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Do First Responders Find Active911 Useful?

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DO FIRST RESPONDERS FIND ACTIVE911 USEFUL?

By

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Abstract

Mobile technology continues to advance, as does the field of emergency management. Today, emergency management personnel utilize the latest technology in all phases of emergency management, which include mitigation, preparedness, response, and recovery. This proposed study particularly identifies mobile technology in the response phase of emergency management pertaining to first responders. Specific technologies on the rise in the field of emergency management include mobile applications. Applications such as Active911 were developed in detail for first responders. It was found that not all first responders take advantage of existing technology and the reasons vary. This mixed methods study was created to be a follow-up study based on previous work completed involving Active911's implementation in the Russellville Fire Department, Arkansas. The survey questions were designed to answer the central research question: Do first responders find Active911 useful? Participants' responses were analyzed using both quantitative and qualitative analysis to determine the trends in each of their responses. Keywords: mobile technology; mobile applications; first responders; emergency management; Active911; response; communications

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Chapter I: Introduction

In only a short amount of time, the world of modern technology has changed drastically. Technology has progressed forward so fast; there is no turning back to the old gadgets that will eventually become obsolete. According to Pew Research (2014), 90 percent of American adults have a cell phone, 58 percent of American adults own a smartphone, and 74 percent of American adults own an e-reader or tablet as of January 2014. These numbers have increased over the last few years and continue to shape our world and our daily lives. The research conducted by Pew Research exposed that 44 percent of cell phone owners sleep with their phones nearby the bed in hopes that they do not miss a call and that 29 percent of cell phone owners could not live without their phones. Analyzing these findings show how much technology plays a role in our lives.

Technology in Emergency Management

Technology not only plays a vital role in our personal lives, but it can also specifically affect every field and industry in various ways. The field of emergency management has emerged and evolved over the last few decades in a drastic manner and is never comparable to the traditional paradigm (Williams, 2012). The emergency management field is extremely widespread and two emergency management jobs in the field could be nothing alike. There are four phases of emergency management to which technology can be applied: mitigation, preparedness, response, and recovery (Reddick, 2011). Technology used throughout the four phases might include Geographic Information Systems (GIS); computer software to create emergency plans; communication devices such as radios; mobile data terminals; the Internet; and mobile applications (Southerly, 2016). Overtime, new technologies have emerged in the field and

have opened up many new possibilities. Advancements in technology have made it possible for those in the field of emergency management to better perform their operations and receive real-time video and data, in addition to the convenience and flexibility that already accompanies technology (Southerly).

Mobile Technology

Technology is generally discussed as a whole, but for the purposes of this study, it is important to look specifically at existing mobile technologies. Mobile technology provides convenience and flexibility at their greatest levels. Mobile technology consists of mobile phones, laptops, tablets, e-readers, personal digital assistants (PDAs), global positioning system (GPS) devices, and card payment terminals (Northern Ireland Business, 2016). A variety of communications technologies allow devices to be mobile including wireless fidelity, most commonly known as Wi-Fi, Bluetooth, 3G and 4G global systems, dial-up, and virtual private networks (Northern Ireland Business). These mobile technologies provide an abundance of benefits to our fast-paced lives.

A study conducted by Pew Research (2014) illustrates that 81 percent of cell phone owners use their cell phones to send or receive text messages, where 60 percent of cell phone owners use their cell phones to access the internet. In addition, the study demonstrated that 50 percent of cell phone owners download mobile applications (apps) and 49 percent use their cell phone for navigational purposes (Pew Research). Mobile technology has somehow become the center of the daily lives of those who own cellular devices.

Mobile Technology in Emergency Management

Mobile technology can provide wondrous benefits for the field of emergency management and for first responders. Smartphones and tablets especially provide the ability to have access to a plethora of applications. Application developers have created many convenient apps for consumers who have a great deal of experience with mobile applications as well as those who have very little experience. While there are plenty of applications that can be downloaded for free, there are some apps that perform greater tasks, but come with a price. The more complex applications are like having the actual software on your desktop, but in the palm of your hand. Most smartphones come with a map and are installed with weather applications. Beyond that, the American Red Cross and Federal Emergency Management Agency (FEMA) also have great apps for emergency managers (Steen, 2014).

