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Use of Mobile Telephones: Experiences of First Responders in Rural African Communities

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Abstract

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MS, Walden University, 2017.
MSc, University of Ibadan, 2007
BAEd, Njala University College, University of Sierra Leone, 2001

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Emergency medical technicians (EMTs) usually participate in disaster response in rural African communities. Disasters in African communities are often characterized by huge fatalities, which are associated with a slow pace of response. The use of information and communication technology in disaster response is recognized as an effective conduit for enhancing response. Previous research indicates the efficacy of the use of mobile telephones in disaster response in advance countries. However, there remains a critical gap in available literature on the experiences of EMTs with the use of mobile telephones in disaster response in rural African communities. The purpose of this generic qualitative study was to explore the experiences of EMTs with the use of mobile telephones in disaster response in rural African communities. The innovation diffusion theory served as the theoretical framework of the study. Data were collected through face to face, semi structured interviews with 10 EMTs from 2 institutions in Sierra Leone. Data were analyzed with the use of Nvivo. The findings of this research include (a) The key areas in emergency response where mobile telephones are most useful; (b) The benefits of the use of mobile telephones in disaster response, including the enhancement of communication and search and rescue efforts; (c) Challenges to the use of mobile telephones; and (d) Ways to improve the use of mobile telephones. The results of this study may enhance positive social change through contribution to the reduction of fatalities usually associated with slow disaster response. It is recommended that future research be conducted on the experiences of other categories of first responders, and to explore alternative funding sources for disaster response in rural African communities.

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Dedication

This project is dedicated to God almighty. To my Mom, my brothers and sisters both home and abroad, my three boys and spouse who stood by me through thick and thin and provided the requisite support that kept me focused throughout this academic voyage. I remain deeply indebted to all of you for your indescribable support and my gratitude to you is immeasurable. I love and thank you from the depth of my hearth.

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I am deeply appreciative and indebted to Dr. Scotten my second Committee member who doubled as my methodologist. The indescribable guidance and motivation received from Dr. Scotten contributed immensely in shaping the methodology that was used for the conduct of the study.

I remain appreciative to my mom, my three boys, my brothers and sisters both home and abroad, my spouse, friends and colleagues for the encouragement and support

they provided in diverse forms, all of which aided my sustained determination and energy that brought me to the end of the dissertation journey.

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Chapter 1: Introduction to the Study

Introduction

Emergency medical technicians (EMTs) are among the categories of first responders participating in disaster response in rural African communities (Mould-Millman et al., 2017). Disasters in rural African communities are often characterized by a high number of fatalities, which are largely underpinned by the slow and ineffective rate of response to the incidences of disasters, when they occur (Li, Chai, Yang & Li, 2016). The use of information and communications technology (ICT) in disaster response has been recognized as a principal conduit for improving disaster response and subsequently lowering the negative impact of disasters when they erupt (Kakar & Mustafa, 2015). Mobile telephones are part of the ICT platforms used by EMTs in executing disaster response.

Studies have been conducted on the use of mobile telephones in disaster response in developed countries. Cinnamon, Jones, and Adger (2016), Perez, Popadiuk, and Cesar (2017), Majchrzak, Markus, and Wareham (2016), Madhavaram, Matos, Blake, and Appan (2017), and Hu and Kapucu (2016) have all conducted studies on the factors that affect the use of ICT in disaster response. All the highlighted studies were deficient in information relating to the experiences of first responders on the use of mobile telephones in disaster response, particularly in rural African communities. Despite the extensive review of literature conducted, I was unable to find any literature that describes the experience of EMTs with the use of mobile telephones in disaster response in rural African communities.

In this study, I used a generic qualitative approach to explore the experiences and perceptions of EMTs with the use of mobile telephones in disaster response in rural African communities. The results of the study may contribute to the body of literature on addressing the high rates of destruction of lives and property associated with slow emergency response to flood disasters in rural African communities.

This segment covers the study background, problem statement and a brief description of the purpose, nature and significance of the study. The research question is identified and the theoretical framework that underpins the study is also indicated. A definition of some key terms is provided. The assumptions, limitations, delimitations of the study, significance of the study and the implications for a positive social change are all covered under the province of this chapter.

Background

Several articles are related to the experiences of EMT's serving as first responders, and their use of mobile telephones as ICT in disaster response. The following articles have been selected as they are related to the study. The inquiry was conducted in rural communities in one of the low-income countries in West Africa. Thus, articles that similarly support major themes of the study were also selected, these articles are summarized in the following paragraphs:

Perez et al. (2017) conducted a study with the purpose of identifying the key internal factors that affect the adoption of technological innovation in healthcare. The study population included users of electronic health records, physicians, administrators, nurses, and technicians. Perez et al. used a quantitative methodology that employed

multivariate statistical technique of structural equation modeling. The results of the study indicated that innovation can contribute effectively to the adoption of technology and that the proposed model also served to evaluate the results achieved with the adoption of this technology. This article was useful for my study as it provided guidance on the factors that affect the spread of technological innovation and how innovation can contribute to adoption of technology by first responders.

Majchrzak et al. (2016) discussed the role of ICTs in a wide range of major societal challenges, including employment, climate, health, and human migration. Users of ICT in various fields were used as the study population. Secondary econometric analysis was the methodology adopted for the study. The results of the study indicate that researchers in the field of information system research should expand the definitions of theories and problems, explicitly define the ICT artifact in both broad and specific way, change should consider emergent digital designing as a replacement for organizations. The study report was useful to my research because the article identified some of the lessons and societal challenges that affects the use of ICT in developing countries.

Madhavaram et al. (2017) attempted to identify the role of ICTs in preparation for and management of human and/or nature induced disasters. EMTs constituted the study population. The methodology employed included a review of prior research and successful case studies. The study found out that a new ICT platform, known as E711 text (message mobile phone service), was identified as one that could contribute to disaster management and prevention especially for poor and developing nations and that there are tremendous opportunities to develop new ICTs in the context of disaster

management. This study report relates to my inquiry in that, it identified alternative technologies that could be used in disaster response.

Hu and Kapucu, (2016) examined how organizational representatives perceive ICTs in communication and coordination with other organizations and investigated whether the centrality of organizations in emergency management networks is related to ICT use. The study population mainly included heads of organizations engaged in emergency preparedness and response. The methodology included a quantitative approach. The results of the study indicate that, though key organizations in emergency preparedness have high level of ICT use, ICTs are highly underused by central organizations in disaster response networks. This article relates to my topic as it provided a description of how organizational heads perceive ICT in communication and coordination, it provided information on how organizations align ICT with organizational goals, and identified alternative ICT platforms that could be used in disaster response apart from mobile phones.

Conrado, Neville, Woodworth, and O'Riordan (2016) explored the purpose of creating a social media message verification framework to support emergency stakeholders' decision-making processes during the response phase of any emergency. The study population included emergency management stakeholders. Quantitative methodology was used. The results of the study indicated that research is in progress for developing a verification framework – for all emergency stakeholders – to support their decision-making process by managing social media uncertainty during emergencies. The results further indicated the key challenges associated with the use of ICT to support

decision making during emergency operations, and clearly delineated the differences and similarities between the challenges faced by executives based on context. This article was useful for my study as it highlighted some of the generic challenges faced by executives in the use of information and communications technology during emergencies.

Kabra, Ramesh, Akhtar, and Dash (2017) examined the technology adoption behavior of humanitarian organizations. With the use of quantitative analysis, the results that emerged from the study indicated that out of the four constructs: performance expectancy, effort expectancy, social influence and facilitating conditions, under UTAUT - performance expectancy and effort expectancy significantly affect the ITC adoption. This article relates to my study as it highlighted some of the common factors that influence the adoption of ICT for use in disaster response.

Ivanova and Gallasch (2016) conducted a horizon scan for combat service support and analyzed global trends in seven areas of technologies of interest. The study population included users of ICTs in various institutions. A quantitative approach with the use of secondary data was the methodology employed. The study results indicated that there are new trends and technologies that can have disruptive effects on military operations. The results further indicated that CubeSats or small satellites are emerging ICT platforms that are cost effective, efficient, and easy to deploy in disaster response in various contexts. This article is related to my study as it identified some of the alternative technologies that are cost effective and efficient to use in disaster response in low income rural African communities.

Haataja, Hyvärinen, and Laajalahti (2014) explored citizens' communication habits and use of information and communication technologies during crises and emergencies. Community members in selected disaster-prone areas constituted the study population. Qualitative methodology was adopted with data gathered through focus group discussions. The results of the study indicated that citizens consider emergency communication to be mostly unidirectional: from authorities to the public. This article is related to my study as it provided some perspectives to the habits of citizens towards the adoption and use of information and communications technology.

Tang, Pongpaichet, and Jain (2016) enquired about using cybernetic principles combined with multimedia technology. Their study aimed at developing effective frameworks for using diverse multimedia data for situation recognition. The study population comprised of stakeholders in disaster management and users of multimedia. With the use of quantitative analysis, the results of the study indicated that an emergency management problem is fundamentally a multimedia information assimilation problem for situation recognition and for connecting people's needs to available resources. The results further highlight some of the commonly used personal technology that could be used in enhancing communication during disaster response. This article was useful for my study as it identified some of the technologies that could be easily developed and used in disaster response.

Murthy and Gross (2017) investigated the use of social media technology during disruptive events. With first responders constituting the study population, and quantitative approach used as methodology, the results of the study indicated that social

media use during disruptive events is complex and understanding these nuanced behaviors is important across the social sciences. The results further indicated that social network tools, especially online social networks, could be used as ICT platforms to aid preparedness and communication during disaster response. This article is related to my study as it identified several technologies that could be used to aid various activities in disaster management.

Problem Statement

The strategy of integrating ICT in emergency response has gained recognition as a critical canal for reducing the negative effects of disasters at a moment when the international community noted the increasing fatalities emanating from flood disasters in especially rural African communities (Hassan & Ayub, 2015). Disasters in rural African communities often cause loss of life and property, injuries, and the spread of diseases, the severity of which are largely associated with slow response (Haataja et al. 2014). In 2016, the International Organization for Migration (IOM; 2016) noted that there was a sustained upward trend in the number of fatalities associated with flood disasters. Part of the reasons ascribed to this trend is the slow response and inadequate use of ICT in response. From an aggregate of 172 countries, for the period 2005 to 2015, the Internal Displacement Monitoring Centre (IDMC) in its 2016 Global Report on Displacement, noted an average of 25.4 million displacements emanating from disasters, such as Hurricane Katrina in the United States, the 2008 Cyclone in Nargis, and the 2010 earthquake disaster in Haiti. All of the aforementioned disasters recorded huge fatalities due to the weak feedback and response systems that were in place, and the inability of the

affected communities to effectively ensure that lives and property were saved immediately after the occurrence of the disaster (IOM, 2016). The integration of ICT such as mobile telephones in disaster response has therefore been recognized as one of the principal conduits for reducing the global statistics on the negative effects of disasters (Hassan & Ayub 2015).

Several studies have been conducted on the efficacy of the use of ICT (particularly mobile telephones) in disaster response in advanced economies (Kakar & Mustafa 2013; Alexander, D. E. 2014; Tufail, 2015; Haataja, Laajalahti, & Hyvärinen, 2016). Despite the extensive reviews and readings that was conducted, I found no literature that examined the experiences of EMTs serving as first responders using mobile telephones in responding to disasters in low income, rural communities in Africa.

Purpose

The purpose of this generic qualitative study was to explore the experiences and perceptions of EMTs using mobile telephones as key ICT in responding to disasters in low income, rural communities in West Africa. Understanding the experiences and perceptions of EMTs may provide some insight into the use of the technology in the various phases of disaster response, as well as the advantages, disadvantages, and challenges associated with the technology. The findings from this study may contribute to the existing body of literature on the use of mobile telephones in disaster response and also contribute to highlighting possible areas for further studies.

Nature of the Study

The study followed a generic qualitative approach. The research question focused on assessing the experiences or perceptions of EMTs in the use of mobile telephones as first responders during disaster response in low income, rural African communities. My selection of the generic or basic qualitative inquiry was based on the consideration that this approach interrogates peoples' account of their subjective opinions, beliefs, attitudes, and retrospection on their experiences. Kennedy (2016) noted that, with a generic qualitative approach, the researcher is not bound to follow specific methodological framework, it embraces methodologies without limitations. The fact that the inquiry is anchored on the subjective opinion of EMTs in the use of mobile telephones, while executing their duties as first responders during all the major activities of flood disaster response in rural communities in Africa, underscored the appropriateness of the approach for this study.

Research Question

What are the experiences of EMTs with the use of mobile telephones in low income, rural African communities?

Theoretical Framework

A theoretical framework is anchored on existing theories and encapsulates the results of diverse investigations on a particular phenomenon (citation). It therefore provides a general description of linkages among items in a phenomenon and provides direction for the purpose of a study. Roger's (year) innovation diffusion theory (Kasperavičiūtė-Černiauskienė & Serafinas, 2016) described how an idea or product

gathers momentum and diffuses. When promoting an innovation, it is critical to understand the characteristics of the adopters. Franceschinis et al (2017) indicated the typologies of adopters as including (a) the innovators, (b) early adopters, (c) early majority, (d) late majority, and (e) laggards. Scarbrough and Swan (2016) listed five key factors that influence the spread of technology: (a) compatibility, (b) complexity, (c) relative advantage, (d) trialability, and (e) observability. Scarbrough and Swan further opined that any technology that exhibits all the five factors will have a high rate of spread and use. If an ICT equipment t provided for use during disaster response happens to be complex or difficult to operate, in addition to its being incompatible with the norms and social values of the user community, Scarbrough, & Swan noted that the acceptability and effectiveness of the said technology may be questioned. The experiences or perception of users of technology are largely influenced by the characteristics of the technology and the pace of adoption of the technology by the users. The experiences and perceptions of EMTs using mobile telephones in the discharge of their functions as first responders in emergencies are largely influenced by the level of adoption of the use of mobile telephones and the characteristics of the mobile telephone based on the five characteristics highlighted by Scarbrough and Swan. Hence, the innovation diffusion theory has a strong nexus with my study as it underscores the linkage between experience of users and the spread of technology. I selected this theory to provide the theoretical framework that underpinned the conduct of this study. One of the key strengths of the theory is that it clearly underscores the critical factors that can either enhance or impede

the spread of technology, it therefore illuminates the factors with the propensity to affect the diffusion of technology. (Scarbrough, & Swan, 2016).

Definition of Key Terms

Several terms were used in this study. In this section I provided definitions for some of the key terms that were used in the study.

Disaster: Disaster basically denotes any event either natural or induced by human activities, which threatens human lives, damages public and/or private property, and infrastructure and disrupts the social and economic life of the people within the affected area (Tambo, 2017)

Disaster Response: Disaster response is defined as any action taken immediately after the occurrence of a disaster to save and protect life, reduce suffering among victims and survivors and protect property and infrastructure (Dumbuya, & Nirupama, 2017). Hamer, Reed, Greulich, and Beadling (2017) noted that disaster response encompasses the dissemination of disaster alerts, search and rescue, care and maintenance of survivors.

