means of collecting data on smartphones or tablets.

The aim is not to offer an all-encompassing discussion on factors determining diffusion and implementation of mobile technologies across the international humanitarian sector, but to examine some of the main potentials and challenges that the Norwegian relief community is experiencing (Åsveen, 2014). Therefore, the primary limitations will concern ‘mobile technology’ and the scope of its use in the international humanitarian community. Both of these topics are unmanageable together in this exercise without some limitations.

The term ‘mobile technology’ in the humanitarian context can be quite cumbersome and might refer to a number of different uses within international relief work. Some of these divergent tasks can include mobile cash vouchers, resource and commodity management, and various social media functions to name just a few (WDR, 2013). For this thesis, mobile technology will be limited within the realm of mobile data collection performed by Norwegian relief agencies in an international context. However, other functions of mobile technology are discussed within several sections of this research.

The international relief community involves too many actors with different agendas and mandates - including the mobile technologies used. Therefore, it is unrealistic to offer an all-encompassing discussion on relationship of mobile technology with the international humanitarian sector. The focus of this thesis will be placed on the major relief agencies. However, it is important to explore at the surface level what kind of technologies are being used across the United Nations system.

1.4 Related Studies

The diffusion and implementation of mobile technology within the humanitarian field is a relatively new phenomenon as reflected in the lack of literature. However, a number of papers have been written about the diffusion of mobile technologies in other contexts. There has been some research on diffusion of mobile technology in related industries, such as healthcare (Burley

et al.) Some research has examined the diffusion of mobile technology in general (Liang et al. 2007). Other research has looked at the diffusion of specific mobile devices such as mobile phones (Kauffman and Techatassanasoontorn 2005; Doong and Ku 2002) or communications technology (Boholina and Koutroumpis 2010).

The importance of crisis communication within crisis management has been firmly established in academia well before the advent of new humanitarian information communication technologies and tools (Åsveen thesis 2015: Winsor, 1988; Comfort, 1993; Coombs, 1995; Quarantelli, 1997). Given the breadth of crisis management, these studies have explored the role of crisis communication at different stages. Some studies look at the role of communication before the onset of a crisis (Winsor, 1988), and others focus on the response stage and associated aspects (Coombs, 1995). This thesis will focus on the later, the response state and associated aspects.

Moreover, the Norwegian Peace Research Institute of Oslo (PRIO) has explored the challenges of the humanitarian principles brought forth by some of the technological innovations (Sandvik, 2013 & 2014). *The World Disaster Report 2013* by the International Federation of Red Cross and Red Crescent Societies (IFRC) provides a full spectrum of potentials and challenges that technology plays within the humanitarian sector. In addition, reports from the UNDP *Mobile Technologies and Empowerment* and UN OCHA's *Technology and the Future of Humanitarian Action* have contributed to furthering the discussion within the international humanitarian community.

The collaboration between commercial logistics providers and humanitarian organizations are documented (Heart to Heart International 2012, International Federation of Red Cross and Red Crescent Societies, 2004). Ergun, O., et al. (2014) examines the 'technology-enabled improvement' in distribution and data management for internally displaced people (IDP) camps in Haiti in conjunction with costs and benefits of coordination. They look at multi-agency coordination in the humanitarian sector by the use of an IT tool but also provide gainful insight into the early implementation of technology into the humanitarian sector.

There is considerable ongoing research regarding the relationship of mobile technology and the international humanitarian sector in various capacities. Some of these research projects have a more a technical approach while others are have a more qualitative approach. The Qatar Computing Research Institute have a sector entitled *Social Innovation* that has a focus on improving humanitarian relief efforts through technological advancement. Many of these projects include a collaboration with UN agencies but primarily focus on aggregated or crowdsourced data from social media sources.

2.0 Context

The term ‘mobile technology’ is a slippery one and not easily definable. For the purpose of this thesis, the definition will be kept at face value and rather simple - personal, portable, and wirelessly networked technologies (Strategic Growth Strategies, 2015). Within this scope, mobile technology can include any number of mobile devices including mobile phones, laptop computers, tablet computers, and so on. Also included within the scope of mobile technologies are social media platforms and software applications or “apps” that function on these devices. However, the context will be narrowed down to digital data collection.

2.1 Situational Use for Mobile Technology

“Data is the basis of efficient coordination because it not only gives us a clear picture of what is happening in a specific area but it also helps us understand the key characteristics of the people involved to better target assistance and protection.” - Dimby Randrianaina, DC4IDP Project Coordinator (UNOPS)

Data collection is paramount to any humanitarian operation in helping to understand the circumstances of the emergency situation, as well as the capacity of the responding relief organization(s) (Webfoundation, 2012). However, data collection has often been a “weak point” for the international humanitarian sector (World Disaster Report, 2013). Tangible assistance has been of greater focus for humanitarian organizations rather than ‘monitoring’ or ‘tracking’ the work of the organizations or the situation at hand (Ibid., 2013). The reality is that effective tangible assistance can be improved by more efficient and timely data collection. Therefore, data collection provides a number of benefits for humanitarian assistance. Is it useful to measure the 4 W’s – *who* is operating where, *what* activities are they providing, *when* will they provide them, and *who* are they reaching (Safe the Children: 2015). Moreover, mobile technology provides important information and feedback for relief organizations and aids them in obtaining constructive and necessary feedback while helping to answer some of these questions. Mobile technology has valuable functions across a wide spectrum for humanitarian agencies that help in addressing some of these circumstances. With a focus on digital data collection, I will illustrate the contextual and situational use of mobile technology in the event of a complex emergency.

Complex Emergency Defined

The *Inter-Agency Standing Committee (IASC)* defines a complex emergency as a, “a humanitarian crisis in a country, region or society where there is total or considerable breakdown of authority resulting from internal or external conflict and which requires an international response that goes beyond the mandate or capacity of any single and/or ongoing UN country programme” (IASC, 1994).

A humanitarian response to a complex emergency is challenging for a number of reasons. The situation on the ground is often dangerous, unpredictable, and has many different actors trying to provide humanitarian assistance at the same time – often times with an overlapping agenda. Furthermore, the large number of actors hampers coordination due to competition, different mandates and reluctance to share information (Kruke and Olsen: 2005).

With the disorder and confusion which comes from a complex emergency, it is important to collect information and data for organizations to best understand the situation and how best to respond to the needs of those affected. Idealistically, this information needs to be shared with other humanitarian organizations and actors to avoid duplication of efforts with the goal of maximum efficiency and effectiveness in response. However, the reality of many complex emergencies express a lack of coordination which results in competition for funding and overlapping mandates and agendas amongst the various actors (Ibid 2005 ; Stephenson, 2005)

With some of these challenges of a complex emergency, the Norwegian NGO relief sector uses digital data collection for a number of different situations that are applicable to different scenarios. Some of the situations include beneficiary registration, baseline surveys to understand community needs, surveys and monitoring forms to evaluate distributions, needs assessments to understand the wants and expectations of affected populations, measuring the goods and services that the organization provides, impact assessments to document change amongst the beneficiaries, and collecting health related information for monitoring and detection purposes. The overall aim for these different situations is to better target humanitarian assistance with efficiency and speed.

It is critical that this information is shared with other organizations, UN agencies, and clusters in fulfilling the overall aim of quick, effective and efficient humanitarian assistance. Information that is shared limits duplicated efforts, wasted precious resources and contributes to better overall response amongst the different humanitarian actors on the ground. Nevertheless, the information that is collected doesn't address the overall challenges of humanitarian coordination nor is that the aim of this thesis.

2.2 Norwegian relief NGO sector

Ninety-five percent of the Norwegian NGO humanitarian relief sector is comprised of five major organizations - The Norwegian Refugee Council, Norwegian Red Cross, Norwegian Church Aid, Norwegian People's Aid, and Save the Children Norway. All of these organizations have different missions and thus may have different but related roles within the humanitarian sector. Therefore, it is helpful to illustrate each of the five organizations and their respective mission within international relief work. Later, this illustration will prove beneficial when examining their relationship with mobile technology in their relief work, as well as with each other.

The Norwegian Refugee Council (NRC) was established after World War II to assist refugees in Europe (NRC, 2015). The organization has evolved to worldwide effort which "promotes and protects the right of refugees and people who have been displaced within their own country" (Ibid., 2015). The organization has a staff of 5000, working on projects in 25 countries with its headquarters in Oslo. NRC's main activity is the delivery of humanitarian assistance through five program activities: shelter, food security, water, sanitation and hygiene (WASH), education, and information counseling and legal aid (Ibid., 2015).

Norwegian Red Cross was established in 1865 as one of the first national societies in the Red Cross Movement with a mission of caring for impacted by war (Rødøkors, 2015). As one of 189 country members in the IFRCRC, collectively they make up the world's largest humanitarian organization (IFRCRC, 2015). Norwegian Red Cross' mission has since evolved to encompass a domestic and international agenda with over 170,000 volunteer members in

Norway (Rødekors, 2015). The international work of Norwegian Red Cross focuses on several areas including health and community care, organizational development, mines and weapon reduction, climate change adaptation, gender perspective issues and disaster prevention (Ibid., 2015).

Norwegian Church Aid (NCA) was also established after World War II as a small fundraising operation amongst Norwegian churches (NCA, 2015). The faith-based organization has since evolved to be one of the largest volunteer organizations in Norway engaged in humanitarian assistance and development assistance work (Ibid., 2015). NCA currently has projects in 30 countries around the world with its headquarters in Oslo (Ibid., 2015). NCA's main activity is the delivery of humanitarian assistance through several programs including emergency preparedness and response, long-term sustainable development projects, water, sanitation and hygiene (WASH), and advocacy (Ibid., 2015).

Save the Children Norway (Reddbarna) was also established after World War II working to safeguard children affected by war (Save the Children Norway, 2015). Save the Children Norway is one of thirty member organizations around the world, together with Save the Children International it makes up the largest leading organization for children (Ibid., 2015). Like the organizations, they have a domestic and international agenda. Collectively, the organization works in 120 countries around the world with a focus on: education, health, emergency response, and children's protection (Ibid., 2015).

Norwegian People's Aid was founded in 1939 to provide humanitarian assistance during conflict and assist in post-conflict reconstruction (NPA, 2015). As with the other organizations, they have both a domestic and international agenda with a headquarters in Oslo. Internationally, NPA works with long-term development projects and mine and explosive clearance with involvement in 37 countries (Ibid., 2015)). NPA is also one of the world's largest cluster bomb and mine clearance humanitarian organizations (Ibid., 2015).

2.3 International Context (UN)

It is important to provide a contextual overview of the different kinds of information communication technology (ICT) being used across the international humanitarian landscape. The technologies being incorporated into the work amongst the United Nations actors have a strong influence on the rest of the humanitarian community. While the UN doesn't have the authority to mandate the tools and methods that organizations use, they do provide inspiration to the rest of the community with their methods and systems used.

Humanitarian technologies are referred to as the “tools and infrastructure used to help disaster-prone communities to better prevent, mitigate and prepare for disasters and, in their wake, respond and rebuild more effectively” (World Disaster Report, 2013). To help in narrowing the scope these technologies, I will broadly explore the ICT's in the response and recovery stage of a crisis/emergency.

In the response and recovery stage of a humanitarian crisis, there are many technological innovations for use by humanitarian actors. These technological tools are meant to provide situational awareness, resource management, accountability, and search and rescue of a crisis/disaster in various ways. Some of these technological tools include big data analytics, information sharing platforms, mobile and digital data collection, crowdsourcing information, crisis mapping, mobilization of resources and volunteers through social media, mobile cash transfers, resource tracking through mobile technologies, and SMS-based feedback systems (World Disaster Report, 2013).

In the event of a humanitarian emergency, the World Food Program (WFP) serves as the cluster lead in ICT response, which is known as the Emergency Telecommunications Cluster (ETC). The ETC is a multi-stakeholder network of NGOs, governmental agencies, and private enterprise that cooperate in providing shared communication services in humanitarian emergencies (Emergency Telecommunications Cluster, 2015). The mandate of the ETC states is to, “to provide timely, predictable, and effective Information Communications Technology services to support the humanitarian community in carrying out their work efficiently, effectively, and safely” (Ibid., 2015).