The American Red Cross offers a variety of apps that can help locate the nearest shelter, provide pet first-aid care, and provide information for specific hazards. The organization also offers other applications that provide weather alerts in the area based on location. These apps allow users to schedule and track blood donations as a blood donor (Red Cross, 2014). The Red Cross applications are also available for downloads in Spanish to provide their products to a larger demographic (Red Cross).

FEMA has a mobile app and it offers multiple capabilities. The app includes disaster safety tips, emergency kit information, emergency meeting locations located in the surrounding area, and maps identifying local shelters and any open FEMA Disaster Recovery Centers (FEMA, 2014). A FEMA Disaster Recovery Center is a mobile office or facility that is set up in an area following a disaster (FEMA). The centers offer

assistance programs for affected citizens by providing them with guidance regarding their situations, providing statuses of paperwork filed with FEMA, and housing assistance and sheltering information (FEMA). FEMA's application also encompasses a feature that allows the user to upload photo reports with GPS technology after a disaster and display it on a map for others to view. That specific feature allows people to see damage from the disaster in specific locations so they know if there are locations they should avoid (FEMA).

Active911

Other mobile applications that pertain emergency managers include apps that are specific to different positions or jobs, such as first responders. Mobile apps for first responders include apps that improve first responder efficiency, provide access to necessary information, and improve incident response (Payton, 2013). A popular first responder application on the market is known as Active911, and it will be explored in this study.

Active911 is an active response system for the modern first responder (Active911, 2016). The system allows the dispatch center to send out critical information, alerts, and navigational maps out to first responders. Alerts sent out to first responders will contain critical information including: the address of the scene, cross streets, time of call, what other responders received the alert, and who all are currently responding to the incident (Active911). After receiving the information, the first responder can then choose to respond to the alert, in which the dispatch center and other first responders can monitor response efforts in real-time. Active911 also includes a shift scheduler that allows notifications to be turned off when the user is off-duty (Active911). The application also

allows multiple layers of maps to be included in the map system, so users can add

locations of fire hydrants or other related features. Profiles of high-risk facilities such as

nursing homes and schools can be created and emergency plans and photos could be

uploaded to each profile (Active911). Building floor plans, locations of safety knox

boxes, and other pertinent information can also be uploaded to those area profiles.

Active911 also has the ability to generate reports for types of calls over period of time

(Active911).

Active911 is system that should integrate with the dispatch center's computer

assisted dispatch (CAD) system (Active911, 2016). Allowing the integration of the

systems will not increase work for the dispatcher, as the critical information is already

being collected and entered into the CAD system. The application can also be used on

smartphones, landlines, PCs, and tablets (Active911). The data is encrypted and all

personnel must pass a background check, which provides extra security among the

transfer of information, as well as the users of the mobile application (Active911).

Problem Statement

The problem as stated previously is that there is an abundance of available

technology and technology itself has advanced in a relatively short amount of time.

Technology will continue to evolve, as will emergency management. The problem is so

broad that it is difficult to narrow it down to mobile technology in emergency

management. Some emergency managers and first responders take advantage of the

existing technology, while others do not. Mobile technology can further advance

emergency management, but certain issues such as departmental budgets, generational

gaps, lack of awareness that this technology exists, and resources not being offered in all

areas hinders the use of new and growing technologies in the field.

Former Work and Research

In the spring of 2014, I worked on a team project that the Russellville Fire

Department had requested a mobile application that mapped out the location of a call

scene, which allowed them to see other firetrucks that were responding and their live

location. The fire department had received iPads from the city of Russellville for all

firetrucks, and wondered if this type of application could be developed for them to use.

In researching other mobile applications capable of those actions, my team and I found

Active911. The team presented the application to the training coordinator and the fire

chief. Since the application did what they wanted and more, they decided to have the

team implement Active911 into their current system. The application had to be added at

the dispatcher's office and dispatchers also learned about its features. The

implementation of the application did not add additional work for the dispatchers, since

all the information being sent to the firefighters was fetched from the CAD system, where

the dispatchers entered the information when they initially received a call.

In the past, there has not been much research conducted in areas of mobile

applications and response phases of emergency management. In fact, there has been no

academic research conducted for the Active911 application. I plan to conduct a study

focused around Active911 users and determine if they find the mobile application useful

and how it compares to the traditional methods of communication. Since I have had no

further contact with the Russellville Fire Department, I would like to use them as

participants in my study that answers the question, "Do first responders find Active911 useful?" and treat this as a follow-up to my previous research work.