Emergency Medical Technician (EMT): EMTs are a group of health workers (paramedics, doctors, nurses etc.) that treat victims or survivors of disasters (citation). EMTs could be drawn from nongovernmental organizations (NGOs), government, international NGOs such as the International Red Cross, community volunteers, and militaries (World Health Organization, 2016).

First Responders: First responders are the first set of professionals who usually appear in the area affected by a disaster (Alexander, 2014). They are the first set of people who interact with survivors, affected persons, or witnesses often before the arrival

of hospital emergency personnel, civil society organizations, or government functionaries (Harris et al., 2018).

Generic Qualitative Approach: The generic qualitative approach is a research approach that is not guided by an explicit or established set of philosophic assumptions in the form of one of the known qualitative methodologies (Percy & Kostere, 2015). The approach does not claim any particular methodological viewpoint (Percy, Kostere, & Kostere, 2015).

Hydrometeorological disasters: are caused by extreme meteorological and climate events, such as droughts, floods, tornadoes, hurricanes, severe storms, mudslides or landslides. They account for a substantial proportion of the natural disasters in most parts of the world. Each of these disasters have the capacity to cause fatalities and infrastructure damage (Dumbuya, & Nirupama, 2017).

Information and Communications Technology (ICT): ICT is a terminology that encompasses a wide range of applications, tools, and systems used for inputting, editing, storage, analyses, retrieval, synthetization, processing, and sharing of data in various forms (citation). ICT includes television, radio, broadband, mobile / cellular telephones, satellite, computer software and network hardware, portals, websites, satellite systems, and remote sensing and many similar platforms, as well as the myriad of associated services and applications including audiovisual-conferencing, data storage, analysis, and integration (Nath & Liu, 2017).

Mobile Telephone: A mobile telephone is a technology that operates through the linkages of a network of transmission towers which conveys signals from one point to

another via the towers (citation). Individual mobile phones are uniquely identified through SIM cards belonging to specified networks (Owusu, Yankson, & Frimpong, 2018).

Assumptions of the Study

Research assumptions entail the basic segments of a research study that are presumed as truthful, though not based on or backed by proven evidence (Liao, & Hitchcock, 2018). I remained fully aware of my research assumptions throughout the study and ensured that they did not influence the results of the study. In my exploration of the experiences of first responders using mobile telephones as ICT in disaster response in rural African communities, my research assumptions included the following:

- The target participants in the study meet the selection criteria.
- Participants will be willing to participate in the study, share their in-depth experiences, and respond sincerely to all questions.
- The participants in the interviews and focus group discussion will be able to fully understand the questions and will provide honest responses that convey their beliefs.
- The questionnaires and guide for the focus group discussion would enhance the acquisition of data needed to respond to the research questions.
- All information that will be elicited from participants will be an accurate and consistent reflection of the viewpoint of each respondent.
- The sample size will be enough to secure reliable data for drawing conclusions

Scope and Delimitations of the Study

The study was restricted to a subsegment of EMTs from two institutions in Sierra Leone with a mandate to support disaster response operations, this included the responsibility of providing personnel serving as first responders in disaster response in Sierra Leone. The objective of the study was to explore the experiences of EMTs with the use of mobile telephones in disaster response in rural African communities. The choice of a sample size of eight to 12 participants was considered adequate for the conduct of a generic qualitative design. I used a purposive sampling strategy for the study.

With regards to delimitations, the following boundary lines were established. The study participants did not discuss their experiences with the use of other ICT platforms other than their experiences and perceptions with the use of mobile telephones in disaster response. The participants and I did not look at the shared experiences of other categories of first responders apart from EMTs. Hence, it was noted that there is need for further research to be conducted with other categories of first responders such as police officers or firefighters to ascertain their experiences with the use of mobile telephones to capture a wider and comprehensive reflection of the experiences of first responders.

Limitations of the Study

Limitations of a research often identify the intrinsic exceptions or reservations of the study (Liao & Hitchcock, 2018). They largely point out the potential weaknesses of the study. Data gathered from the study is not characteristic of the entire populace of first responders in rural African communities. My biases as researcher and perceptual misrepresentations were identified as potential limitation (see Liao & Hitchcock, 2018).

The way questions were posed during the personal interviews and focus group discussion may have influenced some of the responses of some participants. Albeit individual experiences and perceptions are real to the individual, the absence of evidence to support those experiences posed some level of threat to validity of data. Additionally, the existence of subjectivity in self-reporting of experiences often seems to resonate with the experiences of the general public, leaving out the experiences of those that are unique to a subset of the general public. This challenge was not totally circumvented even with the interview protocol described in my research methodology. Most importantly, though individual experiences and perceptions are critical, they were found to be often susceptible to social desirability bias. Another limitation was that, the proposed sample size of participants appeared to be small at first instance, and this made generalizability of the results a challenge. However, the use of triangulation and bracketing helped immensely to strengthen the validity of the results.

Significance

Understanding the experiences of EMTs who use mobile telephones in responding to disasters in low income, rural African communities, is of importance in the field of emergency response. As Martin-Shields (2016) noted, the expansion of the use of mobile telephones in developing countries has heightened efforts to adopt the use of technology in emergencies and disaster response. The results of the study may have contributed to the existing body of literature on disaster response in low income, rural African communities.

Implications for Positive Social Change

The implications for positive social change include a better understanding of the effective use of mobile telephones in disaster response, and the potential to efficiently improve disaster response and minimize the negative effects of disasters (fatalities, injuries, loss of properties) when they occur. Another implication includes the provision of knowledge useful for developers of ICT to design the type of mobile telephone technology appropriate for efficient disaster response in rural and deprived African communities.

Summary

EMTs use mobile telephones to enhance disaster response. I explored the experiences of EMTs with the use of mobile telephones in disaster response. In this chapter, I have discussed the background to the study including some peer reviewed articles relevant to the study, the problem statement and a brief description of the purpose or nature of the study have also been described. The research question has been clearly stated and the theoretical framework that underpinned the study has been elaborated. A description of the key terms used in the study, the assumptions, scope, delimitations, limitations and potential implications for positive social change have all been covered under the province of this chapter. In the next chapter, I have provided a review of the relevant literature to the study topic.

Chapter 2: Literature Review

Introduction

Mobile telephones are one of the ICT platforms used to enhance disaster response in both advanced countries and rural African communities (Hassan & Ayub, 2015). The continued integration of mobile telephones and other ICT platforms have been recognized as one of the key factors responsible for the sustained reduction in the global figures on the negative effects of disasters (Hassan & Ayub, 2015). Several studies have been carried out on the importance of ICT including mobile telephones, in disaster response in advanced countries. (Alexander, 2014; Haataja et al., 2016; Kakar & Mustafa, 2013; Tufail, 2015). After a thorough review of the literature, I found no research that examined the experiences of EMTs with the use of mobile telephones as key (ICT used in responding to disasters in low income rural African communities. The purpose of this study was to explore this gap in knowledge.

In this chapter, I have provided a description of the literature review strategies I employed to identify recent peer-reviewed studies, seminal works and other relevant works. The goal of this chapter is to provide a comprehensive examination of recent literature relating to the following:

- *Scope of disasters in rural African communities:* This research provides statistics and research on the typologies of disasters in Africa and provides results for pinpointing flood disasters as one of the most frequent disasters in Africa.

- *Response to flood disasters in rural African communities:* This research provides an analysis of responses to flood disasters, including their strengths and weaknesses.
- *EMTs as first responders in disaster response:* Research and statistics about the various categories of first responders in disaster response have been indicated. What is known about (EMTs in disaster response has been also indicated.
- *The use of ICT in disaster response:* The research provides reports on the growth and magnitude of the use of ICT in disaster response and indicate the impact of the use of ICT in disaster response
- *Mobile telephones as a key ICT platform used in disaster response:* The research reveals the history of the growth of the use of mobile telephones in disaster response.

Literature Search Strategy

Several databases and search engines were used to identify peer-reviewed and professional journals, monographs, dissertations, edited books and articles. The Walden University library was searched using search engines such as Google Scholar and databases such as SocINDEX, EBSCO, PsycINFO, ProQuest, SAGE Journals, and PsycARTICLES to search for materials related to the study.

In an effort to locate peer-reviewed articles, a combination of the following key words were used with Boolean identifiers to search the aforementioned databases: *Disasters, Information and Communications Technology (ICT), Emergency Medical*

Technicians (EMTs), Emergencies, Flood Disasters, Emergency Response, Disaster Response, Experience of EMTs, and *Mobile Telephones*.

A few articles emerged from particular authors. For such articles, the author search tool was used in the search engine. Further academic networking sites such as ResearchGate and Academia.edu were used to probe into certain publications by some authors. It is important to note that of all the literature that was reviewed, I was unable to find any material that described the experiences of EMT first responders using Mobile telephones in disaster response in rural African communities.

Theoretical Framework

Roger's (year) innovation diffusion theory (Kasperavičiūtė-Černiauskienė & Serafinas, 2016) describes how an idea or product gathers momentum and spread across specific social configuration of people or systems. An important result of diffusion is that people eventually adopt new behavior, technology, or product and adoption entails doing things distinctly from the way they were done initially. Kasperavičiūtė-Černiauskienė and Serafinas, (2016) noted that adoption does not occur concomitantly among various categories of people, based on differences in characteristics of different groupings of people. When promoting an innovation, it is critical to understand the characteristics of the adopters. Franceschiniset, et al (2017) indicated the typologies of adopters as including (a) the innovators (b) early adopters (c) early majority (d) late majority and (e) laggards. Franceschiniset et al briefly described each of the five categories of adopters under the diffusion of innovation theory. The *innovators* are the category of adopters who demonstrate expressed eagerness to try an innovation. These people possess the following

characteristics: venturesome, adventurous, daring, enterprising, ready to take risks, interested in novel ideas and often among the people to make new ideas. Usually, this category of people is small in number. *Early adopters* are likened to being the representatives of opinion leaders. They are often aware of the need for transformation, and hence always embrace the adoption of new ideas. This category of people does not require people to convince or canvass them to accept change or new innovation. The *early majority* belong to the category of people who adopt new ideas before the average person, they often require evidence to convince them that indeed a new idea works. Usually, success stories and evidence of effectiveness of an innovation are among the strategies that could be used to appeal to this set of adopters. The *late majority* are among the set of people who demonstrate skepticism to the adoption of new ideas; they only accept new ideas after confirming that the new idea has been tried by others and that it works properly. The information used to convince this category of people include evidences that the innovation has been tried by a substantial number of people and that they have tried and adopted it successfully. The final category, the *laggards*, are among the category of adopters who cling to their traditions and beliefs and are conservative; they are not receptive to change and are among the proportion of the population who are the most difficult to accept innovation. Persistent pressures from members of the other adopter groups often helps to enhance their adoption of new ideas. Scarbrough and Swan (2016) similarly listed five key factors that influence the spread of technology under the innovation diffusion theory. They include compatibility, complexity, relative advantage, trialability, and observability. Roger posited that the *compatibility* criteria denotes the

level of conformity of a technology with culture and existing social norms among the users of the new technology. *Complexity* signifies the degree of ease or simplicity with which the technology is used by new users of the technology. *Relative Advantage* denotes the improvement or comparative advantages which the use of the new technology has over an existing or available technology. *Trialability* underscores the ability for users of the technology to test or try the use of a new technology before it is finally used. *Observability* is the criteria by which the advantages and effects of the use of a new technology could be ascertained and attributed to the use of the new technology or idea. Dutta and Omolayole, (2016) opined that any technology that exhibits all the five factors noted under the innovation diffusion theory will absolutely have a high rate of spread and use. If an ICT equipment that is provided for use during disaster response happens to be complex or difficult to operate in addition to being incompatible with the norms and social values of the user community, Scarbrough, and Swan noted that under the innovation diffusion theory, the acceptability and effectiveness of the said technology may be questioned.

Hence, the innovation diffusion theory has a strong nexus with the study as it underscores the linkage between the experiences of EMTs with the use of mobile telephones in disaster response in rural communities in Africa and the spread and adoption of the technology by EMTs. This theory was therefore selected to provide the theoretical framework that underpinned this study. One of the key strengths of the innovation diffusion theory relates to the theory's portrayal of the critical factors that can either enhance or impede the spread of a new technology: it therefore illuminates the

factors with the propensity to affect the diffusion of technology. (Scarbrough & Swan, 2016).

Disaster Response in Rural African Communities

Disaster basically denotes any event either natural or induced by human activities, which threatens human lives, damages public and/or private property, and infrastructure and disrupts the social and economic life of the people within the affected area (Tambo, 2017). Disaster response is defined as any action taken immediately after the occurrence of a disaster to save and protect life, reduce suffering among victims and survivors and protect property and infrastructure (Dumbuya, & Nirupama, 2017). Hamer et al. (2017) noted that disaster response encompasses the dissemination of disaster alerts, search and rescue, care, and maintenance of survivors. The writers further noted that disaster response also include actions taken to re-establish essential physical and social systems, the provision of replacement homes and restoration of services. This segment of the review therefore describes the trend and scope of disasters in rural African communities, first responders in emergency response and elucidates EMTs in rural African communities and identifies general challenges to response.

Approximately 15% of the global natural disasters occur in Africa (Markantonis et al., 2018). Disasters in sub-Saharan Africa are predominantly caused by climatological and hydrometeorological changes. Some of the common forms of disasters experienced in Africa include floods, landslides, cyclones, storms, and droughts. Hamer et al. (2017) noted that the number of disasters reported in Africa has increased significantly since the 1970s. During the last decade, Africa experienced more than 1,000 disasters. The African

Union noted that between 2000 – 2001 almost 35 million people were affected by disasters in Africa (citation). Flood disasters are mainly common in the following regions: East Africa, West Africa, Central Africa and Southern Africa. The Southern Africa Environment Outlook (2015) indicated that since 2000, when Cyclone Eline hit the region, the continent started experiencing widespread and consistently increasing number of incidences of floods, especially flash floods. In Africa, a substantial percentage (80%) of deaths associated with disasters are caused by floods (Bettin & Zazzaro, 2018).