There is a profusion of various ICT's currently being used and implemented when

quickly glancing across the other factions of the UN system. For example, the United Nations High Commissioner for Refugees (UNHCR) has a Division of Programme Support and Management (DPSM) that uses mobile technology in different capacities. The subsection: the Field Information and Coordination Support Section (FICSS) which functions as the focal point for data collection, analysis, and dissemination. This section provides reports by using GIS software to produce maps, and other information essential for field operations for the UNHCR and its partners working on behalf of the refugee populations (UNHCR / UNCTAD.)

International Telecom Union (ITU) is the leading United Nations agency for information and communication technologies, driving innovation in ICTs together with the Member States and partnership with over 700 private sector entities and academic institutions (ITU, 2015). The ITU provides the state of international internet connectivity and technology with its annual broadband report (Ibid, 2015).

The United Nations Office for Coordinating Humanitarian Affairs (OCHA) serves a critical role by having the authority to organize and oversee a united response amongst different humanitarian actors within complex emergencies (OCHA, 2015). Their responsibilities include: assessing the situation, understanding the needs of the affected population, determining priorities, obtaining access to affected areas, ensuring sufficient funding and resources, communicating with the public, and monitoring the progress (Ibid, 2015). Many of these responsibilities are completed with the use of ICM and technological tools. Some of the ICT within their portfolio include graphic information system (GIS) software and their databases to analyze and display data, humanitarian data exchange (HDE), various pilot programs with technology innovators, and collaborations with volunteer groups such as the Digital Humanitarians for social media and mapping analysis work (Ibid., 2015).

International Organization for Migration (IOM) serves as an informal member of the UN common system - they follow the policies of the system but not directly members. IOM functions as the Global Cluster Lead for Camp Coordination and Camp Management (CCCM) in emergencies induced by natural disasters (IOM, 2015). A tool that is used is the displacement tracking matrix (DTM) which serves an information management tool developed by the IOM to

gather baseline information on displaced populations and their conditions in the location in which they have temporarily settled (Ibid., 2015). DTM was first implemented in Iraq in 2006 to track the movements of internally displaced people (IDPs) during the wave of sectarian violence. It has been rolled out in over 30 countries (Ibid. 2015).

3.0 Theoretical Framework

This section will be comprised of the theoretical framework chosen for analysis and research of the topic, *What are the key potentials and challenges in the implementation and diffusion of mobile technologies for the Norwegian NGO relief sector?* The main theory used will draw from Everett Roger's *Diffusion of Technologies* in helping to explain both diffusion and implementation aspects (Rodgers 2003). Secondly, I will present pieces of a framework offered by Dekker and Suparamaniam in 'Divergent images of decision making in international disaster relief work' and Karl Weick's 'Sensemaking in Organizations'. These theories will provide different perspectives on the relationship between humanitarian crisis management and technological diffusion and implementation while constructing my theoretical framework for examining my research problem.

3.1 Diffusion of Innovations

To better understand the relationship of the diffusion and implementation of mobile technology within Norwegian NGO relief sector, it is useful to outline Rogers' theory of *Diffusion of Innovations* as a whole. In the process of summarization of his theory, I will chose important elements in building my own theoretical framework.

Rogers defines diffusion, "as the process by which an innovation is communicated through certain channels over time among members of a social system. (2013)" This process is thoroughly examined at both the individual and organizational levels. However, many of the elements of the diffusion process are applicable and interconnected to both individuals and organizations. Diffusion is broken up into four elements: *the innovation, communication channels, time, and a social system* (Ibid. 11). In understanding diffusion of mobile technology within the Norwegian NGO relief section, I will focus on the innovation, time, and social system elements.

The Innovation Process

Innovation has been researched across a diverse spectrum of disciplines from finance to technology but carries a common theme throughout – the introduction of something new and useful (Byre & Tusiime: 2011; Angle & Van de Ven: 2000; Damanpour & Schneider: 2006; Gopalakrishnan & Damanpour, 1997). Ramalingam, Scriven and Connor (2009) further the definition of innovations to be, “dynamic processes which focus on the creation and implementation of new or improved products and services, processes, positions and paradigms. Successful innovations are those that result in improvements in efficiency, effectiveness, quality or social outcomes/impacts.”

For my theoretical explanation, I will follow five innovation characteristics from Rodgers (2003): *relative advantage*, *compatibility*, *complexity*, *trialability*, and *observability*. In explaining the adoption of mobile technology later in the thesis, I will describe these characteristics and incorporate four of them into my theoretical framework. Later, these characteristics will illustrate mobile technology as a potential humanitarian innovation thus as a central component of the diffusion process.

The first characteristic of innovation is *relative advantage*. Relative advantage refers to the new idea to be advantageous over the idea it replaces (Ibid., 2003). Specifically, the notion that digital data collection is superior to analog data collection – pen and paper. This can be measured economically, or through social factors such as convenience and satisfaction. Furthermore, perception plays an important role in this element – if stakeholders perceive the innovation as advantageous, the faster the innovation will be adopted. (Ibid., 2003).

The second and third characteristics of innovation are *compatibility* and *complexity*.

Compatibility relates to the innovation being compatible or consistent to the past methods, and needs of the potential adopters (Ibid., 2003). The characteristic of complexity is self-defined – referring to the innovation as being perceived as being complex or difficult to use. If mobile technology and digital data collection are perceived as being easy to use and compatible with the existing values and norms of the organization (or social system) – the faster it will be adopted. However, if digital data collection (the innovation) is seen as incompatible and/or difficult to use

within the practices of the organization – the slower it will be incorporated into organizational use.

The fourth characteristic of innovation is *trailability*. Successful trailability refers to the way in which an innovation is tried and tested on an “installment plan” (Ibid). If mobile technology is piloted on a scheduled and incremented plan – it will be more adopted faster and more effectively than if it isn’t tried and tested. The opposite is true if an innovation is not tried first incrementally, then it will be adopted slower and less effectively. The ALNAP Review of Humanitarian Action (2009) complements the notion of trailability with its *development* component in humanitarian innovation. The proactive development is a phase within humanitarian innovation through “practical plans and guidelines” of the tool (Ramalingam, Scriven, and Foley: 2009). The development and trialability of the innovation would refer to the planning, guidelines, and incremented pilot testing of digital mobile collection in the field.

The fifth character of innovation is *observability*. Observability characterizes the effects of the innovation to other people or organizations. Again, the easier it is to see and recognize the results of the innovation, the more likely it will be adopted by others (Rodgers: 2003). The opposite holds true in case too – if it is difficult to recognize the results of digital data collection, the less likely it will be adopted.

For my theoretical framework, I look to incorporate the innovation characteristics of *relative advantage, compatibility, trailability/development, and observability* in examining mobile technology as an innovation for the Norwegian humanitarian relief sector. These characteristics will provide valuable insight in looking at mobile technology as an innovation but also as an important component of the diffusion process. By building the diffusion process by each component, first with the innovation element, it will be easier in addressing of the research problem of determining some of the potentials and challenges of the diffusion process.

Humanitarian Innovation

Bloom and Betts of the Oxford Refugee Studies Centre (2013) write on the ‘two worlds of humanitarian innovation’ where they discuss innovation amongst affected populations. This concept can be referred to ‘bottom-up’ innovation that is driven by the beneficiaries as opposed to the traditional ‘top-down’ world of humanitarian innovation. However, humanitarian innovations have historically been top-down in nature (Proudlock and Ramalingam, 2009). Proudlock and Ramalingam (2009) illustrate their point, “Too often, evaluation is undertaken simply to satisfy agencies and donors, rather than to improve outcomes for the targeted population.” Using feedback from beneficiaries to account for impact and improve projects is a challenge for the wider social sector, and rarely prioritised (Bloom and Betts, 2013)).

‘Local ownership and partnership and beneficiary participation’ are elemental principles subscribed to by humanitarian organizations. However, it is widely recognized that these principles are rarely executed in humanitarian interventions (Cornwall 2002, Ramalingam et al. 2009b). As part of the Humanitarian Innovation Project fieldwork in refugee settlements in Uganda, many refugees explained that, “NGO interventions did not always identify their most pressing problems and therefore determine solutions” (Bloom and Betts, 2013). In the light of this theoretical consideration of beneficiary driven innovation, I consider where the use of digital data collection through mobile technology lies in the world of humanitarian innovation. This innovation concept will contribute a further understanding of the diffusion and implementation potentials and challenges of mobile technology.

In completing the diffusion process, I will present the subsequent three elements of *communication channels, time, and social system*. My theoretical framework will be completed with the incorporation of two of them with further explanation afterwards.

Communication channels is the process in which the innovation is communicated to organization to organization. This information exchange determines the conditions for potential adopters about the existence and qualities of an innovation (Rodgers, 2003). If the information exchange about the use of mobile technology for digital data collection is regarded positively, or negatively—the adoption of mobile technology will be reflected upon this exchange.

The *time* element in diffusion refers to ‘innovation-decision’ process which is determined from the first knowledge of the innovation to its adoption or rejection (Ibid, 2003) The time element for mobile technology for data capture refers to when the Norwegian relief agencies first heard about the innovation to the point of adoption/rejection. The speed of data collection with the use of mobile technology’s adoption/rejection is dependent on the innovative nature of the organization itself (Ibid., 2003.). Additionally, the mobile technology rate of adoption within ‘a system’ – in this case, the Norwegian relief organizations – can be measured by the number of them who adopt mobile technology within a given amount of time (Ibid., 2003).

The *social system* is the last central element in Rodgers diffusion process. The social system in this case is the five major Norwegian NGO relief organizations – an interrelated group engaged in a similar mission of humanitarian assistance. The structure of this social system will determine if the diffusion processes is facilitated or impeded (Ibid., 2003). For the purpose of this thesis, I will not include this element in my framework but will recognize the five relief organizations collectively as a theoretical unit – not necessarily being present at the same time in complex emergencies.

For the last pieces of my diffusion theoretical framework, I will incorporate the *communication channels* and *time* elements of the digital data collection innovation. It will be easier to investigate these elements amongst the Norwegian NGO relief sector which will contribute to a better understanding of the potentials and challenges of diffusion of mobile technology.

Implementation

Diffusion of innovation as it relates to organizational use is comprised of a few components. It is important to examine innovation-decision and the innovation processes within an organization. Ultimately, implementation of an innovation involves many actors who play a role within the innovation-decision. The implementation will result in a ‘mutual adaption’ of both the innovation and the organization where they both change within the process.

There are three types of innovation-decisions at the organizational level consisting of *optional innovation-decisions*, *collective innovation-decisions*, and *authority innovation-decisions*

(Rogers: 2013). Optional innovation-decisions are made by an individual independent of the decisions by other members of a system (Ibid., 2003). Collective innovation-decisions are made by consensus through members within the system. Authority innovation-decision are made by a few individuals when the system who, ‘‘possess power, high social status, or technical expertise’’ (Ibid., 2003). In addition, a combination of two of these types can constitute an alternative innovation-decision.

An organization is defined by Rogers as a ‘‘stable system of individuals who work together to achieve common goals through a hierarchy of ranks and a division of labor.’’ An organization achieves a structure through five processes: predetermined goals, prescribed roles, authority structure, rules and regulations, and informal patterns (Ibid., 2003). Each of the five Norwegian relief NGOs is comprised of these five processes.

There are five stages in the ‘innovation process’ for an organization. The figure below represents the whole process from the initiation through implementation. Further clarification of each stage of the innovation process will prove fruitful when analyzing the Norwegian relief organizations.