Purpose

By completing this study, I plan to fill the gap for studies on mobile applications being used by first responders in emergency management. As Active911 is still fairly new, there are no studies specifically focused on the application as well as how the application can be compared to the traditional methods of communication between the responders and dispatchers. With these research results, I hope to determine that such an application is beneficial to first responders and whether or not mobile technology should be utilized more by first responders.

Chapter II: Literature Review

The purpose of the literature review is to analyze the existing literature relating to Active911, and other mobile technologies for first responders in emergency management. Sources used in this literature review have been attained through an electronic literature search using academic databases, such as Google Scholar and EBSCO. Various key terms were searched electronically including emergency management; first responders; response phase; communication; mobile technology in emergency management; interoperability; Active911; I am Responding; and wearable devices for first responders.

The literature review is divided into five different subcategories. Each subcategory presents different literature and aspects pertaining to mobile technologies in emergency management. The first subcategory is *emergency management*. In this section, the changes of emergency management throughout history will be summarized, as well as the evolving role of an emergency manager. The second subcategory, *first responders*, will define and address the role and duties of first responders. The following subcategory, *response phase of emergency management,* defines response in emergency management and will examine the use of information, communication, and interoperability within the response phase of emergency management. The fourth subcategory is *technology and emergency management*. This area will review the various technologies used in emergency management including information technology, geographic information systems, location services, wearable devices, and mobile devices used by first responders. The last subcategory, *similar research*, addresses similar studies that look at social media in the response phase of emergency management and wearable devices used by first responders in the field.

Emergency Management

    Changes throughout history. Questions raised about emergency management go back as far as the 1970s (Britton, 1999). Many did not understand the relationship among the different phases and there was confusion among the placement of emergency management, as it was only evident in five federal agencies at the time (Haddow, Bullock, & Coppola, 2013). Local communities did not put high importance on how they would manage disasters or hazards (Stehr, 2007). More attention and focus were brought to emergency management as the different levels government questioned who they would turn to in the event of a disaster. As Steven Stehr describes (2007), those with emergency management responsibilities did not have very many resources to draw upon.

    By 1978, President Jimmy Carter sought to put the responsibilities of preparedness, mitigation, and response under one federal organization and the following year the Federal Emergency Management Agency (FEMA) was established in which the director would report to the president (Haddow et al., 2013). Emergency management since then has evolved and still continues to emerge, as this can be agreed upon by Dr. Neil Britton (1999). Researchers see the practice of emergency management as "a structured science performed by experts" (Cronan, 1998, p. 20). In 1983 R. Dunn stated,

        Emergency management is a necessary function in society, our physical geography and climate make us prone to most forms of natural disasters and we share with other modern industrialised nations the potential for man-made disasters such as industrial accidents, hazardous substances and hostile acts in peace of war. (as cited in Cronan, 1998, p. 20)

Cronan (1998) also describes in his own words that as the framework for emergency management evolves, it will continue to identify the roles and functions of emergency managers.

Evolving role of the emergency manager. Britton's (1999) research study in discusses emergency management and the evolving role of the emergency manager. He reveals the six positive developments in emergency management including links between research and practice and knowledge-based education programs (Britton). Britton also defines a more practical context for emergency management. He describes their roles by stating,

> Emergency managers should assist in the creation and management of community resilience, development and growth by being able to recognize resources and risks, and help communities choose a level of risk appropriate to their circumstances" and "emergency managers should help manage communities as sustainable entities. (1999, p. 7)

An article by Shari Veil (2012) describes the role of emergency managers and that, "departments at city, county, and state level are primarily responsible for planning and implementing each respective jurisdiction's disaster response, including communicating warnings and response efforts to the public" (p. 290). Their descriptions of emergency management go hand in hand. Britton describes their roles from a broad standpoint and Veil's statement agrees, but is more specific. Britton (2012) also describes emergency managers as ones who additionally ensure that appropriate mechanisms are in place, are functional, and are adequate enough to respond in a particular environment.

This also goes along with Veil's words that describe how first responder communication is a critical aspect in emergency management (Veil, 2012).