Flood Disasters in Rural African Communities

Based on the profile and trend of disasters in sub-Saharan Africa, the World Bank (2016) singled out flooding as contributing to approximately 25% of the natural disasters that have occurred in sub-Saharan Africa between the period 1985 – 2005. The International Federation of the Red Cross (2017) found that countries in sub-Saharan Africa experience diverse forms of floods, including flash floods, rainfall floods, tidal floods, monsoon floods, ravine floods, and coastal floods. The World Bank (2016) found that flooding in Africa is primarily caused by abnormally high rainfalls that are triggered by either tropical cyclones or other forms of human-induced causes including deforestation of catchment areas, growing population sizes on river banks and waterways, inappropriate land use planning, and poor drainage management patterns. Bischiniotis et al. (2018) noted that devastating floods have been reported in most African countries. The International Federation of Red Cross and Red Crescent Societies (IFRC) (2017) in describing the trend of flood disasters in Africa, recounted that flood disasters were

reported in Mozambique in 2000, that Ghana experienced wide spread floods in 2008 that led to the destruction of over 100,000 homes, and that in 2007, Nigeria also experienced floods in most of its states, including Ogun, Sokoto, Lagos, Yobe, Kebi, and Bauchi Nasarrawa. Sierra Leone has also contributed significantly to the flood statistics in the West African subregion. Dumbuya and Nirupama (2017) noted that, in 2014, Sierra Leone experienced one of the most brutal and decimating flood disasters in the Western rural district of the country, which also resulted in a gigantic mudslide. Both of which caused the death of over half a million people and destruction of properties worth millions of dollars. EMTs were among the first responders in the entire response, and mobile telephones was the main technology used as a conduit for communication. I was unable to locate materials that described the experiences of EMTs using mobile telephones in response, this is a gap in the existing body of literature which this study has contributed to addressing.

First Responders in Emergency Response

Disaster management has several facets such as preparedness, response, recovery and rehabilitation (Poblet, García-Cuesta, & Casanovas, 2017). It is often difficult to clearly delineate each phase from the other. Harris et al. (2018) found that, when a disaster erupts, as part of the disaster response phase, the first set of professionals who usually appear in the area affected by the disaster are known as first responders. They are the first set of people who interact with survivors, affected persons or witnesses often before the arrival of hospital emergency personnel, civil society organizations or government functionaries. Harris et al. (2018) argued that first responders are usually

better positioned to reduce the psychological imbalance or stress suffered by affected persons, keep panic and disorders at the minimum, provide first aid to enable and stabilize survivors, help to make affected persons safe, help to control traffic, keep onlookers away, control the crowd, provide reliable information or situation reports on the disaster, and help in developing safety plans They also in some circumstances aid search and rescue efforts (Harris et al., 2018). The categories of professionals usually serving as first responders includes police officers, firefighters, EMTs, or paramedics (Harris et al., 2018). Adini, Bodas, Nilsson, and Peleg (2017) noted that, because of human resource challenges, in most low-income countries, the category of first responders that are often present in most communities during disaster response are EMTs.

EMTs in Rural African Communities

The World Health Organization (WHO), (2018) describes EMTs as a group of health workers (paramedics, doctors, nurses etc.), that treat victims or survivors of disasters. EMTs could be drawn from Non-Governmental Organizations (NGOs), from Government, International NGOs such as the IFRC, Community Volunteers, Militaries etc. They are trained and well-resourced with equipment and supplies and usually operate based on classifications and minimum standards established by WHO and its partners.

Despite the efficacy of EMTs in preventing fatalities from disasters, Mould-Millman (2017) argued that information on EMTs and Emergency Medical Systems (EMS) remains inadequately documented. The outcome of a recent study indicated that Basic EMTs exist in only 26% of African countries (Mould-Millman, 2017). In Sierra

Leone, for example, basic EMTs have played a leading role in almost all the flood disasters that the country has experienced in the last decade (Dumbuya & Nirupama (2017).

Challenges to Response

Disaster response by EMTs in Rural African communities is fraught with many challenges (Bennett, Yuen, & Merrell, 2018). The World Bank (2016) noted that the challenges faced by countries are related to the level of development of the respective countries. The Islamic Development Bank (2015) argued that the most important challenges to disaster response includes the following: (a) limited fiscal resources and weak economies creating inability to significantly invest in disaster response; (b) limited Infrastructure to effectively buffer against flood disasters; (c) weak governance and institutional capacities including policy frameworks to effectively respond to disasters; (d) limited knowledge base.

Conrado, Neville, Woodworth, and O'Riordan, (2016) conducted a study with the purpose of creating a social media message verification framework to support emergency stakeholders' decision-making processes during the response phase of any emergency. The study population included Emergency Management stakeholders. Quantitative methodology was used. The results of the study indicated that research is in progress for developing a verification framework – for all emergency stakeholders – to support their decision-making process by managing social media uncertainty during emergencies, the results further indicates the key challenges associated with the use of ICT to support

decision making during emergency operations, and clearly delineates the differences and similarities between the challenges faced by executives based on context.

Recognizing the leading role played by EMTs as stakeholder in disaster response, the challenges identified in the relevant literature reviewed so far are generic in outlook and does not clearly delineate the specific challenges faced by EMTs in disaster response. Hence there was need for this study to identify the challenges faced by EMTs in disaster response.

Use of Information and Communications Technology (ICT) in Disaster Response.

Disasters, either natural or human induced, are occurrences that disrupt the normal functioning of society (IFRC, 2016), this is as a result of the magnitude of emergences which often exceeds the capacity of the affected community to respond with available local resource. This situation always causes wide spread material, human or environmental losses (IFRC 2016). The IFRC (2016) noted that, the occurrence of disasters such as floods, landslides, wild fires, tropical cyclones take a heavy toll in terms of loss of human lives and destruction of economic and social infrastructure.

The International community recognized the use of ICT as a conduit that can effectively minimize the negative effects of disasters, through the enhancement of response, and saving lives and property. Levius, Safa, and Weeks, (2017) noted that, ICTs in disaster response could be used to enhance the following: gathering information, delivering supplies and other resources, assessment of magnitude of damage, ascertain the number of missing persons, motivate public and institutional response. Effective disaster response requires rapid access to reliable and accurate information and the

capacity to analyze and synthesize data from various sources. This could be efficiently attained through the use of ICT.

Kabra, Ramesh, Akhtar, and Dash, (2017) examined the technology adopting behavior of humanitarian organizations. The results of the quantitative analysis indicates that out of the four constructs, performance expectancy, effort expectancy, social influence and facilitating conditions, under the Unified Theory of Acceptance and Use of Technology (UTAUT) - performance expectancy and effort expectancy significantly affect the ICT adoption.

Murthy and Gross (2017) conducted a study with the purpose of exploring the use of social media technology during disruptive events. With first-responders constituting the study population, and quantitative approach used as methodology, the results of the study indicated that social media use during disruptive events is complex and understanding these nuanced behaviors is important across the social sciences. The results further indicated that social network tools, especially online social networks, could be used as ICT platforms to aid preparedness and communication during disaster response.

Typologies of ICT Used in Disaster Response

Disaster response requires the execution of prompt action within the shortest possible time, to ensure that lives are saved, the sufferings of survivors that are injured is ameliorated, property is secured and those survivors that are psychologically imbalanced are stabilized. Various ICT platforms are utilized in disaster response. Dugdale,

Gonzalez, and Turoff (2017) identified the following as very important ICT platforms that could aid disaster response, these includes:

Terrestrial radio and television. Terrestrial radio is a radio that receives and broadcast signals from land-based stations and receivers. Terrestrial Television is a type of television that broadcast its signals through radio waves from land-based transmitters of TV stations. Terrestrial Radio and Television are among the most accessible and cheap technologies that could be used during disaster response to provide reliable means of communication to a wider listening public in a disaster affected area (Dugdale, Gonzalez, & Turoff 2017). Radio could be used as one -to many broadcastings and does not require the user to be literate and is also portable. It is more accessible to low income households and is portable. EMTs can use both local radio and television channels to communicate detailed and practical information with disaster affected communities to enable their speedy stabilization and adaptation to new conditions, the technologies could be used by EMTs to enhance communication among affected people and their relatives and friends (Dugdale, Gonzalez, & Turoff 2017).

Satellite radio. The satellite radio covers a wider geographical coverage than the terrestrial radio. It receives signals from communications satellites. It could be used to enhance disaster response especially when transmission towers are down (Dugdale, Gonzalez, & Turoff 2017). EMTs can use satellite radio to facilitate communication among members of the EMT team participating in a particular response for example: ambulances to coordinate and facilitate efficient disaster response. It is however worth

noting that satellite radio is costly both in terms of the purchase of the radio and the service set-up.

Amateur and community radio. Amateur radio also known as ham radio is a radio that uses a frequency spectrum for communicating messages, wireless training, recreation but not for any commercial purposes. Amateur radio is often used during emergencies to communicate information to the wider public. The platform is not contingent on any terrestrial system which are liable to fail at any time. Messages are often broadcast on high frequency (HF), Ultra high frequency (UHF), Very high frequency (VHF). EMTs can use Amateur and Community Radio to communicate with disaster affected communities during response, the technology is usually used by EMTs to convey critical information including announcements of progress made in terms of the overall disaster response, on-scene situational report and instructions on accessing emergency assistance pre-positioned for disaster affected persons. The operations of an Amateur or community radio, requires broadcast license. It is excellent for rural poor and remote communities. It is one to many and is portable.

Internet / Email. Internet is a global computerized network that provides diverse communication and information facilities using standardized protocols. The Internet is one of the efficient and most reliable ICT infrastructure that can be used to transfer electronic mail. It is one of the most widely utilized ICT platforms. With the internet, multiple sources could be checked for accuracy of information (Dugdale, Gonzalez, & Turoff 2017). EMTs use internet or email technology to enhance exchange of information as part of the means of coordinating disaster response among team members with access

to internet connectivity. However, internet has one key limitation which is its low penetration in especially developing countries.

Social media. Social media encompasses internet social networks such as Twitter, YouTube, Facebook, Google Plus, WhatsApp. Social Media is a newly emergent ICT platform, that has gained currency rapidly in a relatively short period of time (Williams and Phillips, 2014). EMTs use various forms of social media to enhance coordination of delivery of relief during disaster response, and also to provide information to those who are part of the contacts using a particular social media platform.

Space-based technology. Space-based technologies are technologies that used outer space to retrieve information. It has been found to be increasingly important in disaster response. They are particularly useful for remote sensing, communication and mapping. Some of the three key platforms under space-based technology includes: (i) *Remote Sensing* – mainly records information captured from sensors mounted aircrafts or satellites. EMTs use information gathered through remote sensing for effective planning of response. One key advantage of this technology is that it allows coverage of extensive areas and also provides for simple collection of data over a diverse scale, a major drawback of remoting sensing is that, the bulk of the information produced by remote sensing may not be complete and are largely temporal (Dugdale, Gonzalez, & Turoff 2017). (ii) *Geographic Information Systems (GIS)* which is mainly used for transforming images captured from remote sensing used to produce interactive maps, that could be used for spatial analyses. A critical advantage of the GIS technology is that, it enhances effective time management as it quickens data collection and assures accuracy and offers

better predictions. EMTs use GIS as part of the tools for required for aiding effective disaster response. A major disadvantage of the GIS technology is that, it is expensive, and requires huge input of data that makes it vulnerable to errors in input of data (Dugdale, Gonzalez, & Turoff 2017). (iii) *Global Positioning System (GPS)* which can aid in search and rescue efforts. EMTs mainly use GPS to aid search and rescue and directions for team members engaged in response efforts. It could be used to generate maps that could be used for disaster response. One key advantage of GPS is that it works in all-weather so, its performance cannot be influenced by climatic conditions. On the contrary, a key drawback of the technology is that, sometimes the GPS signals may not be accurate due to obstructions to the signals caused by buildings, trees and other obstacles (Dugdale, Gonzalez, & Turoff 2017).

Mobile (cell) telephone. Mobile phone is a handheld wireless device that enables users make and receive calls and text messages. This technology has high penetration rate in particularly rural areas, it is portable and relatively low cost. On the other hand, it requires high startup cost, and the use of cell towers which could be destroyed during incidences of natural disasters, additionally, the user needs to be literate, and there is no indication that a message is generated by a legitimate author and it is subject to congestion (Madhavaram, Matos, Blake, & Appan 2017). EMTs use mobile telephones to enhance voiced communication and Short Message Service (SMS) among members of the response team or group of stakeholders with access to mobile telephones.

Telephone (Landline). This platform does not require the user to be literate and can enhance quick delivery of information, EMTs usually use this platform to facilitate

the swift transmission of voiced communication between two people either members of the response team or other stakeholders, as long as they have access to a fixed telephone, however, it has the disadvantage of inadequate penetration, subject to congestion of phone lines during emergencies and disasters can damage infrastructure especially the lines /cables.

Madhavaram, Matos, Blake and Appan, (2017) conducted a study to identify new ICTs that could be used in preparation for and management of human and/or nature induced disasters, the study was based on an assessment of the emergency telephone service of the United States of America, the 9 -1-1 platform, and the context of which differs with the context of my proposed research.- rural African communities., Emergency Management Teams constituted the study population whereas Emergency Medical Technicians will constitute the study population for this research. The study found out that, a new ICT platform, known as E711 text – message mobile phone service, was identified as one that could contribute to disaster management and prevention especially for poor and developing nations and that there are tremendous opportunities to develop new ICTs in the context of disaster management, The E711 text message is a mobile phone service used in the United States that conveys a text message "I am OK" from a texter, signifying that the texter is safe, this service has not been used in rural African communities, and is largely used in the United States of America, where there is a high percentage of literacy among the population. This study on the contrary, explored the experiences of EMTs using mobile phone in disaster response in rural communities in

Africa. The study explored the various mobile phone services used by EMTs in rural African communities.

Ivanova and Gallasch (2016) conducted a horizon scan for Combat Service Support (CSS) that analyzed global trends in seven areas of technologies of interest. The study population included Users of ICTs in various institutions. A quantitative approach with the use of secondary data was the methodology employed. The study results indicated that there are new trends and technologies that can have disruptive effects on military operations. The results further indicated that CubeSats (or small Satellites) are emerging ICT platforms that are cost-effective, efficient and easy to deploy in disaster response in various contexts.

Tang, Pongpaichet and Jain (2016), conducted a study on the use of cybernetic (The science of automatic controls and communication systems in both humans and machines) principles combined with multimedia technology. The study was aimed at developing effective frameworks for using diverse multimedia data for situation recognition. The study population comprised of stakeholders in disaster management and users of multimedia. With the use of quantitative analysis, the results of the study indicated that an emergency management problem is fundamentally a multimedia information assimilation problem for situation recognition and for connecting people's needs to available resources. The results further highlighted some of the commonly used personal technology that could be utilized in enhancing communication during disaster response. From all the ICT platforms that could be used in disaster response, I did not find available literature on the experiences of first responders on the use of a particular

ICT platform in disaster response, hence, this study sought to explore the experiences of EMTs in the use of mobile telephones in disaster response in rural African communities.

Mobile Telephone a Key ICT in Disaster Response.