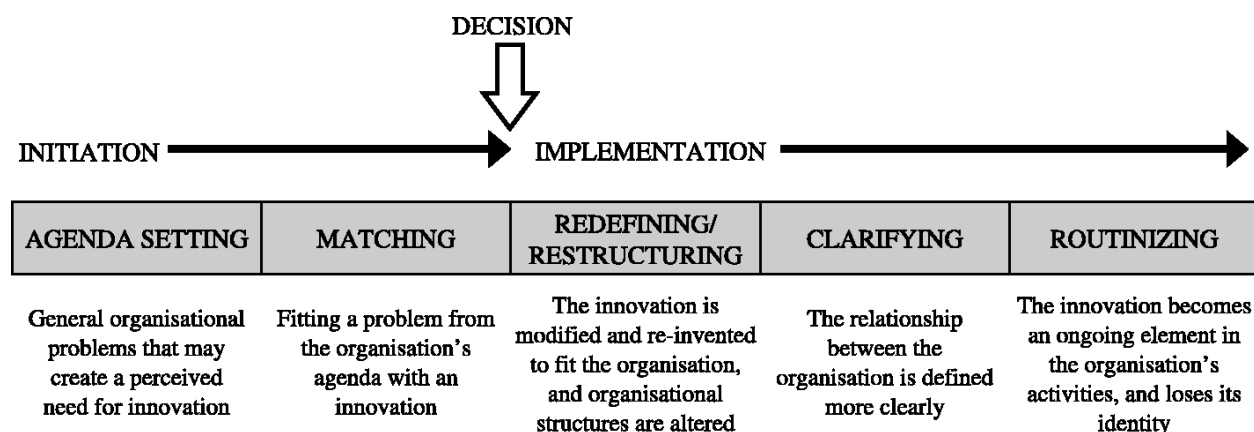


Figure 1: (Rodgers, 2003) pg. 421

3.2 Initiation subprocess

The initiation process which begins with ‘agenda-setting’ is when the organization has specific needs or problems which ‘‘creates a perceived need’’ for a particular innovation (Ibid., 2003). The

perceived need may vary but could be adapted from what mobile technology in digital data collection offers. These first two stages are defined by the initial organizational uses for mobile technology until the decision point (the downward arrow), which marks the start of the implementation process.

This agenda-setting stage is comprised of the two subsections: (1) “identifying and prioritizing needs and problems and (2) searching the organization’s environment to locate innovations of potential usefulness to meet these organizational problems.” (Ibid, 2003) This process can be lengthy and happen over the course of months and even years. Most organizations are constantly looking at different innovations to address their organizational needs and problems. Rodgers also suggests that the recognition of a particular innovation may start with the innovation process instead of the knowledge of particular organizational needs and problems (Ibid., 2003). In the empirical chapter, I will explore some of the needs and problems of the major Norwegian relief organizations which are addressed with mobile technology.

The next stage in the innovation process is the ‘matching’ state. This stage involves matching the organizational problem with a particular innovation with planning and designing (Ibid., 2003). The planning entails “anticipating the benefits, and the problems, that the innovation will encounter when it is implemented. The organization’s decision-makers may conclude that the innovation is mismatched with the problem (Ibid., 2013). The matching process is critical because it marks the distinction between the ‘initiation’ phase and the ‘implementation’ phase. This is the point when an organization will make the decision to incorporate and implement mobile technology for digital data collection in their fieldwork.

3.3 Implementation sub-process

After the matching stage, begins the *implementation sub-process*, which is comprised of the next three stages: redefining/restructuring, clarifying, and routinizing (Ibid., 2003). For my theoretical framework, I will incorporate two of these stages into examining my research problem. Further explanation will follow the summary of the stages.

The redefining/restructuring stage marks the organizational decision to adopt the innovation. The innovation is now refined within the organizational structure, and often times this coincides with a restructuring of the organization (Ibid., 2003). In addition, the innovation starts to shed its unfamiliar characteristics within the organization (Ibid., 2003). Sometimes the organizational structure will be restructured with the creation of a new unit based on the innovation, or could influence the structure of the entire system (Ibid., 2003). Since I will not be exploring the organizational structures of the major Norwegian relief organizations, I will not include this stage as a part of my framework.

The ‘clarifying stage’ marks when the innovation is more clearly defined within the organization, and thus its use becomes more widespread (Ibid., 2003). The meaning of the innovation is also clearer to the members of the organization. Rodgers warns that a rapid implementation at this stage can lead to ‘‘disastrous results’’(Ibid., 2003). Although complicated and difficult, gradual implementation can help the organization confront misunderstandings and problems from the innovation. A slow and methodical implementation of mobile technology for the Norwegian relief organizations will contribute to a clearer understanding of digital data collection for the organization.

The final stage of the implementation sub-process and overall innovation process is the ‘routinizing stage’. This occurs when the innovation becomes ingrained into the organizational structure and becomes commonplace (Ibid., 2003). Once the innovation becomes a structured component of the organization, it loses its ‘‘separate identity’’ and thus becomes routine (Ibid., 2003.). Rodgers attributes the sustainability of the innovation to participation amongst the members of the organization (Ibid., 2003). If many of the organizational members are involved in ‘‘designing, discussing, and implementing an innovation, its sustainability over time is more likely (Ibid., 2003)’’. This would mark the point when mobile technologies are a standard component of the major Norwegian relief agencies means for collecting data.

3.4 Divergent images of decision making

Dekker and Suparamaniam (2005) offer a contrasting view in terms of decision making in the context of international disaster relief work. They illustrate a divergence of decision making between the leadership and the field workers: the leadership usually has the authority to make decisions but often lack the knowledge, while the opposite is true for the field workers. They write, “knowledge and authority are rarely located in the same actor.”

When examining this gap in international disaster relief work, there are a few elements that remain constant. The humanitarian organization has a set of protocols of how to achieve goals while the relief workers have the responsibility to tend to the disaster and those affected populations. The reality of the situation is that most relief work falls somewhere between the two:

“To those who plan for relief work and administrate it from distant head offices, success in the field comes from sticking to the plan, from following protocol and reporting about progress in a way consistent with hierarchy and bureaucratic rule. To those in the field, success has rather different sources. These lie in adaptation, flexibility, experience.” (Dekker & Suparamaniam, 2005).”

In terms of closing the gap between decision makers and field workers with the use of communication technology - the authors make the argument that such technology doesn't address the issues of 'hierarchy, goal conflicts, and authority'. It is worth noting that this article was written in 2005 before the widespread use of mobile technologies within humanitarian work, however, much of their argument holds true. They describe many instances which highlight the ineffectivity of technology to address this disconnect.

“technology created data overload for decision makers up the chain, yet still failed to communicate the essence of ‘being there’ and seeing what was necessary. And in reverse, team leaders and field workers proved hesitant to take orders from a radio or fax machine” (Ibid, 2005).

This rationale will be further explored with the use of mobile technology through my interviews with the Norwegian relief agencies. However, there could be some limitations in analyzing the divergent images of decision making because it requires the perspective from both the field worker and that of the authority in the headquarters. Another consideration is to see how this

affected the beneficiaries if the divergent images are in fact brought closer together through the use of mobile technology.

Different images of decision making in relief work

<u>Formal</u>	<u>Actual</u>
Allegiance to distant supervisors and higher-order goals	Dissociation from distant supervisors Higher-order goals less critical
Adherence to procedure and protocol	Drift from procedure and protocol
Deference to hierarchy and structure	Deference to experience and resource access
Constrained by national and organizational boundaries	Improvisation across boundaries

Figure 2: (Adapted from Dekker and Suparamaniam (2005))

3.5 Occasions for Sensemaking (retrospective)

Sensemaking for international relief organizations in a crisis situation requires a multi-layered effort to comprehend the situation by answering the questions of “what is the problem and what should we do?” (Omaharah and Anderson, 2014) These questions become exponentially more difficult when critical details around the crisis are absent (Ibid.). However, it is also argued “that it is possible to grasp the dynamics of a crisis once it becomes manifested and unfolds” (Bion et al 2005: 19). Weick (1993) simplifies this by writing, “the basic idea of sensemaking is that reality is an ongoing accomplishment that emerges from efforts to create order and make retrospective sense of what occurs.” Sensemaking can be a lens to observe and understand how information is processed within organizations (Muhren et. al 2008). I will take two sensemaking characteristics from Weick to later explore the implementation of mobile technology within the context of their international humanitarian work.

Answering the question of *what should be done?* requires a lot information surrounding the complexities of the crisis. Since decisions often seem to be only loosely linked to the information gathered for making them (March 1999: 26). Sensemaking in crisis conditions is made more difficult because information and action that is instrumental to understanding the crisis often intensifies the crisis (Weick 1988: 305).

In a crisis situation, ordinary decision makers will be severely handicapped by a lack of reliable information on which to base any selection of choices (Cooper, 2007:12), not to mention all the other circumstances that can constrain decision making. Bion et al. describe this situation soundly by writing, "... policy makers easily become distressed and distracted. Crucial bits of intelligence get lost in the steady stream of briefings, phone calls, faxes, emails, wire service reports, cables, and rumours." (Ibid 2005: 29)-"

If the nature of the problem(s) is itself in question, then the amount and reliability of the information can be problematic (Weick 2005, 93). International humanitarian relief work is a continual sensemaking occasion with a situational context that is traditionally unpredictable, complex and varying (Muhren et. al 2008). *Ambiguity* and *uncertainty* are two types of sensemaking occasions common to organizations (Weick 2005: 91). The differentiation between them is that with ambiguity, sensemaking is done because people are confused by too many interpretations, while with uncertainty, sensemaking is required because people are unaware of any interpretations (Ibid.). Therefore, if the definition of the problem is in doubt, collecting and categorizing information becomes a problem. The information flow threatens either to become overwhelming or to be seriously insufficient (Weick, 2005).

Weick (1985) had some observations of technology and sensemaking before 'modern' mobile technology. However, his critique continues to hold true because of the type of information processed. He describes two central problems with the information representation process – the first being an incomplete dataset not addressing emotion, and feelings and secondly, a limited processing ability of those managing the insufficient data. He writes:

Feelings, context, and sensory information are not soft-headed luxuries. They are ways of knowing that preserve properties of events not captured by machine-compatible information. To withhold these incompatible data is to handicap the observer. And therein lies the problem. (pp. 51–52)

Weick writes further about the challenges of interpreting the data outputs, "What is emerging as a growing issue for sensemaking is the ability of humans to comprehend the outputs of the technology. These disparities create the potential for increased arousal.(Weick 177)"

3.6 Theoretical summary

The *Diffusion of Innovations* will help to illuminate the chosen diffusion and implementation processes of innovation within an organization. Meanwhile, *Sensemaking in Organizations* and *Divergent images of decision making* provides nice foundation for organizational sensemaking, occasions for sensemaking, and understanding the differing perspectives from headquarters to the field . Therefore, a combination of these theoretical perspectives as a foundation, I can anticipate the following elements to be highlighted in my research:

- The innovation, diffusion and implementation processes of mobile technology within the major Norwegian relief agencies to be linked to the theoretical foundations described by Rogers' *Diffusion of Technology*.
- Historically, organizational sensemaking has not been transformed through the use of technology. *Ambiguity* and *Uncertainty* are two sensemaking occasions that common to organizations. Throughout the research process, I will examine if these occasions are influenced through the use mobile technology.