An empirical study conducted by Stehr (2007) looks at how the roles and responsibilities of a local emergency manager have shifted over the years, more so since September 11, 2001. The study, conducted in a large urban area of Washington, looked at how a county Office of Emergency Management (OEM) allotted their time to phase specific projects between 1999 and 2006. The collected and analyzed data show that over the eight-year period, the most amount, or 39.7 percent, of employee time was dedicated to preparedness activities (Stehr). The reflected change in project type can be seen through the years. Between 1999 and 2001, more than 70 percent of employee time was directed at preparedness activities. From 2002 to 2006, the percentage of time allotted toward preparedness showed a decline which went from 58 percent to 32 percent (Stehr). Areas that increased were not mitigation, response, or recovery but administration and grants. The data also shows an increase in the number of staff. In the eight-year period, the number of employees nearly tripled from six to seventeen.

Stehr (2007) concludes that after the September 11 attacks in 2001, the federal focus for emergency management shifted to domestic security. This change slowly led to the decline in focus on preparedness projects for naturally-occurring hazards. After 2001, many regions came together as partners and the federal government also made many grant programs available to state and local entities which in turn explained the shift towards grants and administration. Stehr's research shows that the shift in focus at the federal level will also impact the operations and priorities of the emergency managers at the local level. Stehr even revisits and reflects on Britton's study completed in 1999 that

was also previously mentioned. One could conclude based on Stehr's findings that an emergency manager should possess skills that allow them to understand and manage intergovernmental aspects and the many disciplines of emergency management as the roles and priorities will continue to shift (Stehr).

First Responders

There are a wide range of people and organizations that are considered emergency first responders. A first responder can be a member of an emergency communication center, fire and rescue, medical services, law enforcement, HazMat response teams, or other disaster relief organizations (Sawyer et al., 2004). In another article, first responders also included a public health worker (Benedek, Fullerton, & Ursano, 2007). Due to the definition of a public health worker being somewhat inconsistent, the specific roles of first responders are hereby reviewed.

Benedek et al. (2007) study what types of disaster requires public safety workers and public health workers to respond, and also compare the psychological effects that they face after the different events. Although further research was needed to support their data, they concluded that the modern definition of a first responder should include, "traditional public safety workers (e.g., police, firefighters) and public health workers and non-traditional responders who help reconstruct the community's health and safety infrastructure in extreme conditions" (Benedek et al., 2007, p. 65).

Another study describes first responders and their work as emergency managers (Sawyer et al., 2004). This work is particularly designed around responding to incidents or disasters and their causes. Because incidents often occur unexpectedly, the article describes a situation where a first responder must be able to switch gears very quickly.

Their jobs allow and require them to be mobile, responding to incident sites fairly quickly and their equipment aids them in finding solutions (Sawyer et al.). Joorabchi (2014) describes that it is imperative that the needs of first responders are recognized. When emergency responders have all their needs met, they are able to deliver solutions and resolve cases in the best timely manner (Joorabchi). Joorabichi also explains two main elements that are common to a first responder's response to an incident: communication with other responders and data acquisition. Acquiring data allows for first responders to know how to deal with the situation, and communicating information with other responders will allow them to pass on important or vital information (Joorabchi). Statements found in this article support what was found in a previous article by Joorabchi from 2004. In a 10-year span, it is still agreed upon that responders must be able to shift gears very quickly and when their needs are met, it allows them to perform their duties.

Response Phase of Emergency Management

   Characteristics and activities in response. All phases of the emergency management cycle include mitigation, preparedness, response, and recovery, which are all widely accepted among various agencies globally (Zlatanova & Holweg, 2004). Due to their specific roles in emergency management, first responders are called to duty in the response phase of emergency management. Their roles are supported by local community officials and emergency managers (Haddow et al., 2013).

   In another study, the collective knowledge in the response phase is explored (Vivacqua & Borges, 2012). The study describes the response phase as the most studied phase because of its complexity. There are many characteristics and factors that go into the response phase that make each scenario different such as: uncertainty of the size of

event; number of people involved; the speed of events; quick decision-making; number of capabilities and resources needed; and the stress and pressure put on everyone involved (Vivacqua & Borges). Cutter (2003) describes the response phase itself as "actions immediately following an event, such as rescue and relief" (p. 440). Vivacqua and Borges can agree upon this statement as they define the phase as how "it begins immediately after an event with adverse impacts on a community happens, and ends when the situation has been stabilized" (p. 191).

The response phase purpose is to save lives and avoid major economic losses and environmental harms (Vivacqua & Borges, 2012). It also puts plans into action that were planned in the preparedness phase. As with all plans, they cannot be made specifically for every event, and that is why first responders and others involved must be able to adapt and adjust quickly to the situation presented before them (Vivacqua & Borges). According to Vivacqua and Borges, the main activities in the response phase include "the mobilization and coordination of resources, risk assessment, prioritization of goals and analysis of risks, medical, search and rescue guidance and providing shelter for the affected" (p. 191).