Mobile telephone technology has a long history. Henry Sampson, an African American, invented the cellular phone. After that invention, Ling, (2017) noted that, Motorola was recognized as the first company that mass-produced the first set of handheld mobile telephones. He further noted that a Motorola researcher named Martin Cooper on the 3rd April, 1973 made the first call to a rival company using a mobile telephone. Since then, Arker and Mbiti (2016) found that the number of mobile telephones continues to increase exponentially compared to landline telephones. Ling (2017) noted that mobile phone technology operates through the linkages of a network of transmission towers which conveys signals from one point to another via the towers. Individual mobile phones are uniquely identified through Subscriber identification module (SIM) cards belonging to specified networks. Haddon, (2017) argues that mobile telephones are both increasingly ubiquitous and used in enhancing web-based and social media services such as WhatsApp, Twitter, Facebook, GPS, Instagram etc. The effects of mobile phones in rural Africa is dramatic. The technology has reduced the cost of communication, which has created the possibility of the transfer of information quickly and at low cost on diverse social issues including sharing information on incidences of disasters and disaster response efforts. In most places, in rural Africa, mobile phones are considered the first modern telecommunication infrastructure in most rural African communities (Haddon 2017). As mobile phones evolve over time, the technology has

gravitated from a simple communications tool to a service delivery platform. There is however, a dearth of literature on the usefulness of the mobile phone technology based on the experiences of EMTs who are considered the leading category of first responders in the field of disaster response in rural African Communities.

Merits and Demerits of the Use of Mobile Phones in Disaster Response.

The Mobile telephone is acclaimed in Africa as a very useful technological platform that enhances communication including the storage and transmittal of audio and visual materials at a much faster and cheaper rate Haddon, (2017). Available literature highlights some of the merits and demerits of the use of mobile telephones generally. Below is a brief highlight of some of the advantages and disadvantages of the technology.

Merits of Mobile Telephones.

Asongu and De Moor (2015), argued that the advent of mobile telephones has impacted every fabric of African society. This includes improvement in management at both household and corporate levels and there has also been an upgrade in the level of interaction networks. The technology has ushered in positive improvement in business to business interface, improved healthcare monitoring, improved delivery channel in payments for small as well as medium sized enterprises. Available inclusive literature on mobile phones indicate that the technology engenders improvement in delivery of health services. Perez, Popadiuk, and Cesar (2017) conducted a study with the purpose of identifying the key internal factors that affect the adoption of technological innovations in health-care. The study population included users of electronic health records, physicians, administrators, nurses, and technicians. A quantitative methodology that employed a

multivariate statistical technique of structural equation modeling, using the statistical software SmartPLS was utilized. The results of the study indicated that innovation can contribute effectively to the adoption of technology in health sector.

Mobile telephone technology is cheap and has potential for high penetration in rural areas and is user-friendly. The merits highlighted above, are associated with generic users of mobile telephones. The merits of the use of the technology from the perspective of EMTs engaged in disaster response is an area that has been explored in this study.

Demerits of Mobile Telephones

Some of the key disadvantages of mobile phones include the following: liability to congestion and delays, physical damage of the communication infrastructure, such as the towers, which can disrupt communication, power failures that can cause malfunctioning of the technology. Asongu and De Moor (2015) also argue that mobile telephones have a lot of health hazards. They noted that mobile telephones are microwave transmitters and Alderete (2017) espoused that there is a strong relationship between exposure to microwaves and cancer. Alderete further indicated that exposure to radiation from mobile telephones can have a health impact on children. Some of the other health hazards associated with the use of mobile telephones include the following, headaches, impaired immune systems, genetic damage, memory loss, brain tumors, Cardiovascular stress etc. (Kim, Kabir & Jahan, 2016). Despite the disadvantages noted above, the disadvantage of the use of mobile telephones by EMTs remains a grey area. This study has explored these challenges from the perspective of EMTs.

Majchrzak, Markus and Wareham (2016) discussed the role of information and communication technologies (ICTs) in a wide range of major societal challenges, including employment, climate, health, and human migration. Users of ICT in various fields were sampled. Secondary econometric analysis was the methodology adopted for the study. The results of the study indicated that researchers in the field of Information Systems should expand the definitions of theories and problems, explicitly define the ICT artifact in both broad and specific way and should consider emergent digital designing as a replacement for organizations.

Haataja, Hyvärinen, and Laajalahti (2014) conducted a study of citizens' communication habits and use of information and communication technologies during crises and emergencies. Community members in selected disaster-prone areas constituted the sample. Qualitative methodology was adopted with data gathered through focus group discussions. The results of the study indicated that citizens consider emergency communication to be mostly unidirectional: from authorities to the public.

Implications of the Review

The trend of arguments in the literature review reveal that substantial research has been done on the use of ICT in Disaster Risk Reduction. Some work has been done on disaster response in African communities, and the use of ICT in disaster response. There is a lack of research on the experiences or perceptions of first responders on the use of mobile telephones in disaster response in rural African communities. This is a gap this study has attempted to address.

One key research question emerged from the review, that question is: (i) what are the experiences of EMTs with the use of mobile telephones in low income, rural African communities?

Conclusion

The use of Information and Communications Technology (ICT) in disaster response has contributed immensely to reducing the negative impact of disasters when they occur. The IFRC (2016) noted that rural communities in Africa contribute significantly to the global statistics on fatalities emanating from natural disasters. Understanding the experiences of first responders, particularly EMTs with using mobile telephones in disaster response in rural African communities will better delineate both the advantages and challenges associated with the use of the technology for disaster response in rural African communities.

Available literature indicates that the trend of disasters in rural Africa is such that the continent contributes approximately 15% to the global natural disaster statistics (Bettin & Zazzaro 2018), and that disasters in Africa are predominantly related to hydrometeorological causes. Flood disasters are among the most common types of disasters in Africa. The IFRC (2016) espoused that Africa experiences various forms of flood disasters and flood disasters have affected various parts of the continent.

EMTs are among the first responders that are almost always present during disaster response in most rural communities (Adini, Bodas, Nilsson, & Peleg 2017). Mould-Millman (2017) argued that despite the critical role played by EMTs in disaster response, there is a dearth of knowledge regarding their experiences in the literature on

Emergency Medical Systems. Some of the challenges faced by EMTs in disaster response in Africa as noted by the Islamic Development Bank (2016) include limited fiscal resources, limited infrastructure, weak governance and institutional capacities and limited knowledge base.

The integration of ICT in disaster response is recognized as a conduit for effectively minimizing the negative effects of disasters (Levius, Safa & Weeks 2017). Various ICT platforms are used in disaster response, based on its comparative merits and demerits. Mobile telephones are identified as one of the effective ICT platforms used in disaster response in rural communities (Ling 2017). The implication of the review is that though significant work has been done on disaster response in African communities, there is a visible gap in the experiences of first responders on the use of mobile telephones as ICT in disaster response. Hence, there is need for this gray area to be explored. In the next chapter, the Research methodology that was used in the conduct of this research is discussed.

Chapter 3: Research Method

Introduction

The result of a review of the existing literature on the use of ICT in disaster response showed me the need for further qualitative studies to explore the experiences of first responders using mobile telephones in responding to disasters in low income rural communities in West Africa. For this research, I employed a generic qualitative approach to provide an understanding of the experiences of first responders with using mobile telephones in disaster response. The study entailed an investigation of the experiences of EMTs with the use of mobile telephones in disaster response in low income rural communities in West Africa. The focus of the research was centered around the experiences and perceptions of EMTs with the use of mobile telephones as ICT platform in disaster response.

Chapter 3 of this dissertation is divided into three segments. This first segment provides an overview of the generic qualitative approach and a description of the study's research design, the research question, and the role of the researcher. The second segment provides justification for the choice of the research method. The final segment conveys a description of how the research was conducted including a description of data collection procedure, strategy for recruitment of the study participants, data analysis, and issues of trustworthiness.

Research Design

I used a generic qualitative design to explore the experiences and perceptions of EMTs with the use of mobile telephones in disaster response in rural communities in

West Africa. The generic qualitative approach was chosen for this study based on the consideration that the use of the approach avails the opportunity for me to understand how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences. The approach provided a space where I played and made advances by deviating from methodological prescriptions (see Kennedy, 2016). The generic qualitative approach is defined by Kennedy (2016) as a research approach that is not guided by an explicit or established set of philosophic assumptions in the form of one of the known qualitative methodologies. The approach does not claim any particular methodological viewpoint (Percy et al., 2015); rather, it draws upon and builds on the traditions and ideas that came before it, even if that lineage is unarticulated (Kahlke, 2014). The approach additionally draws on the strengths of established methodologies whilst ensuring the flexibility that makes it congruent and attractive to researchers whose studies do not neatly mesh with a particular established methodology. Kahlke (2014) further noted that there are two subcategories of generic qualitative approach. They include (a) an *interpretive description* which focuses on developing research questions from practice and providing theoretically sound evidence that can be utilized in the practice setting and (b) a *descriptive qualitative* research which entails a design to produce low inference description of a phenomenon and attempts to minimize inferences made in order to remain closer to the original data.

The generic qualitative approach has some key benefits, they include the following (a) creating the platform for opening new ground in research (b) the use of the approach also enables researchers to work outside the established methodologies with a

view to aid novel theoretical approaches, and (c) The generation of new questions and articulation of new approaches (Kahlke, 2014).

The generic qualitative approach was identified as the most suitable approach for the conduct of this study, based on the consideration that, with the use of this approach, peoples' account of their subjective opinions, beliefs, attitudes, and retrospection on their experiences could be ascertained. Kennedy (2016) noted that with generic qualitative approach the researcher is not bound to follow specific methodological framework; it embraces methodologies without limitations. The fact that the inquiry is anchored on the subjective opinion of EMTs in the use of mobile telephones, whilst executing their duties as first responders during all the major activities of flood disaster response in rural communities in Africa, underscores the appropriateness of the approach for this study. The research question, *What are the experiences of EMTs with the use of mobile telephones in low income, rural African communities?*, was constructed to solicit information on the experiences of EMTs with the use of mobile telephones in disaster response in low income rural African communities. During the study, I attempted to gauge how the target respondents interpret their experiences and perceptions with the use of mobile telephones as first responders in disaster response in rural communities in Africa.

In summary, the purpose of using this generic qualitative approach was to enhance my exploration of the experiences and perceptions of EMTs with the use of mobile telephones as an ICT platform in disaster response in rural communities in Africa.

Rationale for Research Design

The study employed a generic qualitative design, which underscored the interpretation of subjective lived experiences, opinions and perceptions of phenomena in their outer world (Percy et al., 2015). The generic qualitative approach design was identified as the most congruent approach for this study based on its interpretive, descriptive and reflexive characteristics that enabled the investigation of lived experiences and perceptions. The approach was considered the most suitable approach for the conduct of this study in recognition of the unique capabilities the approach offers in terms of the provision of a deep, rich and contextual comprehension of the experiences of EMTs using mobile telephones in disaster response in rural African communities.

Role of the Researcher

The approach I used for this study ensured the ethical protection of research participants and contributed to the achievement of the overall objective of the study. Target respondents were drawn from among EMTs from two institutions in Sierra Leone, with mandates to provide first responders supporting the conduct of disaster response operations across the country. The mandates of the two organizations were reviewed and steps taken to ensure that the study was conducted within the mandates of each of the target organizations. Percy et al. (2015) noted that researchers must adhere to the ethics and code of standards which were a collective set of guides for decision making. I fully complied with the American Psychological Association (APA) general ethical principles of psychologists and ethical standards in research.

The General Ethical Principles of Psychologists

The five general principles, including beneficence and nonmaleficence, fidelity and responsibility, integrity, justice, and respect for people's rights and dignity, were used to guide my role as researcher in the conduct of this study. Below is a brief description of each of the five principles.

Principle of beneficence and nonmaleficence. The principle of beneficence (doing good) and nonmaleficence (do no harm) underscores the need to take care of and safeguard the rights and welfare of those I interacted with and safeguarded that I did no harm to them (Tagin, Zhu & Gunn, 2015). This included taking actions to ensure that my influence with respect to my knowledge in disaster management was not misused at the expense of the participants (Tagin, Zhu & Gunn, 2015). During the research, I ensured that the basic human rights of participants were respected including their protection from any physical harm or distress. Informed consent was secured from participants prior to their engagement in the research, the removal of identifiers from data, anonymity of participants, and confidentiality of all information provided by participants was ensured.

Principle of fidelity and responsibility. The establishment of trust and relationship with the people researchers interact with in the course of the conduct of research work was essential. During the course of this research, I ensured that ethical standards for the conduct of research were upheld across the entire spectrum of the research, I accepted responsibility for my actions and endeavored to manage effectively any conflict of interest that had the propensity to cause harm to participants (Tagin, Zhu & Gunn, 2015).

Principle of integrity. Being truthful, honest, accurate and protecting the human rights of participants I interacted with during the conduct of the research was ensured. The resolution of all research associated conflicts was done in consonance with the ethical standards of the ethics code of research (Zimbardo, 2017).

Principle of justice. The need to recognize that all persons are entitled to justice and fairness was essential in the conduct of this research work. The conduct of this research respected the principle of justice. Zimbardo, (2017) noted that taking precautions to ensure that biases and limitations of expertise do not create room for unjust conduct in research was considered essential.

Principle of respect for people's rights and dignity. The observance of safeguards to ensure the privacy, confidentiality, worth, self-determination, welfare and rights of individuals in the conduct of research was essential. People's culture, role differential, race, nationality, disability, language and socioeconomic status, were respected and efforts were made to ensure that biases based on these factors were not allowed to influence the research (Tagin, Zhu & Gunn, 2015).

Ethical Standards in Research

I fully complied with key ethical standards during my study. In the conduct of this study, informed consent was secured from the target study participants prior to their full engagement in the study. Before the acquisition of informed consent, target participants were briefed about the following: (a) the purpose of the study, the procedure and expected duration; (b) their right to withdraw or decline their participation from the study at any point in time; (c) any potential research benefits ;(d) assurance of confidentiality of

information provided; (e) incentives for participation in the research; and (f) the opportunity to ask questions relating to the research at any time (Tagin, Zhu & Gunn, 2015; Wolf, Clayton, & Lawrenz, 2018). Since the research design proposed is generic qualitative approach, the recording of voices and images was part of the qualitative data that was gathered. During the research, informed consent was secured from target participants prior to recording their voices or capturing pictures as part of data collection. Recording was done in a manner that did not enhance personal identification or harm. Additionally, consent for use of audio recording was obtained during the debriefing session with participants (Tagin, Zhu & Gunn, 2015).

I made reasonable effort to ensure that inappropriate financial or other forms of inducements were not provided to enhance participation of target participants in this research, especially when such inducements were likely to force participation in the research (Kerkhoff, 2015), Gift cards were provided to participants to reimburse them for the cost of lunch required for their participation in the face to face interviews.

Deception was not used in this study, as there was no justification for any deception technique. Nondeceptive procedures were used throughout the study. There was no likelihood that prospective participants were deceived about the research that was conducted (Kerkhoff, 2015).

During the research, participants given opportunity to get information about the study results. I provided them a platform to correct any information which they considered to be incorrect or a misrepresentation of their individual responses. In the

process where the procedure used turned out to be harmful to participants, prompt steps were taken to minimize the harmful effects (Kerkhoff, 2015).

I took steps were taken to ensure that no deceptive or false statements were included in the results. In instances where errors were identified in the final results, the required steps were taken to promptly correct the said errors (Kerkhoff, 2015).