These theoretical pieces from different sources serve as the building blocks in forming my theoretical framework – see below. With this framework intact, it will be easier through the chosen theoretical components that examines diffusion and implementation from different perspectives to illuminate my research problem – *What are the potentials and challenges of diffusion and implementation of mobile technology within the Norwegian NGO relief sector?*

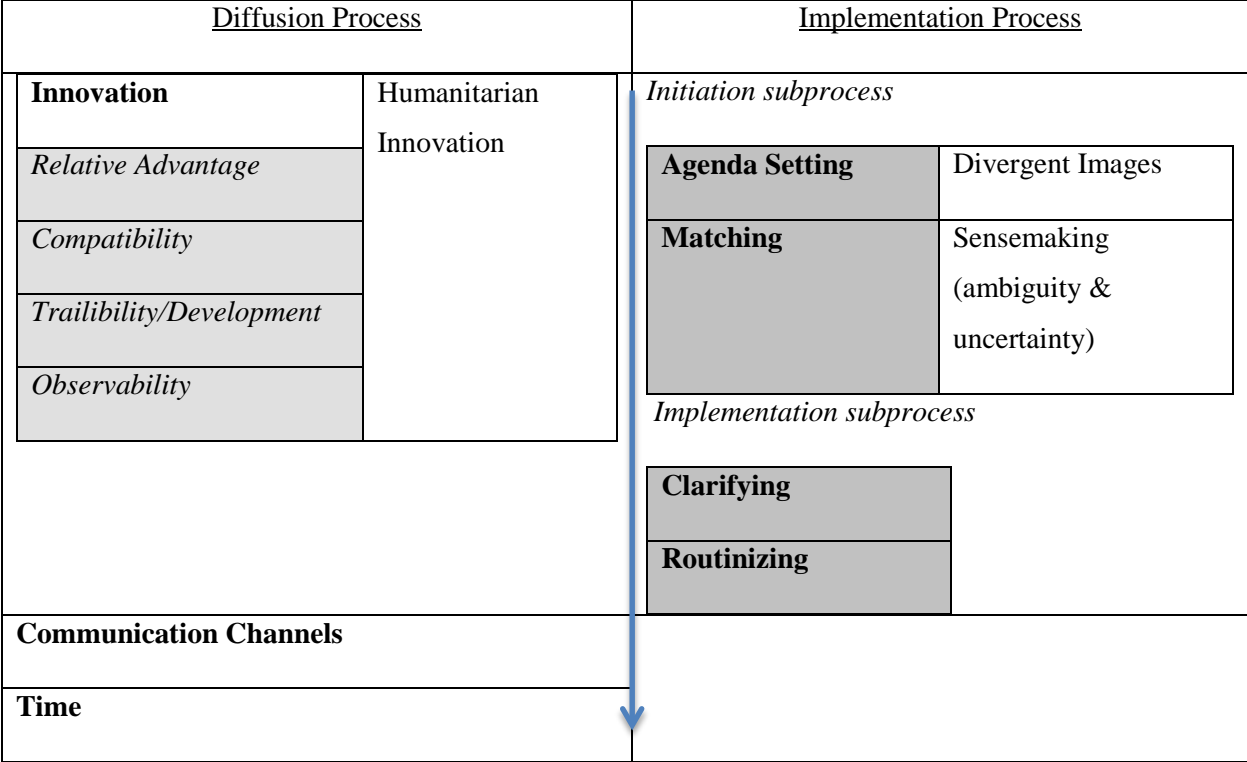


Figure 3: Theoretical Framework: Diffusion & Implementation. A model based on Rodgers (2003)

4.0 Methodology

4.1 Research Design

Research design is the structure and strategy in which one will conduct their research. Valerie Janesick (1994, 1998) describes this colorfully by writing, “design is the choreography that establishes the research dance.” Another helpful way of thinking about quality research design is that if you shared the design with different parties the process of conducting the work would be comparable for them (Berg, Lunde: 42). In other words, research design is a way to keep on track, stay focused, and avoid any potential mishaps when moving forward with the project while containing all the research components. My research design incorporated an inductive research strategy that helped to answer my research problem by incorporating the search for pattern from observation and the development of explanations (Bernard, 2011)

4.2 Inductive Research Strategy

The research strategies were the mechanism(s) in conducting the qualitative research and answering the posed research questions. When examining the different research strategies, the best approach for my project was an inductive strategy. The inductive research strategy was adopted because it is best suited to answer my ‘what’ research problem.

For the posed ‘what’ research problem and operational research questions from section 2.4, an inductive research strategy made the most sense for the nature of my topic. Blaikie (2014) defines this strategy by writing, “the aim of inductive research strategy is to establish limited generalizations about the distribution of, and patterns of association amongst, observed or measured characteristics of individuals and social phenomena (2010: 83). This strategy was helpful in answering some of the core questions research questions by seeking these patterns of association through my interviews with the five Norwegian NGO relief agencies.

In answering these ‘what’ questions, Blaike offers some additional sound advice by writing, “the answer to our ‘what’ question will be influenced by our background knowledge,

from both theory and previous research, as well as from traditions within our discipline, and it will be limited in time and space” (2010: 83). The background knowledge inevitably came from my societal safety coursework that has provided an ample amount of related theory outlined in the previous chapter.

In David Silverman’s book, ‘Interpreting Qualitative Data’ he offers six rules for qualitative research which are beneficial to highlight. In the relationship with my project, Rule 4 and 5 are particularly essential when considering the facets of technology. The two rules are as follows, “Avoid choosing between all polar oppositions. Never appeal to a single element as an explanation.”

These two rules advocate for a well-rounded research without being too dependent on a particular source or frame of mind, and seek data from a wide spectrum of sources. Having these qualitative rules subconsciously was a simple reminder to diversify the data and look through a wider lens perspective.

4.3 The Research Process

The following table reflects upon the core steps taken during the working process based upon the research design process.

<i>Period 1</i> Winter 2004	<i>Period 2</i> January - March 2015	<i>Period 3</i> April 2015	<i>Period 4</i> May 2015-
Developing research proposal.	Preparation for data collection.	Data collection.	Data reduction and analysis.
Stavanger	Stavanger	Oslo	Stavanger
Online research. Literature review.	Created research problem(s). Literature review continued. Drafted interview guide.	Finalized interview guide. Informal interview with NOMAD. Traveled to Oslo for the first four interviews.	Last interview via Skype. Data reduction and analysis.

	Contacted relief agencies in Oslo.	Additional interview via Skype. Document analysis.	
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Figure 4: The research process

Period 1

This period was primarily consisted of researching new uses of technology within the humanitarian sector. Initially, I was considering focusing on the use of social media amongst beneficiaries within a complex humanitarian emergency. However, this eventually evolved into the use of mobile technologies for data collection within the major Norwegian relief agencies. I used this time to gain knowledge how different mobile technologies are incorporated into humanitarian relief work.

Period 2

The 2nd period was marked by the preparation work for the data collection phase. I further refined my research problem(s) and began to make contact with the five major agencies in Oslo. It was difficult to find suitable contact(s) dealing primarily with mobile technology because of the use in different areas of the organization. After I found the appropriate contacts, I began coordinating and scheduling interviews in Oslo.

Period 3

This period consisted of spending a week in Oslo conducting four interviews with four different Norwegian relief agencies. Within two weeks, I had my fourth interview via Skype. Subsequently, I began transcribing the interviews and processing the data. A large component of the data processing involved finding patterns in different areas amongst the five organizations.

Period 4

This last period consisted of the data reduction process, as well as continuing to analyze the data. My final interview was conducted with my informant with Save the Children who is based in

Geneva via Skype. With the considerable amount of data collected, I began to reduce the data to more manageable amounts to use in answering my research problem and operational questions.

4.4 Data Collection: Types and Sources

For my research, I gathered data in a semi-natural social setting. This entailed conducting interviews with people about the work conducted in a natural social setting. The distinction between them is not having to be present in the natural social setting – a complex emergency. This type of data collection proved fruitful because it is easier to speak with someone outside a natural setting (with experience from a natural setting) than the preparations, logistics, and potential risk involved in going into a natural social setting – a complex emergency.

For the research, I closely followed the guidelines proposed by Robert K. Yin in his book, *Case Study Research* (2014). Yin offers data collection guidelines through four principles of data collection. The first principle is to “use multiple sources of evidence” which is fairly intuitive. This principle was fully utilized for my research project throughout (Yin, 2014). Examining multiple sources makes ones research better-rounded thus making a better overall product.

Yin’s second principle is “create a case study database” which emphasizes the organization of the data collected for the research. The same principle applies to the qualitative data that is collected as well. It is important to keep it keep well organized, maintained, and accessible for when it is needed (Ibid. 123).

In terms of types of data, the three that are most recognized are comprised of primary, secondary, and tertiary. Primary data refers to the data that is acquired first-hand by the researcher. Secondary data refers to the data that is acquired by someone else, but it is analyzed first-hand by the researcher. Secondary data may include statistics, results from surveys, etc. Tertiary is the lowest tiered of the data types, and involves data that is collected by another source, and also analyzed by someone else. My research project encompassed predominantly ‘primary’ and ‘secondary’ types of data. Primary data came from interviews from stakeholders within crisis management and/or mobile technology. The secondary data came from the reports

and case studies from the experiences of UN and humanitarian relief agencies. Inevitably, some tertiary data was used but my research weight was placed on the primary and secondary data sources.

4.5 Selection of Data Sources

The selection of sound data sources was ultimately determined by after I refined my research problem and operational research questions. However, there was not an abundance of data sources related to the use of mobile technology for digital data collection. It is worth nothing that some of the principles mentioned in the last section will be applicable here as well.

After I selected my data sources, I broke down my “evidence” by listing the strengths and weaknesses of each piece (Yin: 2014). Of the six most common sources of evidence, I incorporated documentation, interviews, and archival records and lacked any observation evidence components (Yin 2014: 105). For my project, I used documentation, which was comprised of a wide array of documents ranging from articles, case studies, and reports. The strengths of this data included “stability, unobtrusive, specific, and broad”; while the weaknesses include “retrievability, biased selectivity, reporting bias, and access.

As before mentioned, I conducted seven interviews for my project. The strengths of my interviews included “targeted and insightful” data but also provided a personal touch. Some weaknesses to the interview process include “bias due to poor questioning, response bias, inaccuracies due to poor recall, and reflexivity.” However, I strived to have good and neutral questions but also to recollect the interview properly and thoroughly – an interview guide and recorder supported this.

4.5.1 Limited Data Sources

Mobile technology offers a significant amount of data regarding telephone use but is rather limited in the context of data collection. The humanitarian context is also more focused on the dissemination of mobile phones in developing parts of the world with far less attention to

digital data collection. In addition, there was difficulty in finding case studies from the use of mobile technology in the data collection context from the various agencies.

4.5.2 Informants from the Norwegian relief agencies

The selection of informants from the five agencies largely came from trial and error coupled with persistence. I used a combination of cold calling each organization, and following up by e-mail if I did not reach someone. I had various levels of success with the different agencies, and once making contact with someone often would lead to another informant. One of the difficulties was that rarely a point person and never specific department that dealt with mobile technology. I would often have to speak with different people before eventually reaching the key person(s) that had experience using and/or implementing digital data collection projects with the use of mobile technology. Therefore, the informants have different relationships with mobile technologies and in different contexts. Some of the informants had lots of experience implementing mobile technology in the field while others had only been based at the headquarters level – or a mix of both.

With the case of Save the Children Norway (Reddbarna), they did not have anyone who dealt with mobile technology directly and provided me with a contact in Somalia. However, I wasn't able to make contact with the informant there. Eventually, I was able to make contact with someone who works with mobile technology for Save the Children but primarily works with the Education Cluster based in Geneva, Switzerland.

4.5.3 Document analysis

The document analysis process was particularly important to the research design. The written reports on mobile technology and digital data collection provided invaluable information in helping to understand the uses and systems used. Furthermore, these written materials helped to describe some practical examples of mobile technology within a complex emergency. Since my research lacked a field research component, I had to rely heavily on these materials because they provided a lens in examining the multidimensional uses and experiences of these

technologies in the field. Additionally, these written reports and sources helped to contribute to the development of my research problem and operational research questions.

Some of the comprehensive written reports that provided valuable insight into my project included the *ICRC's 2013 World Disaster Report*, *UNDP's Mobile Technologies and Empowerment*, and *Save the Children's Mobile Technologies in Emergencies*. These reports contributed to building the foundation of my understanding of mobile technology in a humanitarian context in which contributed to the development of my interview guide.

A challenge was getting access to more specific written reports related to each Norwegian relief organizations experience. Since each organization is at different stages with regard to their use of mobile technology – the lack of written reports or case studies reflect this. The added secondary written sources would've helped to further compliment my primary interview data.

4.6 Interview Process

In preparation for the interview process with the relief agencies in Oslo, I first had an informal Skype interview with NOMAD (Humanitarian Operations Mobile Acquisition of Data). NOMAD is a French based non-profit organization which assists humanitarian organizations with implementation and support of mobile data collection systems.

This initial conversation helped formulate a better understanding of the use of mobile technology within the humanitarian sector, and assisted in testing a draft interview guide that would later be refined and used with the Norwegian relief agencies.

The formal interview process took place in Oslo and/or via Skype. Since the major Norwegian relief agencies are headquartered in Oslo, I traveled there to conduct them in person. I used a recorder to tape the conversations that aided in the transcription process afterwards but also help to engage with the informants in a more natural and conversational style. I used an interview guide which consisted of 15 questions that was given to the informant, and the interview flowed based on the questions. Follow up questions were asked when deemed appropriate or necessary.

After conducting these in-person interviews in Oslo, I conducted the remaining ones via Skype. For these interviews, the process was essentially same but it became an ‘artificial setting’ since it was conducted through the computer without the video component.