Information was sourced through interviews which were conducted with target EMTs who had participated in floods disaster response in rural communities in Sierra Leone, and a focus group discussion (FGDs) was conducted with a view to secure the relevant information. With the generic qualitative approach, I was suitably positioned to serve as the voice of description relating to the experiences of EMTs with the use of mobile telephones in disaster response in rural African communities. My role was principally to understand the experiences of EMTs with the use of mobile telephones in disaster response in rural African communities. To enhance the acquisition of full participation of respondents in the research, I established rapport with the interviewees ahead of the commencement of the interviews. As recommended by Liu (2016), I listened attentively to the participants' description of their perceptions and experiences and generated questions that drove response to the context and the research question. As noted already in Chapter 2, I was unable to find literature relating to the experience of EMTs with the use of mobile telephones in disaster response in rural African communities. The maintenance of an objective scholarly voice was ensured throughout the study.

Reflexive Role

A critical requirement for a researcher using a generic qualitative approach is to conduct their study from a reflexive viewpoint (Gabriel, 2015). Reflexivity entails a process wherein the researcher takes into cognizance their personal experience and recognizes how these experiences may influence both the process and outcome of the generic qualitative study. Cunliffe (2016) noted that a reflexive approach enables the researcher to reflect on their thoughts whilst analyzing the process and participant's data objectively and intentionally. With the reflexive role, I assumed a key role in the data collection and analysis exercises, as an insider and coparticipant, participants were provided some level of comfort with me and I was also in a position to assist participants with data collection exercise.

Recognizing that reflexivity highlights an understanding of the efficacy of the researcher's experience and that the researcher is part of the key informants in the data collection exercise (Cunliffe, 2016). With reflexivity, my biases were not construed as a negative influence, but rather they were considered as unavoidable aspect of qualitative research (Cunliffe, 2016) Qualitative research is perceived as a process of exploration for both the researcher and for the participant so the process added credence to the research exercise through improvement in self-awareness and comprehension (Cunliffe,2016).

Interpretive Role

The interpretive approach is a constituent of the generic qualitative approach (Soss, 2015). The choice of this approach was rooted in the fact that, it avails participants the opportunity of discussing their lived experiences and perceptions with the use of

mobile telephones in disaster response in Rural communities in West Africa. My Interpretative role in this generic qualitative study, primarily involved an iterative process of data gathering, thematic analysis and explanation of the subjective opinions and reflections on the experiences of participants (Percy, Kostere & Kostere, 2015). The interpretive process also encompassed the analysis of the descriptions of the experiences of participants and formulation of qualitative generic configurations.

Research Question

In this study, I focused on only one research question, it is as stated below: What are the experiences of EMTs with the use of mobile telephones in low income, rural African communities?

Methodology

This segment elaborates the method that was adopted for the study. It conveys a systematic description of the methodology and the nexus between the research purpose and the research approach employed. In an effort to maintain methodological rigor, the following guidelines were proposed:

Sampling Strategy

There are a couple of sampling strategies that could have been employed for qualitative research. Purposeful sampling was identified as the most appropriate sampling strategy for the conduct of the research. The choice of the Purposeful sampling strategy was informed by the consideration that, the strategy provides a means of demonstrating the peculiar characteristics of a target sub-group (Palinkas, Horwitz, Green, Wisdom,

Duan, & Hoagwood, 2015). The strategy also availed me with the opportunity to select the participants and activities of the study.

The target sample of participants for this study ranged between 8 and 12 EMTs, , who have used mobile telephones as a means of communication when serving as first responders in disaster response in rural communities in Sierra Leone. The determination of the sample size of between 8 and 12 was guided by the principle of saturation in qualitative research, the principle of Saturation basically portends that, there is tendency for diminishing return to emerge with large qualitative sample sizes (Malterud, Siersma, & Guassora, 2016). Malterud et.el. noted that, as a qualitative study progresses, more data does not imply more information, hence, the sample size was deemed appropriate to ensure trustworthiness of the results. The objective of the study was to investigate the lived experiences of EMTs with the use of mobile telephones in disaster response, the study therefore consisted of the conduct of face to face interviews with the target participants as well as conducting one Focus Group Discussion (FGD) with EMTs who have used mobile telephones in disaster response in Sierra Leone.

Participants Selection Process

The selection of participants was done through self-selection by the 10 EMTs deemed to have rich practical experience in disaster response. All of the 10 participants were given the opportunity to willingly volunteer to participate in the research. Two Institutions with statutory mandate to participate in disaster response operations in Sierra Leone, were contacted to secure their permission for the conduct of the study and for them to allow their EMTs with experience in disaster response to voluntarily participate

in the study. After the receipt of the approval for the study to be conducted in the target sites, two general meetings were held at the two target sites, during the general meetings, EMTs were informed about the purpose of the research and the opportunity for them to voluntarily avail themselves for participation in the study. After the compilation of the list of interested volunteers from the two institutions, each of the interested participants were screened based on the following selection criteria: (a) At least 25 years of age, implying that they are adults who have gathered adequate experience in serving as EMTs in disaster response (b) Speaks English, since the interviews were conducted in English which is the official language through which formal engagements are conducted in Sierra Leone. (c) Currently works as EMT in the disaster response department of either of the two target institutions , implying that the potential participants were in active service and were therefore sharing recent experience (d) Has participated in over three (3) disaster response operations and has used mobile telephones during those operations. The criteria of participation in three disaster response operations was used to establish a standard minimum level of experience among potential respondents.

After the screening process, an information sharing session was conducted for all screened participants, additional information on the research was provided during the session and responses were provided to concerns or queries that were raised by potential participants. After the information sharing meeting, individual letters were issued to each of the nominated EMTs to secure their consent for participation in the study.

Data Collection

Data collection in Generic qualitative research often requires participant observation, content specific questionnaires and semi or fully structured interviews (Percy, Kostere, & Kostere, 2015, Kahlke, 2014). In recognition of the fact that under this type of qualitative study, as the researcher, I was considered as the research instrument, Data for this study was collected through semi-structured face to face interviews and FGD. All interviews were audio recorded with the prior permission of the participants and coded using generic coding (Liu, 2016, Kahlke, 2018). Additionally, field notes were maintained to ensure that any additional information related to the research question that was provided during the course of the interview was captured fully. A complete transcription version of each interview session was completed and shared with the respective Interviewees for them to confirm that their individual transcripts are reflective of what they said or intended to say during the interview sessions, this served as a measure for ensuring the trustworthiness of the research data. (Percy, Kostere, & Kostere, 2015, Kahlke, 2018).

Data Analysis

The collection of qualitative data often requires transcription of the collected data into written format. The data gathered (both text and audio) in line with the research question, was transferred into NVivo – a Computer Assisted Data Analysis Software used for managing and analyzing qualitative data (Zamawe, 2015, Belotto, 2018). With the aid of NVivo, aggregation and coding of data and generation of relevant themes or concrete categories was done (Noble & Smith, 2014). The selection of the NVivo software was

driven by the strengths of the software as highlighted by Zamawe (2015), which includes, (a) Capability to use both visual and sound recorded data sources; (b) The availability of folders that can make the organization of data by defined categories; (c) The provision of nodes that could address diverse queries that could be posed by researchers.

In this research, I served as my own measure of validity. Credibility is a critical ingredient in establishing trustworthiness when conducting a study (Twining, Heller, Nussbaum, & Tsai, 2017). To ensure trustworthiness and credibility of the generated data, I manually verified all corresponding themes, with a view to reconfirm that identical themes and patterns were identified and coded correctly. Additionally, to ensure credibility and reliability, a semi structured questionnaire was used for securing pertinent data. Moreover, the design of the research instrument availed me the opportunity to infuse tacit knowledge and the use of appropriate qualitative methods including purposive sampling as well as the data analysis methods, contributed to enhancing the credibility and reliability of the results.

Issues of Trustworthiness

One of the principal challenges in qualitative research is to establish or assure trust and confidence in the insights that the researcher utilizes in the conduct of his research and the results that eventually emanate from the study (Morse, 2015). It was therefore imperative that steps were taken to ensure the trustworthiness of the data, and to adequately demonstrate that the results of the research strongly reflected the viewpoints of the participants, rather than my perception or biases. Hadi, and Closs, (2016), noted

that, ensuring trustworthiness entails the existence of the following attributes, transferability, confirmability, dependability and credibility.

Transferability

Generalizability is a critical attribute of quantitative studies. Qualitative researchers on the other hand, do not work towards making their results generalizable but rather pursue understandings that could be applicable to various situations (Connelly, 2016). It is also noted that with qualitative studies, a result that occurs in one situation is not necessarily applicable to other situations. Hence, to ensure transferability, a detailed description of the settings and participants involved in the study was done, additionally, I ensured that recruitment of EMTs / Participants was done through the two designated institutions with statutory mandates to participate in disaster response.

Confirmability

Confirmability entails neutrality and the control of a researcher's biases (Amankwaa, 2016). Addressing issues of confirmability with qualitative studies is often a challenge due to the possibility of the occurrences of biases. Therefore, steps were taken to ensure that the findings of the research neatly reflected the lived experiences of EMTs and not my personal views. Hence, the interviews were conducted with the highest degree of objectivity. All predispositions, assumptions, presumptions, preconceptions and biases were identified and held in abeyance through a process known as bracketing to prevent threats to internal validity of the study.

Dependability

Dependability is likened to the concept of reliability in qualitative research (Connelly, 2016). It supports the notion that similar results will emerge if the study was to be repeated with the same participants, though it is critical for one to understand that even when a study is repeated with the same participants, each study will be considered a new study, based on the change in the environment. To ensure the dependability of this research, an audit trail of the entire research exercise was instituted, details of how data was collected and how the themes or categories were established were all maintained. It is important to note that there can be no credibility without dependability and no validity without reliability (Amankwaa, 2016).

Credibility

Credibility denotes the believability of research findings based on evidence (Twining, Heller, Nussbaum, & Tsai, 2017). One of the ways through which research credibility was ensured in this research included member checks, EMTs who participated in the interviews were given the opportunity to review interview transcripts, to secure participants concurrence on what was recorded, and also soliciting feedback on the research findings. All of these steps were to enhance the identification of any misrepresentations in the results and to clearly delineate researcher biases where they occur.

Ethical Procedures

Ethical issues in research are usually associated with data collection and analysis or reporting phases. It was therefore important for the ethical considerations to be

factored into the planning, conduct of data collection and evaluation of the research phases. LaRossa and Bennett (2018) noted that, due consideration should be given to participants to ensure that they are not subjected to harm during the course of the research, some of the safeguards that were used included the participants choosing the location and time when they prefer to have their interviews, giving them assurance of confidentiality of their information, and option for them to discontinue their participation if they felt that they were not satisfied with the conduct of the exercise or felt psychologically distressed.

The participation of EMTs in this study was contingent upon the signing of the individual consent forms prior to the commencement of the data collection exercise. The consent form comprised eight basic elements, they included the following: (a) A statement indicating clearly that the study is for academic research; (b) A description of the purpose of the research and the expected duration of the EMT's participation; (c) A description of the procedure to be followed; (d) Identification of any reasonable risk, benefits and any other alternative treatment that is available; (e) Explanation that the participation of the EMT is voluntary and that consent to participate could be withdrawn at any point without penalty; (f) A description of the extent of confidentiality with respect to records of EMTs; (g) A description of the details of the person to contact for queries or concerns related to the research; (h) A description of any possible compensation available to participants as benefits for their participation in the research.

During the course of the research, the procedure for the protection of human participants were observed. The Consent form was approved by the Walden University

IRB, which implied that all the critical safeguards for the protection of human subjects were adequately addressed. Some of the safeguards included ensuring that all data related to demographics remained confidential and kept under lock for a period of five years after the research. Codes were assigned to each participant to remove identifiers and ensure anonymity and confidentiality of their responses throughout the research exercise. Efforts were made for participants to fully understand the nature of the study and the fact that, their participation was voluntary. No sanctions were applied to participants who choose to opt out of the research, no information pertaining to any participant was disclosed, all data elicited from participants were kept for a period of three years after the dissertation was published. All these conditions were communicated to each participant as part of the interview protocol discussed at the outset of the interview.

Summary

A generic qualitative approach was identified as the most congruent approach for interrogating the research problem. This chapter conveys a description of the research design and its rationale, the role of the researcher including both his reflexive and interpretive roles, a description of the methodology including: sampling strategy, participant selection process, data collection, data analysis, Issues of Trustworthiness encompassing transferability, confirmability, Dependability and Credibility. The Ethical Procedures utilized in the conduct of the research were also elaborated. The next chapter provides a description of the findings of the study.

Chapter 4: Results

Introduction

The purpose of this generic qualitative study was to explore the experiences and perceptions of EMTs, with regards to the use of mobile telephones in disaster response in rural African communities. I conducted face-to-face interviews, and focus group discussions with 10 EMT's from two institutions involved in emergency response operations in Sierra Leone, West Africa. I sought an in-depth understanding of the experiences and perceptions of EMTs regarding the use of mobile telephones in disaster response operations. The study addressed one research question:

What are the experiences and perceptions of EMTs with the use of mobile telephones in low income, rural African communities?

In this chapter I provide a description of the research setting, participant profiles, data collection procedure as described in Chapter 3, the data analysis technique used, evidence of the trustworthiness of the study results, and a presentation of the findings of the study

Research Setting

Individual face-to-face interviews and a focus group discussion were conducted between the 1st – 17th May 2019. All the personal interviews and the focus group discussion were held in a private facility I secured in Freetown in Sierra Leone. The location of the facility was discussed and agreed upon by all participants to ensure that they were comfortable with the site and that it would enhance the provision of their candid responses to all of the interview questions and discussion points.

Participant Recruitment.

I received letters of agreement from two institutions with statutory mandates for supporting disaster response. I obtained letters of cooperation from the two target institutions and secured approval from Walden University's Institutional Review Board (IRB), and my IRB approval Number is 05-30-19-0502460. I recruited a purposive sample of 10 EMTs who met the established selection criteria from the two target research sites in Sierra Leone. Participants were recruited through an open invitation made in two separate general meetings organized for all EMTs at the two target research sites. During the public meetings, I explained the purpose of my study to all attendees and outlined the participant selection criteria. The primary aim of the meeting was to enable interested potential participants to voluntarily make an informed decision about their participation in my study. Interested participants were advised to contact me directly after the meetings.

EMTs who were interested in participating in the study were not allowed to publicly express their interest during the general meeting. This restriction was instituted to ensure that the privacy of potential participants was not compromised. During the individual meetings held with interested participants, I collected necessary information related to the participation criteria. The criteria included the following: (a) at least 25 years of age, (b) speaks English, (c) currently works as EMT in the disaster response department of either of the research sites, (d) Has participated in over three disaster response operations, and (e) Has used mobile telephones during those operations. A total of 17 potential participants expressed interest in my study. Subsequently, 10 EMTs were

identified to have fully met the criteria. The 10 potential participants were notified and invited, via email, to an information meeting on a scheduled date and time. At the information meeting, I explained the nature of the study and provided clarification of any concerns related to the study procedure, the voluntary nature of participation in the study, any associated risks and benefits of being in the research, privacy issues, and ethical standards. Schedules for the individual face to face interviews, and the FGD were also developed and agreed upon by selected participants.