4.7 Data Reduction and Analysis

The essence of this section is how I effectively reduced the data to provide for better analysis. Bruce Berg and Howard Lunde describe the importance of data reduction well in their book, ‘Qualitative Research Methods for the Social Sciences’ by writing, “qualitative data need to be reduced and transformed (coded) in order to make them more readily accessible, understandable, and to draw out various themes and patterns (2012: 55).

Through the research project, I accumulated a high volume of data through the transcription of the interviews thus it was imperative to reduce the load through effective management. One of the methods of data reduction is to code qualitative data, which essentially quantifies qualitative data into to quantitative data (Blaikie 2014: 25).

For analysis, it is advised to outline the method and procedure that is used before the research is complete. By doing this, ensures that there is consistency in your data, methods, which will in turn make sure better research, as well as a better end product (Ibid. 26).

For my research project, I utilized a uniform system to code my qualitative data before I complete the research itself. I outlined the method and procedure that I used before completing the research. By doing this, I ensured that there was a consistency in my data, methods, which lead to better research by effective data management (Ibid. 26).

4.8 Research Quality

It is important to remain critical to the quality of the data collected through the research process. Two important issues are whether or not the research investigates what I wanted it to examine (validity), whether or not I can depend or rely on the collected data (reliability), and whether or not the data collected can be used for other research (transferability) (Jacobsen, 2005 ; Bakke Lie, 2011).

Validity

The validity of my research can be broken down to two tests: internal validity, and external validity (Yin: 2014).

Internal validity occurs in the data analysis of my research and refers to the possible threats between treatment and effect in experiments (Blackie: 2010). To increase the internal validity of my research, I did pattern matching amongst the transcribed interviews from my informants. In addition, I strengthened my validity by combining and gathering the data from interviews and from the literature review without relying on one or the other. However, my validity lacked true methodological triangulation by lacking a field perspective – observations and/or participant observations from those using mobile technology in the field. In its place, the methodological triangulation was based upon the research conducted from the organizational headquarters level in Oslo.

External validity tests whether the research findings “are generalizable beyond the immediate study” (Yin: 2014). My informants were chosen based on a non-random sampling based on their experience to my research topic: mobile technology / digital data collection. However, there is likelihood for *transferability* seeing the roles, responsibilities, structures, methods, tools, and guidelines are applicable for other humanitarian actors and organizations.

Reliability

The reliability of the research is whether or not we can rely on the research (Bakke Lie: 2011). Furthermore, reliability demonstrates that the operations of a study – such the data collection methods – can be repeated with the same results (Yin: 2014). The reliability of my research could be adversely affected by not collecting data in the field because I was dependent upon the perspectives of predominately advocates of mobile technology without having the ability to observe the potentials and challenges firsthand. Not to mention encompassing more of the perspectives of those primarily based in the field. By having the perspective of those who work in the field, and those who work at the headquarter level for each of the organizations would have contributed to a more well-rounded research design.

Transferability

Transferability refers to the degree or capacity to which the results of qualitative research can be generalized and transferred to other contexts or settings (Research Methods, Knowledge Base). It is difficult to generalize everything but the general motivations and experiences can certainly be transferred to other contexts and settings. Many of the findings in regards to the motivations of digital data collection amongst organizations could be found in other situational contexts or settings. However, the transferability of some of the experiences would be different depending on the socioeconomic and culture differences found amongst different settings globally.

4.9 Strengths, Weaknesses, Limitations, and Conclusions of Research Design

The main strength of the research design was to help formulate a clearer understanding of how to conduct meaningful and directed research before starting the actual research. It has provided advantages and disadvantages of research steps that may or not be used along the way.

The weaknesses of this research design stem from a few different aspects. Not having a specific case made it difficult to narrow the research focus as initially intended. In addition, researching complex emergencies without field research limited my ability to delve deeper into some of the challenges of mobile technology on the ground – and potential divergence between the ground actors and decision makers from a far. As a result, most of the interviewed informants are predominantly based at the headquarters level and were primarily strong advocates of mobile technology in practice. If my research were narrowed to a specific situational case, perhaps it would have been easier to examine the challenges and potentials of the research problem in further detail. Furthermore, my research could have been strengthened by incorporating more informants from each organization with experience with mobile technology from a non-implementation perspective-- ideally from a similar branch of the organization.

I chose not to investigate the relationship between different organizations and their digital/mobile data capture systems. However, it would have been interesting to see how the different systems of mobile technology affect or influence coordination amongst the different humanitarian actors.

5.0 Empirical Data

The purpose of this chapter is to first explore the different uses, experiences, and challenges of mobile technology amongst the major Norwegian relief agencies. Subsequently, it will be easier to answer and highlight my research question of finding the key potentials and challenges in the implementation and diffusion of mobile technologies for the Norwegian NGO relief sector.

The first section will examine the motives behind incorporating mobile technology into digital data collection and humanitarian work. Some patterned themes from the diffusion process will be presented. The data collected comes from a combination from the interviews conducted with the different agencies, as well as, through various written documentation (sources and case studies).

The second section will examine the potentials and challenges of the implementation of mobile technology. Similarly to the first section, patterned themes from both the diffusion and implementation subprocesses will be presented from data collected through different sources of documentation – written sources and interviews.

Diffusion of mobile technology: Understanding the organizational endorsement

The diffusion of mobile technology refers to the process in which mobile technology (the innovation) is spread within and across the humanitarian sector based upon the theoretical framework provided in the third chapter. This diffusion process amongst the Norwegian relief agencies have come in different ways but all of them share a similar rationale in their promotion. The interviews with the different agencies provided some patterns in the ways in which they endorse the use of mobile technology that has contributed to the diffusion process. In addition, different sources of written documentation contributed to a better understanding of the processes involved. Mobile technology has seen widespread global diffusion for many uses but is still relatively new to the humanitarian sector with a potential not yet fully realized.

Mobile technology as an innovation

Innovation plays a central role in the diffusion process but its true impact is only realized when it can be used across a wide spectrum of users (Bessant et. al: 2014) Traditionally, data collection has been done by pen and paper. In many ways, mobile data collection methods carry many advantages over paper. A common advantage over the traditional pen and paper is the quality and speed of the data collected. With the ability to set constraints of the data collected, there is less chance for collecting outlying data. Furthermore, when collecting data traditionally, there is a data entry step that is eliminated with digital data collection which also improves the quality of the data captured. However, paper still offers some flexibility – it functions regardless of infrastructure challenges and the ability to take notes easily if more detail is required (IFRC, 2013). Additionally, many remarked on the cost savings of digital data collection over paper methods.

Using mobile technology cuts the time from data collection to analyzing significantly. In addition this process saves money. An informant illustrates this, “...for us it actually very cost saving because data collection itself, sending people out is expensive and having to go back and recollect information...one thing, it is difficult because things have changed so much that is difficult to get the base line that was there before”(Informant #5, NPA). In addition, this information often needs to be shared with other actors involved in the complex emergency. The same informant remarks, “...What we want to do is to get the information more directly from the field to the end user of that data. We need to update multiple stakeholders. Working in any country, we have obligations to report to the state party or national authority for our work.” (Informant #5, NPA).

The Norwegian Refugee Council first began piloting mobile technologies in 2011 and 2012 with their Horn of Africa program. The 2012 NRC Annual Report on the Horn of Africa and Yemen provide background on the project,

“...the use of questionnaires rendered on smart phones, in order to replace paper forms used for undertaking assessments, registering beneficiaries or conducting post implementation follow ups. The responses were instantly sent to a cloud-based web server where the data was accessible to anyone with a login and password.”

An NRC informant spoke about the development of mobile technology after the pilot in 2011/2012. From this initial pilot, NRC expanded its use to fourteen countries. The informant describes this evolution being driven from the field perspective by saying,

So with some sorts of software, or procedures and things like that, you have to push them, you have to get people to adopt them, and you have to do trainings and get management to enforce the use of certain software. With mobile tech it has been the opposite, where people have wanted to use it because it makes their lives easier, saves them time, it improves the quality of the data that they are getting.

Data Security

The impression of more secure data was attributed to mobile technology from various sources contributing to the characteristics of a humanitarian innovation (*relative advantage, compatibility, trailibility and observability*).

Data security is further reflected in the UNDP’s report, ‘Mobile Technologies and Empowerment’: “...policies need to be instituted to regulate the use of this data to protect people’s privacy and ensure its reasonable use (i.e., in times of need as opposed to marketing or surveillance purposes).

Addressing these concerns, the an informant says: “*And sometimes the mobile technology can make it more secured because the data has been uploaded onto the cloud, so it’s no longer accessible as it is when you have a stack of papers. And there are ways to make the data anonymous which we do if it’s a sensitive situation. We keep personal data separately, identifiable information separate from other information, so people won’t be able to misuse data*” (Informant # 1, NRC).

Mobile devices can increase the security of the data but can also lead to security risks for person collecting the data. An informant describes a situation in Syria where the physical paper trail is limited by digital data collection which increases the security of the data, “*What they saw with*

phones, just by having a simple password on your phone, that eliminated a paper trail. You would be less likely to lose a piece of paper or bring a lot of visibility because in Syria everyone has a smart phone” (Informant #6, STC). However on the contrary, having mobile devices can lead to risk in the privacy sense. ICRC’s 2013 World Disaster Report writes, “Security risks, especially in conflict situations, related to carrying mobile phones with large amounts of privacy-related information.

Security challenges

Physical security in certain situations was a common pattern amongst the written sources and through the interviews with the organizations with the use of mobile device. Some of the characteristics addressed included: data security, risk, and personal safety issues.

Data security challenges exist irrespective of the data collection mechanism. According to an informant from the NRC describes data security: “...*Data security is another issue that is cited frequently, where we are collecting personal information on people, in situations of conflict that can potentially be used in a harmful way if they fall into the wrong hands. So this is definitely something we take seriously, however, we need to balance it with the fact we have been collecting this data on paper anyway.*” (Informant #1, NRC). OCHA’s Technology in the Network Age helps to further illustrate this point of data risk by writing, “In conflict situations or other highly polarized environments, privacy concerns can become paramount. Information can be used by authorities or non-state actors to target those who provide it, or other individuals. Governments often seek to monitor online dissent and information sharing (46).”

Informant from the NPA describes the challenge of safeguarding the data: “*I don’t think the analysis of the data has been our problem. It is more the collection and safeguarding the data. I think on analyzing them we have a good capacity. It is more a problem for us to store them right and get the right data.*” On the contrary, an informant highlights the lack of skill in the interpretation of data: “*People know that it is important to be collecting data, they know that*

they should be doing this but they are less familiar and less skilled in interpreting that data and marking it useful.”(Informant #1, NRC)

Compatibility with prior data collection systems

Mobile technology for data collection was remarked as compatible to the means and methods of data collection beforehand. Collecting more quantitative data or information through the use of surveys is seen as highly compatible, as opposed to collecting quantitative data or unstructured data (IFRC). An informant remarked on this by stating,

Overall, they seem to be fairly compatible. As mentioned earlier, rich qualitative data they are not so good with. So...things like focus group discussions, in depth interviews; they aren't so helpful. So we really don't use them in those sorts of situations, they are not appropriate (Informant #1, NRC).

The *complexity, trialability, observability* of mobile technology is depended on the situational or contextual use amongst the agencies. From an end-user perspective it was remarked that the software was pretty user-friendly. After mobile technology was first piloted in the Horn of Africa, it was noted that the systems were “user-friendly” and the data collected carried many potentials (NRC 2012 Horn of Africa Annual Report). However, it has also been noted that the initial setup of mobile technology requires a technical skill-set which make it evidently more complex than that of the pen and paper.

Technological Challenges

The technology of digital data collection has been described a challenge for the end users, the staff, and the organizations. There are considerable initial costs and time constraints when acquiring, setting up, and configuring a digital data collection system, which requires also technical expertise – accentuated in a complex emergency (ICRC World Disaster Report). Therefore, it has been expressed that the methods and systems used should be as simple as possible. In addition, the paradox between good experience and good technological skill-set was discussed. Many of these observations are related to the humanitarian innovation characteristics of the diffusion process.