Participants Demographics (Participant Profiles)

The diversity in the demographic characteristics of the participants ensured a well-balanced mixture of various perspectives and experiences that participants brought into the study. The ages of participants ranged between 35 – 67 years. The participants were all EMTs from rural African communities, with practical experience as EMTs that spanned between 8 – 22 years. They have used mobile telephones in disaster response operations for a period ranging between 8 – 15 years. The demographic questionnaire was completed during the face to face interviews conducted with each participant. To protect the privacy of participants, identifiers such as names were removed and each participant was assigned a pseudonym of P.1, P.2, P.3, P.4, etc. Details of the demographics of participants are as presented in Table 1.

Table 1

Participants Demographics

Participant Code	Age	Gender	Years of Experience as EMT	Years of Experience with a mobile phone in Disaster Response
P.1	50	Male	20 Years	15 Years
P.2	35	Male	10 Years	10 Years
P.3	48	Male	15 Years	12 Years
P.4	37	Male	10 Years	10 Years
P.5	67	Male	22 Years	14 Years
P.6	56	Male	16 Years	13 Years
P.7	58	Male	14 years	13 Years
P.8	36	Female	8 Years	8 Years
P.9	45	Female	10 Years	10 Years
P.10	47	Female	9 Years	9 Years

Interview Protocol

Face-to-face interviews were conducted with all 10 participants. The interviews included several semistructured open-ended questions that were constructed to elicit the perceptions and experiences of participants with the use of mobile telephones in disaster response in rural African communities. An interview protocol (Appendix B) was used to ensure consistency and homogeneity in the questions posed for the collection of the requisite data. The discussion and signing of the consent form by each participant preceded the interviews. Each face to face interview was concluded with the presentation of a gift card of fifty thousand Leones (Le. 50,000) the equivalent of US$5 for sandwich and water from a local restaurant in Freetown, as refreshment in appreciation and acknowledgment of each respondent for his / her full participation in the study.

The face to face interviews were followed up with a FGD attended by all the 10 participants, to ascertain their shared experiences. A Walden University IRB approved guide for the conduct of the FGD was used. The guide contained a description of the opening session, which included setting the context, ground rules, procedure for the conduct of the FGD, and individual self-introductions. The second segment of the FGD guide included the discussion questions.

Data Collection

Data collection efforts commenced after receipt of the official approval from Walden University IRB. My IRB approval number is 05-30-19-0502460. Before the IRB approval, I received certification (Certificate number: 1636447) on the 15th December 2014, from the National Institutes of Health (NIH) Office of Extramural Research after completing a web-based training course in *Protecting Human Research Participants*. The submission of my NIH certificate, letters of cooperation from the target research sites, and completed IRB forms were part of the preconditions that were satisfied for the receipt of the IRB approval.

At the onset of the face to face interview sessions with each of the participants, I read and discussed the contents of the informed consent approved by IRB and secured their signatures. Participants were encouraged to be relaxed and feel comfortable as they responded to the 14 open-ended questions indicated in the interview protocol. Information on the demographic characteristics of participants was secured after they signed the consent form. One focus group discussion session was also conducted for all 10 participants after the completion of the individual face to face interviews. The focus

group discussion guide (Appendix C) was used as the framework for the conduct of the focus group discussions.

In a bid to comprehensively capture all the responses of the participants, all the individual face-to-face interviews and the one FGD were audio-recorded via a digital recorder, after securing each participant's consent. The meetings lasted between 30:10 (minutes/seconds) and 50:04 (minutes/seconds). The mean participant interview duration was 38:02 (minutes/seconds). Participants were provided with adequate time to respond to each of the questions. The focus group discussion session lasted for 1 hour 30 minutes. As the interviewer and researcher, my goal in both the face to face interviews and focus group discussions was to present the questions fully, listen attentively, and allow respondents to answer each question without any interruption. Field notes were taken during each interview session to capture relevant details of the interviews.

Before each interview, my experiences or observations on each session were noted through reflective journaling. This enabled me to concentrate on the experiences of the participants on the research topic and helped to reduce the possible infusion of my biases into the results of the study, thereby helping to make the results of the study reflective of the actual experiences of the participants.

Before the commencement of the face-to-face interviews, participants were verbally informed that some level of member checking would be integrated into the interview process to strengthen the credibility of the elicited data. The participants provided their consent for the member checking to be incorporated into the interview process. During the interview sessions, I listened attentively to the reactions of

participants (Liu, 2016), summarized their responses and, in some instances, repeated the questions to get a clearer understanding of the responses of the respective participants. Member checking was done through contacting eight out of the10 the participants via telephone. I met physically with two of the study participants, who were available and in locations that were close the venue where the interviews were conducted. The object of the meeting was to crosscheck the information in the pdf version of the individual transcripts, sent to them after the interviews and to confirm those responses that appeared to be unclear, to ensure accuracy of the data collected. Additional meetings were not required after the completion of the transcription of both the text and audio data. During the member checking calls, participants had the opportunity to provide additional information which was not offered during the face to face interviews.

Data Analysis

After the data collection process, I initiated the physical organization of the various sources of data, including interview protocols, field notes, reflexive journal, and transcription of the audio data. Individual folders for each participant were created and labeled by the codes assigned to each participant. Each participant's folder consisted of the signed consent form, field notes, interview protocol, journal notes, and the transcript of the audio recorded interviews and FGD session. The physical categorization of the documents allowed for easy reference to the documents during data analysis. After the physical organization of the various sources of data, I began with an initial review of the data with the repeated reading of the transcripts of the interviews and the FGD, to fully

understand the information. This first step enabled me to familiarize myself with the data and enhanced my understanding of the experiences.

In the second stage of the analysis, a more intense and careful analysis of the data was initiated. NVivo was used to identify the most recurrent words in the data (see Noble & Smith, 2014). To execute this identification, I established the following criteria: (a) identify 30 words; (b) remove frequently used words that carry minimal meaning such as, take, and also, (c) the minimum acceptable word length was four letters/characters, and (d) synonyms used by respondents were identified. Table 2 conveys these words.

With these words, in addition to the notes taken during the interviews and focus group discussion, I categorized the data into sets and allocated codes that described the sets of data. The process continued until all the data were assigned codes. On Table 3, an example is shown of the coded data.

Table 2

Recurrent / Frequently Used Words

Word	**Synonyms / similar words**
Disaster	Catastrophe, tragedy, emergency, crisis, calamity, adversity, Misadventure
Communication	Talk, message, conversation, dialogue,
mobile telephones	Handset, mobile, Cell Phone, Receiver
Response	Rescue, Liberations, saving, Salvage, save, free
Utilize	Exploit, Operate, Employ,
Respondent	Relied, responder, replied, answer
Think	Believe, consider, guess, intelligence, mean, reason, suppose, thinks, thought
Media	Media, medium
Technology	Equipment, machinery, expertise, kit, tool,
Information	Conversation, data, informed, source, sources
Voice	Speech, vocal, opinion, say, Expression
Organization	Group, Society, Body, part, association, union, business
Victims	Prey, dupe, target, object, quarry, fatality, casualty
Survivor	Sticker, fighter, Toughie
Enhance	Improve, Augment, boost, develop, increase, heighten
Network	System, Grid, Web, link,
Suffering	Anguish, travail, pain, distress, Misery, woe
Efficient	Well-organized, efficient, effective, competent, resourceful

Table 3

Raw Data and the Assigned Codes

Codes	Raw Data
Areas of Emergency Operations where mobile telephones are most useful	• Most of the disasters we have responded to relate to flood hazards. • Mobile telephones are critical in emergency operations, especially in evacuations, search and rescue, provision of emergency medical assistance to survivors – injured, delivery of relief aid.
Benefits of mobile telephones	• It helps in making disaster response efficient and effective. • It enhances communication • It helps in reducing suffering and most of the adverse effects of disasters on disaster victims and survivors. • Helps in enhancing search and rescue and identification of victims/survivors through photos taken by mobile phones. • Helps in making response efficient. • Provides evidence-based information backed by photos • A tool for awareness raising and preparedness efforts
Challenges to use of Mobile telephones	• Network coverage is a significant problem associated with the use of mobile phones, networks coverage. • Cost of airtime, often expensive, so air time provided by employers is usually inadequate or limited. • Cost of mobile phone is usually expensive. • Most of the mobile telephones are susceptible to malfunctioning. Not suitable for field operations, they have to be handled with care. • Not suitable for use during heavy rainstorms or during thunderstorms • Mobile phones are relatively expensive – Operators have to use their generators to power their masts. So tariffs very high and born by • Could be used as a tool for communicating wrong information – wrong figures
Suggested Improvements to mobile telephones	• Collaborate with mobile phone companies to expand and strengthen their network coverage in rural and disaster-prone communities. • Provide mobile phones that are less sophisticated, durable, and not easily breakable. • Provide less expensive phones. • Provide phones with a universal charger. • Provide phones with excellent power saving capacity. And alternative power banks to be provided for each phone user. • Provide CUG for First responders, or readily available airtime. • Provide pieces of training in the use of phones • Provide enough top-up/airtime to EMTs using mobile phones. • Provide phones that could be usable in all weather, including during rains and thunderstorms. • Phones that could be used during rains or floods. Water resist phones that could be used in the rain. • Provide dedicated lines that could be used exclusive for communication by EMTs so that the network could not be clogged during emergency periods.

In the next stage, to identify commonalities in the coded data, further examination was completed. Efforts were made to gather data with commonalities into categories, to the extent that no further reduction was possible. The groups were also further reviewed to identify any connections or possible relations for the merger of such categories, and it emerged that there were no evident connections. The categories were used as the final descriptors that became the themes used to provide answers to the research question, (See Table 4)

Table 4

Sample Research Question, Theme, and Category

Research Question	Theme	Category
What are the experiences of EMTs with the use of mobile telephones in low income, rural African communities?	Areas of Emergency Operations where mobile telephones are most useful	• Most of the disasters we have responded to relate to flood disasters. • Mobile telephones are critical in emergency operations, especially in evacuations, search and rescue, provision of emergency medical assistance to survivors – injured, delivery of relief aid.
	Benefits of mobile telephones	• Enhances communication and helps in making disaster response efficient and effective. • Helps in reducing suffering among disaster survivors and aids the amelioration of the adverse effects of disasters • Enhances search and rescue efforts and could be used to generate photos that could aid identification of victims/survivors through photos taken by mobile phones. • Provides photos that could be used to provide pictorial evidence to substantiate relevant information.
	Challenges to use of mobile telephones	• Weak network coverage is a significant problem associated with the use of mobile phones in disaster response in rural African communities. • Cost of air time, often expensive, so air time provided by employers to EMTs is usually inadequate or limited. • Mobile phones provided by employer organization are reportedly expensive as indicated by employer organizations. • Most of the mobile telephones are not strong enough and are susceptible to malfunctioning. Not suitable for field operations, they have to be handled with care.

	• Most of the Mobile telephones are not suitable for use during heavy rainstorms or during thunderstorms • Tariffs for mobile telephones companies are often high, due to the cost of operation attracted by mobile companies for the running of private generators to power their masts or towers. • Could be used by some people for propagating wrong messages that could negatively impact communities.
Suggested Improvements to mobile telephones	• Collaborate with mobile phone companies to expand and strengthen their network coverage in rural and disaster-prone communities. • Provide mobile phones that are less sophisticated, not expensive, but durable, and not easily breakable. • Provide phones with a universal charger. • Provide phones with excellent power saving capacity. And alternative power banks to be provided for each phone user. • Provide adequate airtime or provide a CUG arrangement with mobile phone companies for First responders to be able to communicate effectively. • Provide necessary training in the use of mobile telephones in the use of complicated phones. • Provide water-resistant mobile telephones phones that could be usable in all weather, including during rains and thunderstorms. • Provide dedicated lines that could be used exclusively for communication by EMTs so that the network could not be clogged during emergency periods.

Presentation of Findings / Results

With the aid of Nvivo, the transcript of the audio and text of the face to face interviews and the FGD, were analyzed based on the context of the questions in the interview protocol and the FGD. The raw data was carefully reviewed and uploaded into Nvivo, which was used to aid the reorganization and classification of the raw data into codes. The generated codes based on identifiable commonalities were further aggregated into categories. The categories were then grouped and refined into themes (Zamawe, 2015). The analysis of the raw data generated from the interview protocol, which sought to address the research question (*What are the experiences of EMTs with the use of mobile telephones in low income, rural African communities?*), culminated into the generation of four themes; (i) Areas of Emergency Operations where mobile telephones are most useful (ii) Benefits of the use of mobile telephones in Disaster Response (iii) Challenges to the use of mobile Phones in Disaster Response in Rural African Communities (iv) Suggested Improvements to the use of mobile telephones in Disaster Response. The analysis of the results was substantiated using selected excerpts from the raw data, though some of the responses, wordings, specific phrases and statements of participants were slightly reviewed to protect the identity of the participants and also to ensure the confidentiality of the respondents.

Theme 1: Areas of Emergency Operations where Mobile Telephones are Most Useful

Despite the perceived multi-sectoral resource and capacity challenges facing the advancement of disaster management in rural African communities (Hamer, Reed,

Greulich, Kelen, Bradstreet, & Beadling, 2017), this study has revealed that EMTs in Rural African communities, understand the basic concepts of disaster response. They described disaster response as the steps taken *(including disaster alerts, search, and rescue, care, and maintenance)* immediately after the eruption of a disaster, to save and protect lives, reduce suffering among survivors and victims and protect property and infrastructure in the disaster-affected footprint. Participants identified the critical areas in emergency response operations where mobile telephones could be more useful in enhancing communication. The following areas were identified, (i) During search and rescue operations; (ii) In the conduct of evacuation exercises; (iii) During the provision of emergency medical assistance including ambulance services to disaster survivors – Injured; (iv) In facilitating the delivery relief assistance to disaster survivors. Some of the responses of participants are as noted below:

> Participant P.1: Mobile telephones are useful in most areas of emergency operations, but the key areas where I consider the technology to be most useful includes the facilitation of search and rescue exercises and in the conduct of evacuations especially when survivors are to be relocated to from disaster flashpoints to safe areas.
>
> Participant P.4: Mobile telephones are useful in the entire spectrum of disaster response operations, however, the areas where I consider the technology to be the most effective includes: in the facilitation of the delivery of emergency medical assistance including the use of ambulance services to convey injured persons, the sick or persons who require medical attention from disaster areas to medical

facilities. Another area where mobile telephones could be crucial in enhancing emergency response operations includes in coordinating the delivery of relief assistance such as food and Non-food items to disaster survivors.

Theme 2: Benefits of Mobile Telephones

The effectiveness of Disaster response in advance countries has been proven to be enhanced by the integration of ICT in response activities. Recognizing the dearth of literature on the experiences of the EMTs with the use of mobile telephones in disaster response in rural African communities, participants were requested to highlight, based on their experiences, some of the benefits. The reactions of participants in both the face to face interviews and FGD mostly reinforced the generally held view that the use of mobile telephones in disaster response contribute towards reducing the adverse effects of disasters and makes response efficient and effective (Macherera & Chimbari, 2016). The responses of some of the participants are as noted below;

Participant P.1: My mobile telephones helps in enhancing search and rescue efforts during disaster response.

Participant P.2: Mobile phones help to fast track communication during response

Participant P.3: For me, I consider mobile phones as a technology that can contribute to enhancing disaster response and reduce the suffering of disaster-affected persons.

Participant P.4: Based on the type of software that is installed on the phone, I have learned over the years that it could be used as a tool for data collection.

Theme 3: Challenges to Use of Mobile Telephones

In exploring the experiences and perceptions of EMTs with the use of mobile telephones in disaster response in Rural African communities, participants were requested during the face to face interviews, as well as the FGD, to highlight some of the challenges they encountered with the use of mobile telephones as EMTs. In their responses, participants reiterated the following problems as the key impediments to the efficient use of mobile telephones in disaster response in rural African communities; (i) Inadequate network coverage or weak signals is a significant problem to the use of mobile telephones, as most rural areas do not have robust network coverages, hence mobile phones could not be used in rural areas with limited or weak network coverage; (ii) Most mobile telephones are susceptible to frequent malfunctioning. They are sometimes not appropriate for field operations as they need to be handled with extreme care; (iii) Most mobile telephones are not suitable for use during heavy rains or thunderstorms; it poses severe threats of electrocution/shocks during storms; (iv) The tariff charged by mobile phone companies for the use of their networks is often high, this is because of the cost associated with powering their towers/masts with thermal generators, and hence the tariffs charged are usually high; (v) Mobile telephones gadgets are often expensive. Though companies sometimes buy them for their staff, the cost of a new mobile telephones is relatively costly and not affordable by some people; (vi) The batteries of most mobile phones cannot preserve charge for an extensive period, hence, they require frequent recharge of their batteries, this tends to affect the use of the

equipment especially when it runs out of charge. Some of the responses of participants are as stated below;

> Participant P.1: For me, poor network coverage is a key challenge affecting the use of a mobile telephone in rural African communities.
>
> Participant P.2: My mobile phone and most of the phones used by my colleagues are vulnerable to frequent malfunctioning or freezing. I often ensure that I handle my mobile telephone with care as they are easily breakable.
>
> Participants P.3: My mobile telephone cannot be used during heavy rains or thunderstorms, as it can be easily damaged, especially when I accidentally immersed one of my old mobile telephones in water, especially when the phone was not water-resistant.

Theme 4: Suggested Improvement to Make Mobile Telephones Useful for a Response.

Participants were asked to suggest ways through which improvement could be made to enhance the effective use of mobile telephones in disaster response in rural African communities. The following are some of the suggestions proffered by participants (i) Collaborate with mobile telephones companies to expand and strengthen their network coverage in rural and disaster-prone communities; (ii) Provide mobile telephones that are less sophisticated, durable and not easily breakable; (iii) Provide mobile phones that are less expensive; (iv) Provide mobile telephones with universal charger to avoid difficulties associated with using specific chargers; (v) Provide mobile telephones with very good power saving capacity and alternative power banks for each

phone user; (vi) Provide Close User Groups (CUG) services for First Responders, or provide readily available airtime; (vii) Provide trainings in the use of mobile telephones (viii) Provide enough top-up/air time to EMTs using mobile telephones; (ix) Provide mobile telephones that could be usable in all weather, including during rains and thunderstorms; (x) Provide mobile telephones that could be used during rains or floods such as water resist phones that could be used in the rain. (xi) Provide mobile phones with huge storage capacity; (xii) Equip mobile telephones with flashlights that can enhance lighting during response; (xiii) Provide dedicated lines that could be used exclusively for communication by EMTs so that the network, could not be clogged during emergency periods; (xiv) Equip mobile telephones with GPS to enhance identification of locations especially during search and rescue.

The responses of some of the participants are as stated below:

Participant P.1: I am suggesting that disaster response organizations work closely with mobile telephones companies to increase and expand the number of cellular base stations in rural communities. Another suggestion is that efforts to be made to equip phones with GPS to enhance identification of locations, especially during search and rescue.

Participant P.2: I want to suggest that organizations should consider providing mobile phones that are not complex but strong and not easily breakable. Additionally, the mobile telephones that are to be supplied for EMTs should not be expensive.

Participants P.4 Recharging of some mobile telephones is a challenge, so organizations should consider providing mobile telephones with the capacity to be charged with universal chargers to avoid difficulties associated with using specific chargers

Participant P.5 I want to suggest that employers provide mobile telephones with good batteries and excellent power saving capacity, besides, provide alternative power banks for each EMT.

Participant P.8 I think there is a strong need for the provision of basic training in the use and handling of mobile telephones for EMTs. Additionally, mobile phones need to be equipped with flashlights that can enhance lighting during a response.

Participant P.10 I want to recommend that Disaster response organizations provide mobile telephones that could be usable in all weather, including during rains and thunderstorms, in other words, I am suggesting that employers provide mobile phones that could be safely used during rains or floods this could be water-resistant phones that could be used under the rain.

Evidence of Trustworthiness

The establishment of trust and confidence in the approach employed and the results generated from qualitative research is a significant concern, associated with qualitative inquiry. In conducting this study, steps were taken to ensure the existence of adequate evidence of trustworthiness (transferability, confirmability, dependability, and credibility) in the data collection process and that the results reflect the viewpoints of the participants (Hadi, and Closs, 2016).

Transferability

Recognizing that generalizability is not tenable under qualitative studies, efforts were made to pursue understandings that could be transferable to EMTs and first responders in Sierra Leone or countries with similar demographic and socioeconomic characteristics (Connelly, 2016). To ensure transferability, a detailed description of the research settings and participants was done. Additionally, participants were recruited from two research sites. These included participants that met the selection criteria for the research and these were sites with statutory mandates to support disaster response in rural African communities. There is a very high likelihood that similar results will be generated if this study is conducted at similar research sites with other categories of first responders.

Confirmability

Confirmability denotes neutrality and the regulation of a researcher's biases (Amankwaa, 2016). The possible infusion of biases in research is primarily associated with qualitative studies. To ensure confirmability, steps were taken to guarantee that the findings of the research neatly reflected the experiences and perceptions of the research participants. This was done through conducting both the face to face interviews and a focus group discussion with the highest degree of objectivity. All of my predispositions to some of the challenges (weak network coverage, cost of operating the required mobile telephone infrastructure in rural communities) associated with the use of mobile telephones in rural communities, and presumptions about the usefulness of the use of mobile telephones in emergency situations in Africa, were identified and held in

abeyance through a process known as bracketing to prevent threats to the internal validity of the research.

Dependability

Dependability is likened to the notion that similar results will be generated if this study was to be repeated with the same participants, or a new study were conducted with a similar context (Connelly, 2016). To ensure the dependability of this research, all the participants were asked the same questions in the interview protocol, to allow for consistency in eliciting the experiences of participants with the use of mobile telephones in disaster response. An audit trail of the entire research exercise was instituted, details of how data was collected and how the themes were established was documented.

Credibility

Credibility ensures the plausibility of research conclusions based on evidence (Twining, Heller, Nussbaum, & Tsai, 2017). Research credibility was ensured through the conduct of member checks. All the 10 Participants were allowed to review interview transcripts, to secure their concurrence on what was recorded, and I also solicited feedback from participants on the research findings. All of these steps were instituted to enhance the identification of any misrepresentations in the results where they occurred.

Summary

In Chapter 4, I presented the data collection procedure including; selection of the10 participants from the two research sites, setting of the interviews and focus group discussions, the demographic characteristics of the participants, interview protocol and guide for focus group discussions and the process of data analysis were all presented in

this chapter. Participants provided their experiences concerning the use of mobile telephones in disaster response in rural African communities. Several codes were generated from the reactions of participants, with the use of NVivo a total of four main themes were identified from the responses of participants, based on the research question and the emergent interview protocol and FGD The steps taken to ensure the trustworthiness of the research findings were described. Chapter 5 provides an interpretation of the research data, conclusions, and recommendations for future research, positive social change implications, and the overall findings of the study.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

Disasters in rural African communities often results in loss of life and property, injuries, and the spread of diseases; the severity of which are primarily associated with slow response (Haataja et al. 2014). The integration of ICT such as mobile telephones in disaster response has therefore been recognized as one of the principal conduits for reducing the global statistics on the adverse effects of disasters (Hassan & Ayub, 2015). Several studies have been conducted on the efficacy of the use of ICT (particularly mobile telephones) in disaster response in advanced economies (Alexander, 2014; Hattaja et al., 2016; Kakar & Mustafa 2013; Tufail, 20156). Despite the extensive reviews and readings that were conducted, I found no literature that examined the experiences of EMTs serving as first responders, with using mobile telephones in responding to disasters in low income, rural communities in Africa.

The purpose of this generic qualitative study was to explore the experiences and perceptions of (EMTs, with the use of mobile telephones in disaster response, in rural African communities. During the course of the research, I examined the perceptions and experiences of EMTs in rural African communities, where the statistics on the adverse effects of disasters has been observed to be exponentially high in comparison to the adverse effects of disasters on more urban African communities (Bischiniotis et al., 2018). I interviewed 10 EMTs (seven male and three female) from two research sites in Sierra Leone and four primary themes were identified from the findings. In this chapter, I interpreted the findings, applied the results to the theoretical framework and drew

conclusions based on the research data, delineated the limitations, discussed the implications for positive social change, and also proffered recommendations for future research.

Interpretation of Findings

As noted in Chapters 1 and 2, the integration of ICT platforms like mobile telephones in disaster response in advance economies has been recognized by the international community, as a contributor to the efficiency of disaster response in the West (see Levius et al., 2017). The dearth of literature on the experiences of EMTs in rural African communities was the principal motivation for the conduct of this study. This study focused on assessing the experiences of 10 EMTs from two research sites in Sierra Leone.

The findings of the study include identification of the areas in emergency response operations where mobile telephones are most useful, the benefits of the use of mobile telephones, some of the impediments associated with the use of the technology in disaster response, and some improvements that could be infused into the use of the technology to make it resilient and effective in aiding disaster response. The interpretation of the findings is presented in two segments. The first segment provides a description of how the findings confirm and extend knowledge in the field of disaster response, as noted in the peer-reviewed literature provided in Chapter 2. The second segment offers an interpretation of the findings in the context of the theoretical framework that underpins the study.

Scholarly literature suggests that mobile telephones are a critical ICT platform that can contribute significantly to enhancing disaster response (Hassan & Ayub 2015, Levius et al., 2017). Participants in this study confirmed the efficacy of the use of mobile telephones in disaster response, especially in rural African communities. In addition to confirming existing knowledge related to the importance of the use of mobile telephones in disaster response, the findings also portray an extension in knowledge as it delineates the specific areas of disaster response (e.g., search and rescue, evacuation exercises, provision of emergency medical assistance and delivery of relief assistance) where the use of mobile telephones could be visibly rewarding or useful.

The peer-reviewed literature in Chapter 2 highlights some of the benefits of the use of mobile telephones in disaster response. Haddon (2017) and Asongu and De Moor (2015) noted the enhancement of communication, improving search and rescue, strengthening awareness raising, and data collection as some of the benefits of the use of mobile telephones in emergency response. Participants in the study consistently outlined similar benefits of the use of mobile telephones in disaster response in rural African communities. The findings of the study therefore largely confirm existing knowledge related to the benefits of the use of mobile telephones in emergency response as outlined in the existing literature. Additionally, mobile telephones could be used as a tool for capturing photographs of critical scenes during response, which could be used in the preparation of evidence based reports, required for policy development and decision making, this is a new insight uncovered by my research as part of the benefits of the use of mobile telephones in emergency response.

There is abundant existing literature that outlines the challenges associated with the use of mobile telephones in disaster response. Bennett et al. (2018) and Madhavaram et al. (2017) are among some of the scholars who identified and elaborated on some of the challenges associated with the use of mobile telephones in disaster response. The findings of my study strongly confirm that indeed, the use of mobile telephones in disaster response tolls with critical challenges. Participants identified inadequate cellular coverage, susceptibility of mobile telephones to frequent malfunctioning, limited use during extreme weather conditions, high cost of mobile telephones and tariffs, and weak phone batteries with low capacity to effectively preserve adequate energy to power mobile phones for considerable period as some of the key challenges associated with the use of mobile telephones in disaster response in rural African communities. The challenges mentioned above are consistent with the challenges identified by scholars, especially in the review of the use of the technology in advanced countries. Most important, one unique challenge that was uncovered by this research as a challenge that is characteristic of the use of mobile telephone in disaster response in rural African communities, is the unavailability of electricity supply in rural areas can serve as a key impediment to the effective use of mobile telephones. The intensive use of mobile telephones requires frequent recharging of the phone batteries, when access to electricity is not assured in rural communities, the efficiency of the use of mobile telephones could be hugely debased.

The scholarly materials provided in the literature review outlines some of the suggested improvements that can optimize the effectiveness of the use of mobile

telephones in disaster response. Levius et al. (2017) and Asongu and De Moor (2015) are among some of the scholars who proffered suggestions that can make mobile telephones effective for disaster response. Participants in the study strongly confirmed most of the ideas in the existing literature that are aimed at improving the effectiveness of mobile telephones for disaster response. The findings transmit the need to strengthen network coverage; provide mobile telephones that are less expensive, provide alternative power banks for mobile telephones as some of the most critical suggestions that can improve the effectiveness of mobile telephones in disaster response in rural African communities. Additionally, some new insights that were uncovered by this research as suggestions proffered for the improvement of the use of mobile telephones in rural African communities includes the following; provision of basic trainings for EMTs in the effective handling of mobile telephones, provision of mobile telephones with features (water resistant features) that can enable its use in extreme weather conditions, equip mobile telephones with flashlights to enhance lighting during response operations, equip mobile telephones with GPS features to enhance identification of locations during search and rescue operations, provide mobile telephones with huge storage capacity to enhance its data storage capacity.

The key findings of the study underscore Roger's (1962) (year) innovation diffusion theory, which states that five key factors can influence the use and spread of technology. The five factors noted by Roger includes compatibility, complexity, relative Advantage, trialability, and observability (Scarbrough & Swan, 2016). Dutta and Omolayole, (2016) opined that any technology that exhibits all the five factors noted

under the innovation diffusion theory would have a high rate of spread and use. The results of the study confirm that mobile telephones exhibit all five attributes; hence, its extensive use by EMTs in rural African communities. The overwhelming benefits recounted by participants as some of the benefits of the use of mobile telephones in disaster response reiterates the fact that mobile telephones exhibit all the five critical attributes noted by Roger in his innovation diffusion theory. The challenges to the use of mobile telephones outlined in the findings are either directly or indirectly related to the four key factors noted by Roger in his innovation diffusion theory. The highlighted challenges underscore the need to strengthen the four critical attributes indicated in the theory to ensure the optimal use of mobile telephones in disaster response in rural African communities.