An informant discusses the technology challenges of understanding the technology, “ *Sometimes it’s about understanding the telephone, understanding the smartphone, understanding how to transfer it. That’s one thing. The other thing is about the analysis of the data. These are issues that we have identified and that we are working on planning solutions for. I think the main issue is about technology itself but also... it should be as simple as possible*” (Informant #2, Norwegian Red Cross). However, there is also the challenge of having the right mix of experience and technology savvy. An informant discusses the challenges and necessity of mixing people who are experienced in their field but lack technology experience and vice versa by stating, “*The challenge is to mix in with new people, new ideas and get a good mix of people that can utilize this new system as well as take care of the good work that people are doing in the field. Some of the field people and some of the people who are good at mine action are not necessarily good at data collection and use of modern technology*” (Informant #5, NPA).

Sandvik et. al ‘Humanitarian technology: a critical research agenda’ weigh the benefits of the investment of setting up mobile technology versus tangible aid by writing, “On the organizational level, considerations have to be made with regard to financial investments aimed at securing large data volumes vis-à-vis the possibility of spending those funds on delivering aid. New time-saving technologies can spare lives, but may be forgone due to high acquisition costs. Securing data at the operational level also means investment in training staff to be aware of how to collect and secure data in the field and how to transmit data in a secure manner to headquarters and partners.”

Furthermore the 2013 ICRC World Disaster Report outlines the challenges of data management and analysis in a crisis situation by stating:

In this complex environment, there is a growing need to demonstrate impact, improve performance and deliver activities across a broad range of contexts and a variety of scale, but with consistent quality. Part of this process includes improving assessments and ensuring baselines are conducted, regular monitoring occurs and operations are critically evaluated to ensure improvement and dissemination of best practice (120).

Additional Diffusion Elements

The open *communication channels* of the accomplishments of mobile technology was shared amongst all the informants. They had expressed the desire to further incorporate mobile technology into their work. The use and promotion amongst other agencies has also served as an inspiration to incorporate these tools into their work. When asked about inspiration from other agencies, an informant said: “... *definitely. It would be hard to point to specific cases but just as you hear organizations using mobile tech, now it’s pretty standard. Now almost all organizations, to some extent, are doing mobile data capture*” (Informant #1, NRC). Underlining that inspiration came in part from within the Norwegian relief sector, an informant said, “*Especially the NRC . . . because they have done a lot in the last years and they use the same solution that we are using now for Ethiopia.*” (Informant #3, NCA). Highlighting the positive and negative inspiration from the international or UN level, an informant remarks, “*So basically part of the benefit and the disadvantage of the UN is we can’t force anyone to do anything. We can encourage, but we can’t force them. So that’s part of the reason why it’s taken two years or a year and a half to roll out mobile technology in the field*” (Informant #6, STC).

Implementation of mobile technology: Understanding the organizational uses and experiences

Gaining insight into the implementation of mobile technology for the Norwegian relief sector requires a certain comprehension through various factors. The various uses, potentials, challenges and experiences will later contribute to better understanding of the implementation (and diffusion) of mobile technology amongst the major Norwegian relief agencies. Below will loosely follow the initiation subprocess (*agenda setting* and *matching*) and implementation subprocess (*clarifying* and *routinizing*) through interviews and written documentation.

Uses for mobile technology

Linkage of Different Data

Mobile technology for data collection creates a digital link in which brings different types of data together in one process. This is important because it encourages efficiency in the data collection

process but the linkage also encourages accountability and oversight for donors, organizational staff, and other stakeholders. An informant illustrates this by stating, “*Mobile tech links certain types of better as well, for example, photos with GPS, with text and quantitative data, it links it all together, whereas if we’re collecting paper surveys or paper data collection forms, and then taking a photo, and then a GPS, they all will be on three different formats, and we have to find a way of meaningfully linking them together, so, this establishes that link.*” (Informant #1, NRC) This linkage was also described by NRC’s ‘2012 Horn of Africa and Yemen Annual Report’ where they first piloted mobile technology for digital data collection in the field, “... NRC implemented programmes in many areas with inconsistent and difficult access. Donors and others were often unable to visit project outputs as they do in other contexts. The creation of survey data and geo-referenced photos accessible in real time allows NRC to do virtual tours of outputs for donors, headquarter staff and other stakeholders.”

Real-time Data

The ability of the organization for instant access to the information that was collected was discussed amongst the organizations. This provides the advantages of monitoring the data from as far as it comes in, quality of data, as well as providing timely support if needed. The real-time data potential of mobile technology is also applicable to Divergent Images and the sensemaking characteristics of *ambiguity* and *uncertainty*. In addition, program sustainability is attributed to the speed of data received. The ability of looking at data in real-time carries a multidimensional lifesaving potential.

The speed and quality in which collected data can be useful was a requiring theme. An informant remarks on the speed and quality that mobile technology allows for, “... *We can correct some of the data errors as they happen in the field, rather than waiting for the weeks to go by and the team is back and the month has gone by and the data has been entered and then you’re stuck with the quality of the data. So really data quality is one that we’re striving for*” (Informant #6, STC). Furthermore, when the NRC first piloted mobile technology for data collection, they also remarked on the efficiency in which data was made available to decision makers. The report

reads, “Rather than waiting days or weeks for data entry, data was available to managers in real-time at considerable cost savings.” (NRC 2012 Horn of Africa and Yemen Annual Report). Reiterating the importance of real-time data with potentially lifesaving implications, an informant says, *“One of the issues when we are working on outbreaks, we want the data in real time instead of having in a week or two weeks delayed because that will delay our response. More or less, that’s my main issue. It doesn’t require many resources. It would require less people to collect the data and you get the information in real time and it is cost efficient”* (Informant #2, Norwegian Red Cross).

The ability of incorporating of real-time data can strengthen the sustainability of some projects. An informant discussed how certain country programs fell victim to slow data intake before the use of mobile technology, *“Now getting data quicker, showing our results, we are able to maintain programs over time. So I think there is a direct link between this quicker result and getting the program to run over time”* (Informant #5, NPA).

Potentials:

“And of course, the greatest potential is just to be more effective in your delivery of aid” –Informant #4 (Norwegian Church Aid)

Many potentials were discussed from the Norwegian relief organizations and written reports covering cost effectiveness, efficiency and quality data, shared understanding with other actors involved in relief, as well as the potential for two-way communication with beneficiaries. All of the potentials of mobile technology share in the main goal of a more timely and effective response by the Norwegian relief organizations.

An informant remarks on some these potentials: *“...getting better data, being able to use it more effectively, more efficient timeliness of the data, there is a lot of potential for more the two-way feedback, there is a lot more potential there”*(Informant #1, NRC)

ICRC’s 2013 World Disaster Report outlines a multi-organizational mobile data pilot project from Pakistan’s Federally Administered Tribal Areas known as, ‘IDP Vulnerability Assessment and Profiling (IVAP) project. Describing the project and advantages of mobile technology, the report writes:

... Paper was not used, so surveys could not be lost and no data entry was required. The database was set up to check for duplications automatically (when the same IDP had been interviewed more than once) and to auto-analyse the data for complex vulnerability criteria, such as female-headed households with more than four children living in a specific slum. Having this single database allowed organizations to have a shared understanding of needs (pg. 23).

Unintended Consequences/Benefits

Mobile technology providing impacting services beyond the scope of its initial implementation. It has been remarked to increase engagement and capacity development between the organization and partners. An informant remarks: “... *It wasn’t something we out to use mobile technology in order to increase engagement. It’s more we found that as a consequence. Now we’re trying to capitalize on it*” (Informant #6, STC).

Remote Monitoring and Evaluation

Mobile technology has been mentioned for its potential to assist organizations in making sense of a situation from a far. Mobile technology was also discussed as a mechanism for gathering information when access was restricted or limited. However, there is the need to analyze whatever data is collected remotely.

An informant spoke about the need for a system which enables interpretation of data remotely, “... *We need remote (data interpretation). We are looking at a system where we can sit and advise remotely. Then key persons in the world at the global level can advise on that*” (Informant #2, Norwegian Red Cross). The use of mobile technology in a remote management public health context is described in the UNDP’s ‘Mobile Technologies and Empowerment’ report: “The use of mobile phones to record, retrieve and disseminate health information is improving the quality of health care by providing health workers access to important information, including medical advice from far away experts.

This notion of remote monitoring is being tried and tested by some of the relief organizations. An informant spoke about a concrete example in Syria where the organization is not there

physically but has maintained a presence from a far, “... *Can we do something even if we don’t have access? Mobile technology has enabled us to do that. In Syria there is a lack of everything but they have a mobile connection, all communities.... So we are reaching people even if we are not there*” (Informant #5, NPA). An informant complements the last statement with an experience from remote monitoring, “*I started working with mobile technologies last year (2014) when I was working in the Syria crisis, and it required remote monitoring for everything because no, let’s say, non-Syrian project manager would be entering the project sites. So we had a lot of remote managing, and a big need for mobile technology* (Informant #4, NCA). NRC first piloted mobile technology in 2011-2012 with their work in the Horn of Africa. They published ‘2012 Horn of Africa and Yemen Annual Report’ which outlined transparency and the ability to track work from afar as a finding from the organization’s first use in mobile technology, “*Monitoring and evaluation data collection initiatives were often designed and implemented by field staff in relative isolation. The use of a cloud-based web application for managing these initiatives meant that senior managers, advisors and others can follow progress from afar and offer support and advice.*”

An informant describes an optimistic scenario for the future use of mobile technology in Syria:

“... there are certain areas where we can’t go, so we don’t know what is needed and we are not able to assess the situation. How can mobile technology help us to better help those that have been affected? I think our motivations have been growing as we’ve started to see the possibilities of what mobile technology has to offer us” (Informant #6, STC)

Contextual and Situational Understanding

It was also noted in the literature and from interviews the importance of understanding the situation or context before using mobile technology. In many ways, mobile technology can be a double-edged sword because in certain ways it can help the organization to understand the context or the situation while in others it can also draw undesired attention in certain cases.

An informant illustrates the necessity of having staff and equipment in the appropriate location: *“So we are it quite extensively to show that survey process and data collection is the most important and then when you are using operational teams and equipment you need to use them in the right place.”* (Informant #5, NPA) However, the unwanted attention of carrying perceived expensive mobile technology hardware in a crisis situation is a concern. This aspect is illustrated well: *“...when you are working the complex emergencies side of it means you’re working with a lot of dangerous situations, and a lot of vulnerable people that, perhaps, are desperate. So the higher profile and a fancier toy you get, the more that you will be subject to robberies or violence. So you have to really understand the context before just jumping into it.”* (Informant 2, NCA) Supplementing to this point of situational risk, an informant adds: *“...Another aspect of risk is that these very volatile situations and if we are sending our staff out with something that is valuable, or seen as valuable, maybe we are putting our staff at risk of theft and violence.”* (Informant 1, NRC)

Challenges:

Qualitative Data Limitations

In collecting qualitative data – the use of mobile technology has presented some challenges. Depending on the fieldwork, some answers can’t be confined to a check box. Some of the organizations expressed the challenges of data collection which reflects both quantitative and qualitative data. All five of the major Norwegian relief organizations expressed the difficulties of capturing qualitative data with the use of mobile technologies.

An informant discusses the challenges of qualitative data by stating, *“What we’re actually finding is sometimes mobile phones don’t allow you to capture the qualitative answers. Your paper form is asking a question and then you’re recording my qualitative answer. But if I was to give you a tick box answer, you’re not capturing that.”* (Informant #6, STC) Another informant compliments this challenge with further detail by saying, *“The challenge is, of course, the same side of the coin, the face that we will pigeonhole people into eight easy categories and one*

‘Other’ category. That may not be used because it’s easier just to click a preselected category, as opposed to writing an estimation of another category.” (Informant 2, NCA)

An informant expresses the unseen prospect that qualitative data could have less weight if mobile technology allows for efficient quantitative data by stating, *“If some of these tools are really effective with quantitative data and people find them really useful for quantitative data , maybe qualitative data will slip aside or become less important or maybe we collect less of it...”(Informant #1, NRC)* Reflecting on this an informant warns of premature conclusions from digital data collection by saying, *“With mobile technology you might have more fixed forms and it’s easy to kind of jump to conclusions maybe. That’s one thing that you have to factor in and do more training on.” (Informant #5, NPA)*

Infrastructure

Digital data collection is reliant on an infrastructure that provides electricity and mobile network coverage. Systems that are dependent on mobile connectivity can encounter functionality problems in intermittent connectivity or offline situations (WDR 2013). In the event of an emergency situation without consistent power sources and internet connectivity – the advantages of digital data collection will be adversely affected.