Additionally, Roger's categorization of people based on their rate of adoption of technology, is also underscored by the findings of the study. It is indicated in available scholarly materials that mobile telephones were first adopted in Africa for disaster response operations in the year 2000 (Harris et al. 2018). The findings of the study indicates that all of the 10 participants have long years of experience with the use of mobile telephones, they all indicated that they had started using mobile telephones prior to them being engaged as EMTs. This clearly portends that the participants are among the category of people Roger described as the innovators and early adopters, as they appear to have adopted the use of mobile telephones as early as when the technology was introduced in their respective communities. This clearly confirms compliance of the study findings with existing knowledge

Limitations of the Study

Some critical limitations to the trustworthiness of this study need to be noted. The data gathered from the study is not characteristic of the entire population of first responders in rural African communities, the data was limited to just EMTs who are only one sub-set of the various categories of first responders participating in disaster response. Though the same sets of questions were posed to each of the participants in the study, the potential variations in individual perspectives and how some participants may have perceived some of the questions may have influenced some of the responses of participants. This is consistent with an earlier assertion made by Amankwaa (2016). Though individual experiences and perceptions are real to the individual, the absence of evidence to support some of the experiences of participants, in addition to the possible exaggerations of some individual experiences, tends to pose a threat to the trustworthiness of the collected data (Liao, & Hitchcock, 2018).

Most importantly, though individual experiences and perceptions are critical, they are often susceptible to social desirability bias. Another limitation is that the study sample which comprised of 10 EMTs, appears to be small and limited to one category of first responders EMTs and not the various groups of first responders. However, issues of trustworthiness were addressed during the data collection and hence strengthened the credibility, reliability, and transferability of the results.

Recommendations

The recommendations proffered draws from the strengths of the study and some of the peer-reviewed materials referenced in the literature review of this study. Based on

the limitations to the trustworthiness of the study, there is need for future research to focus on exploring the experiences of other categories of first responders with the use of mobile telephones during disaster response in rural African communities. It was evident in the literature review that most of the discoveries about the use of mobile telephones are associated with general users of mobile telephones and not a specific category of first responders. For example, the experiences of Fire Fighters, Soldiers, Police Officers, with the use of mobile telephones in disaster response in rural African communities, need to be researched as the experiences of EMTs will not be transferable to other categories of first responders. There is need for future research to compare the various categories of first responders based on their levels of adoption of technology. It will be useful to compare innovators and early adopters, with late majority and laggards in terms of their perceptions of the use of mobile telephones. Recognizing that most of the challenges to the use of mobile telephones in rural African communities are associated with limited financial resources, there is need for future research that focuses on identifying alternative financial sources such as grants, funding organizations that could be used to support disaster response operations in rural African communities.

Implications for Social Change

The findings of the study convey the potential for positive social change. From the overarching purpose of the study, it is evident that the experiences of EMTs, with the use of mobile telephones in disaster response, in rural African communities, can contribute to increasing the understanding of some of the ways through which mobile phones could be effectively used in disaster response communications. Particularly in

rural or remote communities, this knowledge will, in turn, aid the attainment of efficiency and effectiveness in disaster response operations. Resultantly, effective and efficient disaster response will ensure the reduction in the adverse effects (fatalities, injuries, loss of properties) of disasters and contribute to positive social change. The decrease in the harmful effects of disasters will trigger positive social change at the individual, family, organizational, and societal levels.

The findings of the study confirm the identification of the critical areas in emergency operations where the use of mobile telephones to facilitate communication could contribute significantly towards improving overall disaster response. Knowing the key areas in disaster response, where the use of mobile telephones may be most effective is very important. Some of the effects of this knowledge may include aiding disaster response managers in the deployment of the requisite logistical support (Mobile telephones) that may be required to maximize efficiency in disaster response, and resultantly contributing to reduction in the extent of human sufferings associated with slow-paced disaster response. Improving disaster response has the tendency of contributing to the realization of positive social change at the individual, family, organizational and societal levels.

Another avenue through which the findings of this study may contribute to positive social change is the fact that the study findings delineated some of the benefits, challenges and suggested ways of improving the future use of mobile telephones in disaster response in rural African communities. Understanding the benefits, challenges and suggested improvements to the use of mobile phones, in disaster response, may be a

useful resource for the mobile telephones industry, especially in terms of informing the design of mobile telephones that may be suitable for rural African communities. The development of appropriate mobile telephone technologies may prevent the emergence of the highlighted challenges from degrading the efficiency of the technology when used in disaster response operations. This capability in mobile telephones may contribute to enhancing effective disaster response which may reduce the adverse effects of disasters, as well as reducing the number of fatalities, injuries, and illnesses emanating from the slow disaster response. The reduction in the adverse effects of disasters will contribute to positive social change.

The generic qualitative approach that was used for the study and face to face and FGD data collection methodology that was adopted for the study was the most appropriate approach which aided the attainment of the study results as they emerged. The DOI theory that was used was also appropriate for providing the theoretical framework for the study. Both the methodology and theoretical framework aided the positive social change implications which the study results will eventually trigger. Overall, the results of the study may contribute to a reduction of the adverse effects of disasters, whenever they reoccur, this will contribute to positive social change in the target communities.

The recommendation for practice therefore, is to ensure the effective utilization of mobile telephones in those areas in disaster response (Search and rescue, evacuation, provision of medical assistance including ambulance services, the coordination of the delivery of relief items during disaster response), where the use of the technology has

been found out to be most rewarding. Also, forging effective collaboration with mobile telephone companies to strengthen mobile telephone network coverage in target rural communities is another key recommendation for practice.

Conclusion

The principal purpose of this generic qualitative study was to explore the experiences of EMTs with the use of mobile telephones in disaster response in rural African communities. The findings of the study illustrate that: EMTs in rural African communities fully understand the critical areas in disaster response operations where mobile telephones can generate more than optimal results. The use of mobile telephones in disaster response is beneficial, but there are challenges associated with the use of the technology in disaster response. In-spite of the identified challenges, there are useful measures suggested to improve on the efficiency of the use of mobile telephones in emergency response in rural African communities. The results of this study has contributed to addressing the identified gap in knowledge and the existing body of literature in the disaster response discipline in rural African communities.

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Appendix A: Participant Letter

Dissertation Research – Walden University

Dear Sir / Madam,

Subject: Request for Participation in Dissertation Research – Walden University

My name is James Harding, I am a doctoral candidate in the Human Services and Social Work Department of Walden University in the United States of America. One of the requirements for the fulfillment of the award of the degree of Doctor of Philosophy in Human Services and Social Work is the conduct of a research study. To this end, I intend to explore the Use of mobile telephones: Experiences of First Responders in Rural African Communities.

As you are aware, disasters in rural African communities often engender loss of life and property, injuries, and the outbreak of diseases: the severity of which are primarily associated with a slow response. The use of ICT in disaster response has been found to be one of the conduits for improving disaster response and reducing its adverse effects. EMTs are among the categories of first responders participating in disaster response in rural African communities, and mobile telephones are being used as one of the ICT platforms to enhance response. A lot of studies have been done on the use of ICT particularly mobile telephones in disaster response in advance countries, but in all the review of relevant literature, I was unable to find any material on the experiences of EMTs with the use of mobile telephones in disaster response in rural African communities. I, therefore, intend to explore the experiences of EMTs with the use of mobile phones in disaster response in rural African communities, which is an existing gap

in knowledge. This study will contribute to the body of literature on addressing the documented social problem of high rates of destruction of lives and property associated with slow emergency response to flood disasters in rural African communities.

In my search for suitable participants for this study, I read about the role your EMTs or paramedics, continue to play as first responders in various waves of disasters in Sierra Leone. It is therefore presumed that their experiences with the use of mobile telephones in disaster response will contribute immensely to defining the experiences of EMTs with the use of Mobile telephones in disaster response in low-income countries.

I, therefore, write to kindly request you to grant permission /approval for EMTs in your Emergency / Disaster management department, to willingly and voluntarily avail themselves for participation in my research. The volunteering EMTs will be required to participate in a face-to-face interview and Focus Group Discussions that will be based on providing responses to questions related to their experiences with the use of mobile telephones in disaster response in Sierra Leone.

Upon receipt of your permission / approval, a general briefing meeting will be held with EMTs in the Disaster Management Department of your Ministry / organization, to brief them on the purpose of the research, the voluntary nature of the recruitment of participants and how the volunteers will be screened in line with the selection criteria for inclusion in the study. A range of about 4 to 6 EMTs will be eventually selected from your institution for participation in the research. The privacy and confidentiality of all information provided by your volunteers will be strictly assured.

I thank you in advance for your time and assistance. Please do not hesitate to contact me via email or telephone. My contact information is: …….

Sincerely yours,

James Harding

Candidate of Walden University Doctoral Program

Appendix B: Interview Protocol

1. How long have you served as an Emergency Medical Technician?
2. How many waves of disaster response have you served as an EMT - first responder?
3. Have you ever used a mobile telephones as a communication equipment in your disaster response efforts in Sierra Leone?
4. How long have you used mobile telephones to enhance your disaster response operations?
5. Who owns the mobile telephones you use in your disaster response operations?
6. How comfortable are you with the use of mobile telephones?
7. Who do you usually use your mobile telephones to communicate with during disaster response?
8. Who covers the cost of operation of the mobile telephones used in your disaster response?
9. What facilities (Voice Call, SMS, photos, audio, video, etc.) of a mobile telephone do you use most in your disaster response activities
10. What are some of the benefits of using mobile telephones during disaster response?
11. How can EMTs be encouraged to use mobile telephones?
12. What are the challenges associated with the use of mobile telephones in disaster response in rural African communities?
13. What improvement can you suggest to make mobile telephones an effective tool for enhancing disaster response.
14. In the absence of a mobile telephones, which other ICT equipment have you used to enhance your work as an EMT?

Appendix C: Focus Group Discussion Guide

Use of mobile telephones in Disaster Response –
Focus Group Discussion Guide

A. Opening and Explanation

(i) Introductions and Setting the context

- You are all welcome to this discussion. As you may be aware, my name is James Harding, a Doctoral Candidate at Walden University, and I want to thank you for being part of this very important discussion.
- This discussion is part of the data collection platforms I am using to gather feedback from EMTs on their experiences with the use of mobile telephones in Disaster Response in Rural African Communities.
- During this discussion, I will pose a couple of questions related to the experiences of EMTs with the use of mobile telephones in disaster response. When you answer, please express your thoughts about each question or any other related issues.

(ii) Ground Rules

- Note that there is no wrong or correct answer to any of the questions that will be posed. You are therefore encouraged to state your personal experiences, viewpoints, feelings
- I am interested in getting inputs from everyone here today. The more information gathered from you, the better we will be able to improve disaster response in rural African communities as well as making positive social change.
- All comments will be accepted and appreciated. If you are unable to answer a particular question, please let me know. You are encouraged to please notify me if you don't understand what the issue is referring to.

- Feel free to express your personal opinion on what is being discussed.
- It is essential for you to be honest, and to be aware that you are not obliged to say anything about yourself that will make you feel uncomfortable.
- I will not during the discussions answer any question related to the use of mobile telephones in disaster response in rural African Communities, because, I am a student researcher, so, I do not want to influence your answers in any manner, I will remain in this student researcher role till the completion of my dissertation. I want to learn from your experiences. If you have any question that is related to the use of mobile telephones in disaster response, please wait until the end of the discussion, and I will be happy to refer you to a place where you may get assistance.

(iii) Procedure

- During the course of this discussions, I will be moderating the session, in addition, I will be performing a few other minor functions during the course of the discussions, and these functions will include, taking some notes as well as managing the equipment for audio recording of the session, to ensure that the entire discussion is fully captured.
- I wish to clarify that, a tape recorder will be used to audio record all of the discussions, as I need to pay careful attention to all of what will be said during the discussions. I will have to replay and listen carefully to all the responses provided to my questions during the discussions. I will then take the information gathered from the discussion session for the preparation of a report. The audio recording of each discussion will commence right from the introductions. No video recording will be allowed.
- The discussions are strictly confidential. What you hear and what you say should not be shared with anyone outside the room.

- This is a group discussion, so you do not have to wait for me to call on you. Speaking one at a time is essential, so everyone will hear what you say, and it will make it easier when I review the tapes. Also, it is essential to be considerate of your fellow participants and give each other an opportunity to speak.
- When responding to a question, I would like for each of you to state your first name each time you respond in order to determine who said what during the discussion, though your names will not be indicated in the final report, to maintain your privacy.
- We have a lot of information to go over, so I may have to change the subject at times or move ahead in the middle of our discussion. Please stop me if you want to provide additional information that you feel is important to our discussion.
- Our session will last for approximately 45 minutes to 1 hour.

(iv) Self-Introduction

- Let's start by briefly introducing ourselves. You may want to state your name and the number of years you have served as EMT. Be assured that your name will not be indicated in the final report.

B. Discussion Questions

- We are now going to begin our questions

- **Experience of EMTs**
    i. How can you describe disaster response in rural African communities?
    ii. How many waves of disaster response have you served in as EMT - first responder?
- **Mobile telephones**

i. How long have you used mobile telephones to enhance your disaster response operations?
ii. Who owns the mobile telephones you use in your disaster response operations?
iii. How comfortable are you with the use of mobile telephones?
iv. Who do you usually use your mobile telephones to communicate with during disaster response?
v. How is the cost of operation of your mobile telephones covered?
vi. What facilities *(Voice Call, SMS, photos, audio, video, etc.)* of a mobile telephone do you use most in your disaster response activities?
vii. How can EMTs be encouraged to use mobile telephones?

….……..……Five Minutes Break……

- **Perceived Benefits**
  i. What are some of the benefits of using mobile telephones during disaster response?
- **Perceived challenges**
  i. What are the problems associated with the use of mobile telephones in disaster response in rural African communities?
  ii. What improvement can you suggest to make Mobile telephones an effective tool for enhancing disaster response.
  iii. In the absence of a mobile telephones, which other ICT equipment have you used to enhance your work as an EMT?

C. Closing

- These are all the questions I have for you for this session. Before we leave, do you have any additional responses or comments on the information discussed today?
- Once again, I want to reassure you that all of the information you have provided here today remains confidential.

- Before leaving, I want to remind you that a follow-up call or face-to-face meeting will be scheduled within two weeks for participants who have agreed to member check. The said call or meeting will be scheduled once the data has been analyzed for validation of the report and any additional comments.
- Thanks for coming and for being part of this session. The information that you have provided is essential and useful.