UNDP’s report ‘Mobile Technologies and Empowerment’ describes the challenge of digital data collection with mobile infrastructure problems, *“...a lack of reliable Internet connectivity and service provision can also be a challenge for mobile projects working off web-based platforms. Even if mobile networks are operating smoothly, a breakdown of Internet connection can hinder planned outcomes” (pg 35).* An informant complements this by stating, *“A lot of this technology relies on having internet connection, mobile networks; if you are outside or that you limited or blocked information. That would be the same as, that is no different than data on paper or anything but the advantages are not there if you don’t have access to the internet” (Informant 1, NRC).* Furthermore, ICRC’s 2013 World Disaster Report highlights the problems with digital data collection without a sound infrastructure by writing, *“Problems due to limitations in*

connectivity for solutions not designed to function well with intermittent connectivity or off-line.”

Experiences from the Norwegian relief agencies

Some field experiences from the Norwegian relief agencies with the use of mobile technology cover both positive and negative incidents in regards to digital data collection in the event of a complex emergency. Some of the patterned incidental trends may have been referred to in the previous subsections of this chapter.

The Global Education Cluster co-led by Save the Children conducted a sector needs mobile data collection project in Mali in 2014 and produced a ‘lessons learned’ document. Among the challenges/constraints of the project included some technical software issues, hardware limitations, and cultural impact of the project. This report ‘Cultural impact of mobile data collection’ from Kidal, Mali describes some cultural barriers that mobile technology posed, “...*the collection of data via cellphone created a sense of alienation among target communities. To reduce concern, key informant interviews were first conducted via paper surveys, and later transferred to Magi (software platform) via mobile in mobile in a private setting.*” Further illustrating this point of cultural barriers, an informant said: “... *you don't want to have a barrier between your survey taker and your enumerator and your beneficiary. So if a piece of paper and a pen break down a barrier, it's better to have a piece of paper and a pen. If it's acceptable and usable and not threatening to have the mobile device, then you can do it that way*”(Informant #4, NCA).

An informant illustrating a challenging situation when health data/information wasn't shared in Darfur, Somalia : “... *In one of the areas that was most heavily bombed, you had three health clinics that set up. They didn't necessarily share the data between each other, so in a sense, they weren't making the most informed decisions about who they were providing medicine to, how often they provided it. The result was that children were receiving double the vaccinations that they needed*” (Informant #6, STC). Complementing this issue of data duplication from another

perspective, an informant says: *“We see a lot of duplication of data, so when different organizations are reporting, it is difficult to get the right picture. Especially for us, we want to measure what is the base level in that country and where is the end state?”* (Informant #5, NPA)

There are also instances when too much data becomes a concern. For example, when Typhoon Haiyan struck in 2013 and devastated parts of the Philippines in 2013-- the international humanitarian response to the complex emergency performed a myriad of assessments. An informant commented, *“How much duplication of data was happening? All that data and all that information was getting shared, so people were in a sense, overloaded”* (Informant #6, STC).

Cost Saving

NPA informant: *“...for us it actually very cost saving because data collection itself, sending people out is expensive and having to go back and recollect information...one thing, it is difficult because things have changed so much that is difficult to get the base line that was there before”*

Informant from NPA: *“... What we want to do is to get the information more directly from the field to the end user of that data. We need to update multiple stakeholders. Working in any country, we have obligations to report to the state party or national authority for our work.”*

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to enforce the use of certain software. With mobile tech it has been the opposite, where people have wanted to use it because it makes their lives easier, saves them time, it improves the quality of the data that they are getting.

6.0 Discussion

Based upon the theoretical framework provided in the 3rd chapter, one could expect the diffusion and implementation of mobile technology in the Norwegian relief sector to be consistent with the processes described. By looking at the potentials and challenges of diffusion in the first section, and then the potentials and challenges of implementation in the second section – directed at solving the research problem: *What are the key potentials and challenges in the implementation and diffusion of mobile technologies for the Norwegian NGO relief sector?*

Overall, this section will look at the empirical data gathered from the last section in light of the theoretical framework to assist in answering my posed research questions:

1. *What are the uses for mobile technology amongst the different actors?*
2. *What have been the experiences of mobile technology in the organization's work?*

6.1 Diffusion of mobile technologies – potentials and challenges

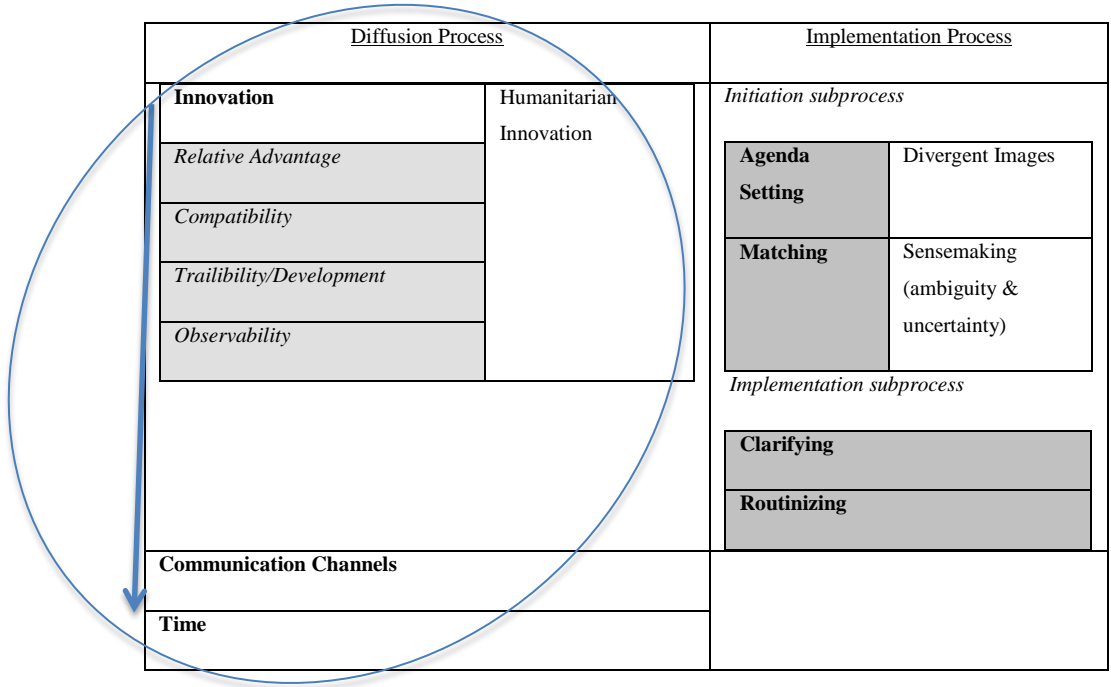


Figure 5: Theoretical framework: Implementation process (miniature)

As outlined in the third chapter, my diffusion framework is comprised of interconnected elements including: the innovation (mobile technology), communication channels, and time. (Rodgers 2003). Each of these elements have their own attributes in their composition.

The Innovation of Mobile Technology

Mobile technology as a standalone innovation is widely recognized but its use within the Norwegian relief humanitarian sector is relatively new. The potential of mobile technology to provide solutions to the problems of the sector is still being explored. Through the interviews with the five agencies, I will first establish mobile technology as an innovation within the humanitarian context of data collection. The four characteristics of an innovation from my theatrical framework include: relative advantage, compatibility, trialability, and observability.

For the humanitarian sector, data collection has historically and universally been completed by pen and paper. Mobile technology as a method of collecting data is widely remarked as a *relative advantage* over pen and paper. Digital data collection is seen as faster, more accurate, easier to share, and has improved oversight capabilities for management. An informant from NCA reflects on these advantages by saying: “We want to save time, energy, and money. So we do that by collecting things and getting them immediately digitized and ready for analysis. And we don’t have to wait for someone to input this information in a digital way. So it’s basically time, money, and energy.”

The mobile technology is seen as *compatible* within the sector’s data collection work is largely agreed to. The cases of incompatibility primarily came from the environments in which they were used and less the systems themselves – due to negative perception of the beneficiaries or safety concerns for the staff. In either case, switching back to collecting the information ‘the old way’ -- by pen and paper – is always compatible.

All of the respondents noted that their respective relief organizations have at least piloted (or experimented) with mobile technology with successful results to support Rogers’ theory that argues that innovations have to be tried and observed to be accepted and implemented (Rogers, 2003). Thus *Trialability* and *Observability* are the last two attributes for an innovation. Trialability is degree to which mobile technology (the innovation) may be experimented with on a limited basis (Rogers 2003). In addition, most of the organizations have initiated or are working towards incorporating mobile technology as a standard tool for their data collection work. The successful trialability of mobile technology within the organizations’ work has been observed. The instances of unsuccessful trialability came in some of the early pilot tests of mobile technology in the field. An informant expresses these initial difficulties by saying, “*In 2004 we did a pilot in South Sudan with tablets and so on, but then you have to develop a tablet yourself. It was expensive. So did that and then it was a not a success.*” (Informant #5, NPA)

As a result of the positive results of mobile technology, the Norwegian relief sector is working toward further incorporation of it. The observability of these results makes it more likely for these organizations to adopt the use of mobile technology in the field (Rodgers: 2003). An informant supplements this element of observability by saying, “... *I think when I show people the things that we have done so far, they’re really like “wow, you do all this?” and they’re really excited. So hopefully this will be opening people’s eyes for the mobile technology.”* (Informant #5, NPA)

Innovations that highlight a successful alignment of these perceived four elements are considered to be adopted more rapidly than other innovations (Rodgers, 2003). All of the elements regard mobile technology as an improvement over the traditional methods of data collection which solidifies its standing as an innovation within the major Norwegian humanitarian relief sector. With mobile technology regarded as an innovation, the diffusion process is completed with the ‘communication channels’ and ‘time’ elements.

Communication channels

The essence of the diffusion process is the information exchange through which one organization communicates a new idea to one or several others (Ibid, 2003). The information exchange of mobile technology came from within the Norwegian relief sector, and from the experiences from other humanitarian organizations. The Norwegian relief organizations expressed inspiration and support from each other, actors within the UN system, and from other organizations to incorporate mobile technology into their data collection toolboxes.

Time

The time dimension is difficult to quantify amongst the five relief agencies. In the *innovation-decision process* which the time it takes from first knowledge of the innovation to the decision to adopt or reject the innovation – this process happened rather quickly amongst the five organizations (Ibid., 2003). “First knowledge” of mobile technology amongst the organizations cannot be quantified but the first piloted use can be. From the first pilot tests of mobile

technology, the trend for the relief sector as a whole was rapid expansion for the use of mobile technology for digital data collection (*the innovation*).

6.1.1 Summary of Diffusion of Mobile Technology

The diffusion process is comprised of three central elements: the innovation (mobile technology) constructed of four sub-elements, communication channels, and time. The use of mobile technology for digital data collection is easily recognized as a humanitarian innovation based upon the perceptible benefits of the sub-elements of relative advantage, compatibility, trailability, and *observability*. The last two elements of the diffusion process: communication channels, and time – continue to illustrate the rapid diffusion of mobile technology within the major Norwegian relief sector. However, since mobile technology is still a relatively new humanitarian innovation within the Norwegian relief sector – many of the challenges have yet to surface.

6.2 Implementation of mobile technology: potentials and challenges

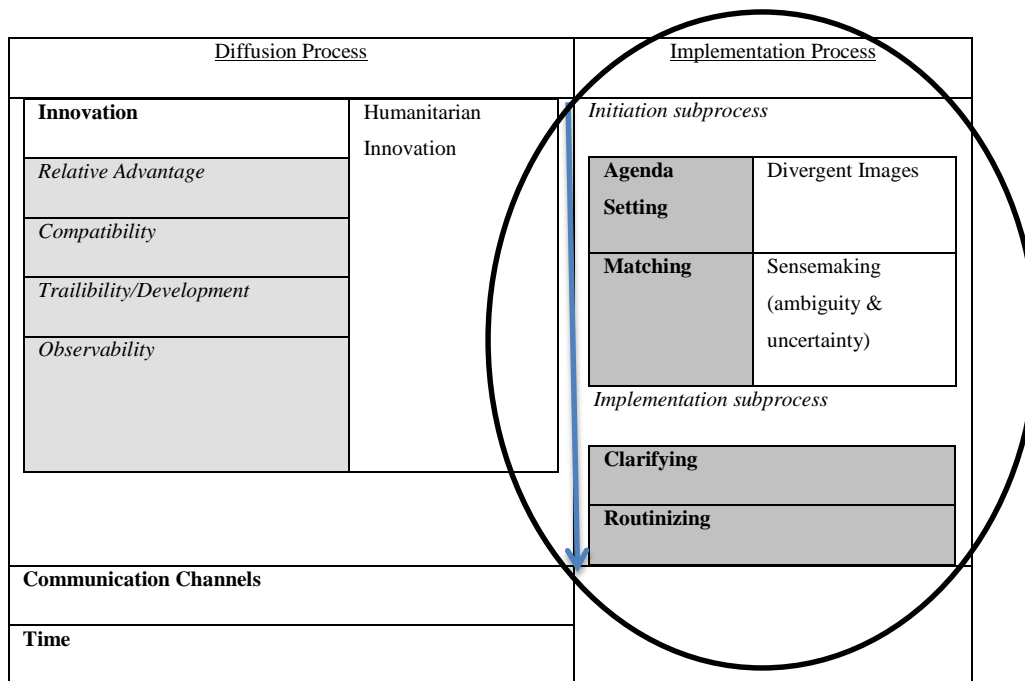


Figure 6: Theoretical framework: Implementation process (miniature)

The implementation of mobile technology in the Norwegian relief sector has seen both potentials and challenges. Following the implementation theoretical model presented in the 3rd chapter, I will present some of the findings that the sector has faced thus far. From my theoretical framework, the process will be outlined in the following the stages: *Agenda-setting*, *matching*, *clarifying*, and *routinizing* stages.

6.2.1 Agenda-setting and matching

The agenda-setting and matching stages represent the first two stages in the *initiation* process before the beginning of the formal *implementation* process. The initiation process consists of “all the information gathering, conceptualization, and planning for the adoption of an innovation, leading up to the decision to adopt the innovation and the *implementation* process.

In the context of agenda-setting, there are several organizational problems that create a perceived need for mobile technology. A common theme throughout the interviews was the need for information to be collected, and shared as quickly as possible. Mobile technology offers data to be collected and shared in ‘real-time’, which became a recurring theme. Cost and energy efficiency is another repeated benefit that came from both written and interview sources. However, Rogers (2003) writes, “sometimes knowledge of an innovation, rather than the recognition of a problem or need by an organization leading to search for a solution, launches the innovation process”. This knowledge of mobile technology for data collection started the innovation process for the Norwegian relief organizations as opposed to a “recognition of a problem or need”.

Different images of decision making in relief work

<u>Formal</u>	<u>Actual</u>
Allegiance to distant supervisors and higher-order goals	Dissociation from distant supervisors Higher-order goals less critical
Adherence to procedure and protocol	Drift from procedure and protocol

Deference to hierarchy and structure	Deference to experience and resource access
Constrained by national and organizational boundaries	Improvisation across boundaries

Figure 7: (Adapted from Dekker and Suparamaniam) miniature

Dekker & Suparamminam (2005) offer the perspective of ‘divergent images’ between formal decision making procedures and actual decision making in the field. Mobile technology helps to bind this divide in a number of ways. With the capability of real-time and remote monitoring – the likelihood of similarity between actual decision making and formalized procedures is greater by helping distant decision makers convey the essence “being there” (Ibid.). Mobile technology allows for distant supervisors have a closer connection to work in the field through the linkage of the data (GPS, video, and photo). In addition, the potential of mobile technology to extend beyond national and organizational boundaries have not yet been realized. However, the ease of collecting data with mobile technology can contribute to a data overload for the decision makers afar.

In the context of matching, there are reoccurring problems from the organization’s agenda that fit well with mobile technology. These perceived needs largely mirrored those of the agenda-setting stage. Within a complex emergency, the five organizations expressed various problematic situations where aiding the beneficiaries / the affected is complicated by a multidimensional set of factors. Some of these factors include (but are not limited to): uncertainty and ambiguity (sensemaking) of the complex situation, access and logistical concerns, and coordination amongst the various the actors who are trying to provide timely relief to the affected. As mentioned before, mobile technology addresses some of these concerns by contributing to real-time data collection, data quality, remote access in certain situations, and timely data analysis and dissemination. Mobile technology can positively contribute to sensemaking of uncertainty when organizations are unaware of any interpretations but can contribute negatively to ambiguity because it can lead too many interpretations of the data because of the ease of collecting data. Nonetheless, it is important to not to overgeneralize situational contexts when they are often different. An informant comments on this by saying, “*You can easily compare a country to*

another country which is not relevant. I think the challenge is that sometimes people are comparing across countries and that can be a bit dangerous. You have to compare to the same setting” (Informant #5, NPA).

6.2.2 Clarifying and Routinizing

The clarifying and routinizing stages marks the transition from the *initiation* process to the beginning of the *implementation* process. The clarifying process is when the relationship between the use of mobile technology for data collection and the Norwegian relief organization is more clearly defined (Rogers, 2003). Each of the five relief organizations is still at various junctures of clarifying their relationship with mobile technology. For example, the informant at NRC explains how their organization is working to clarify their relationship throughout the organization by developing a set of standard tools that can be used across the organization. This need for standard standardization is grounded in the challenges of using different mobile technology solution in the 26 countries where the organization works. An informant remarks that standardizing a working tool within the organization can make the implementation more effective and efficient by stating, “...if we have a standard set of tools, then we create guidance, we can do training packages, we can support on implementation a lot more effectively and efficiently. So that’s the goal this year, to identify a set of standard tool kit of technologies that we use in different circumstances and for different purpose that we would use across the organization.” (Informant #1, NRC)

Routinizing marks the final stage in the implementation of mobile technology when it becomes a normal part of the organizational work, and loses its identity (Ibid., 2003). The implementation process is successfully completed when mobile technology (the innovation) has “lost its separate identity” (Rogers., 2003). Collectively, the Norwegian relief organizations express a confidence that mobile technology will soon be a normal part of the information and data collection process. This view is reflected well by the informant from the NRC,

“I think mobile technology for some of our standard project monitoring, can just be standard. I think we are going to be that everywhere. There are too many advantages and efficiency gains for us, not to be. The technology is cheap and accessible – and cases the software is completely free. The devices cheapened and so widespread now that even in the worst places that we work, people don’t look twice if it’s a mobile device – they are just used to them. I think just as part of our standard data collection, I think that is just there for the future.”

However, mobile technology has not completely lost its identity amongst all the actors in the Norwegian relief sector. An informant remarks: *“What we’re doing our doing in our department, at least – in the emergency response department – is working on making the mobile technologies a staple, instead of the exception.”* (Informant 4, NCA)

Summary of Implementation of Mobile Technology

The implementation process of mobile technology is comprised of: *agenda setting, matching, clarifying, and routinizing*. Within the major Norwegian relief sector, mobile technology has worked through the first three stages of implementation (*agenda setting, matching, clarifying*) with both recognizable potentials and challenges throughout. Mutually, the major Norwegian relief sector is very optimistic and foresees a near future where mobile technology is a routine aspect of information and data collection. Nevertheless, there is some organizational structural work needed until mobile technology loses its foreign character and becomes standardized. Until then, mobile technology lacks full implementation within the major Norwegian relief sector. As a result, some of these potentials and challenges of implementation haven’t yet been fully realized.

7.0 Conclusion

What are the potentials and challenges in the diffusion of mobile technologies for the Norwegian NGO relief sector?

The diffusion of mobile technology for data collection within the major Norwegian relief sector is built upon the theoretical framework offered by Rogers (2003). I analyzed the components of humanitarian innovation, communication channels, and time. Throughout the course of this thesis, mobile technology has been established as a humanitarian innovation illustrated by the benefits of the subparts of the theoretical framework.

The mobile technology hardware and software components are continually evolving and becoming cheaper for the Norwegian organizations to incorporate in their humanitarian relief toolboxes. Additionally, mobile technology is rapidly diffusing within the developing world making digital data collection increasingly less unfamiliar, which gradually breaks down existing cultural barriers. Moreover, the diffusion of mobile technology to the Norwegian relief sector has been encouraged by the use of within the UN system and amongst other relief organizations. However, the true potentials of the diffusion of mobile technology for data collection are not yet realized. The potential of mobile technology to harness and foster an improved two-way communicative relationship between relief organization and beneficiary is looming.

The challenges of diffusion of mobile technology within the Norwegian relief sector derive from a few different reasons. There are administrative considerations -- the initial costs of setting up and maintaining mobile technology for data collection and also contextual considerations of a complex emergency. A complex emergency is demarcated by dissimilar and often chaotic characteristics from place to place. Therefore, it can be challenging for the relief organization to be reliant upon a new system or method for gathering information – especially when there are many different mobile technologies to choose from.

What are the potentials and challenges in the implementation of mobile technologies for the Norwegian NGO relief sector?

Similarly to the diffusion process, the implementation theoretical framework was built upon a modified version of Rodgers (2003) that also incorporates two organizational sensemaking elements of Weick (1995) and Decker and Suparamaniam's 'Divergent images of decision making in international disaster relief work' (2005). Although, mobile technology for data collection haven't been fully implemented within the Norwegian relief sector. However, certain potentials and challenges arise to the surface through the four processes of the implementation process.

Mobile technology for data collection makes the current organizational methods for collecting data more efficient and effective by improving the quality of the data, linking different types of data together, allowing for faster analysis and dissemination of the results. However, mobile technology is not a solution that is effective in all situations and in all places. It is most effective with the quantitative data and less so with qualitative data. One of the biggest challenges of digital data collection is makes the data collection process so easy that it can create an excess of data which becomes difficult to analyze, respond to and finding the significance of the data can be lost in the muddle. These challenges are compounded by the disordered qualities of a complex emergency which include many different actors with overlapping and at times competing agendas. However, these challenges would exist with or without digital data collection but mobile technology still contributes to a more efficient and effective manner of collecting data.

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Appendix 1: List of informants

#	Department	Organization
1	Monitoring and Evaluation	Norwegian Refugee Council
2	Public Health and Emergency	Norwegian Red Cross
3	Emergency Response	Norwegian Church Aid
4	Emergency Response	Norwegian Church Aid
5	Humanitarian Disarmament	Norwegian People's Aid
6	Information and Knowledge Management	Save the Children International

Appendix 2: Interview guide

Background Info

Could you please tell me your name, position, nature of work/organization?

Data Collection

What types of data is your organization most interested in collecting in the field?

Why is that information important?

Is there any data/information that mobile tech allows for, but isn't currently collected that could be beneficial for the organization? (audio, video, photos, GIS, etc)

Mobile based technologies

What kind of problems does your organization aim to solve with the use of mobile technologies?

How has mobile tech served to solve these problems?

Can you describe the compatibility of mobile technologies within previous organizational methods and systems of collecting data in the field?

Have the use/implementation of mobile technologies amongst other relief organizations provided inspiration in your organization's adoption? If so, how?

How have mobile technologies evolved within your organization's work in the last few years?

What are the *key potentials* and *challenges* of data collection using these mobile technologies in the event of a complex emergency?

Affected populations (beneficiaries)

How does the use of mobile technologies influence your mission to serve affected populations?

Are there ways in which affected populations (beneficiaries) are able to influence the way the use/implementation of mobile technologies in the field?

Crisis Management

Who are responsible for determining which technologies are used in the field?

What is the relationship between these decision makers and the end users of the technology?

What are the key potentials and challenges of “interpretation” of the data using mobile technologies in the event of a complex emergency? Can you speak on the perspective of the end user? Agency/Headquarters?

What are the key *potentials* and *challenges* of dissemination of the results from the data collection using mobile technologies?

After the information/data that is collected and analyzed -- how exactly is it used/shared? (amongst different agencies, clusters, donors, implementing partners, affected populations (people of concern))?

Future Vision

How do you envision the role of mobile technologies within your organization in the future?