Information in response. In their study, Vivacqua and Borges (2012) describe how all phases of emergency management require information and the reasons for each phase vary. Among all phases, the time dependency of information is highest for the response phase. Responding personnel adapt to the situation as it continues to unfold and evolve. In response, there are often things that happen beyond the responders' control that they must work around. Examples that reflect on the time dependency of information during the response phase include circumstances where a rooftop might start to collapse

or someone getting trapped in a specific location (Vivacqua & Borges). First responders need to know this type of information to be able to respond and make hasty decisions. Such information needs to be communicated in a rapid manner and updated continuously.

Response time. An area pertaining to first responders often analyzed and reviewed is the response time. Often examined by elected officials and administrators, response time is construed as the amount of time from the receipt of call to the on-scene arrival (Blackwell & Kaufman, 2008). Through the years, different response time guidelines have been published as recommendations for emergency responders. A recommended target response time published in 1979 advised for eight minutes or less, for at least 90% of emergency responses (as cited in Pons et al., 2005). Researchers found that the survival rate of a person needing basic or advanced life support decreased significantly if support was initiated in more than four minutes. Although the previous study was only a result of patients of cardiac arrest, it became general guidelines for all emergency responses regardless of patient injury or illness (Pons et al.).

The Guidelines 2000 Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care suggested that a response time of eight to ten minutes should be the goal for emergency responders (as cited in Blackwell & Kaufman, 2008). As most first responders are qualified to use automatic external defibrillators, it is preferred that defibrillation is performed in five minutes or less for those in need. Blackwell and Kaufman agree that in order to effectively decrease response times, it is possible that resources such as equipment, communication systems, ambulances, and personnel are exhausted or spent.

Although suggested response times are thought to increase survival, very few studies have been conducted to provide the evidence. A study was conducted to determine the effect of response time on patient survival until to hospital discharge (Pons et al., 2005). The study was completed for unselected patients in a large urban setting. The study gathered data that indicated that improved survival was not associated with situations where response times were within eight minutes. However, few cases were recognized for patients with intermediate or a high-risk of mortality where response times were four minutes or less.

Blackwell and Kaufman (2008) conducted a similar study to determine the effect of response times in an urban setting. In their study, researchers found that when compared to calls where the response times were beyond five minutes, improved survival was related to situations where the response times were less than five minutes. Little data exists that suggests that changing the recommended response times to between five and eight minutes would have a valuable effect on survival rate, as the influence could be brought by other factors (Blackwell & Kaufman). Blackwell and Kaufman also concluded that aiming for a response time of less than five minutes could lead to costly expenses that not all communities would find justifiable. They recommended that target response times should be personalized to meet the needs of the community, politically, and economically.

Communications. It is found that communication among first responders is crucial to their success (Panitzek, Schweizer, Bradler, & Muhlhauser, 2011). It is found among multiple articles that the authors can agree to the previous statement and also the past events (Manoj & Baker, 2007). Communication is the sending and receiving of

messages through verbal and nonverbal means such as written, spoken, or physical gestures (Effective Communication, 2005). During times of a disaster emotions run can wild. It is important that communication be executed in a timely and accurately fashion in order to relieve some of the physical and emotional stress that comes with disaster responses (Effective Communication).

There are many first responder groups or organizations that respond to an event and they must be able to communicate effectively (Manoj & Baker, 2007). Especially in large scale disasters, communication is vital and key. As the range of the disaster heightens, more first responders will get involved and each will have their own range of capabilities and technology (Panitzek et al., 2011). In a study that examines web-enabled communication systems, the authors describe how it is aimed to get information to the responder within the least amount of time (Babatunde, Kayode, Betty, & Ibiyemi, 2013). It can be seen over the years and throughout the globe how poor emergency communication capabilities have had adverse effects in response and relief efforts.

September 11, 2001. Panitzek et al. (2011) agree that a time where communication technology was not sufficient enough was the September 11 attack. The different agencies had trouble communicating with one another due to the lack of interoperability (Stegall, 2014). Problems with radio communication could be linked to communication methods, different radio equipment, and failure of the equipment. There were many incidents where first responders were not able to communicate with their life lines. This caused first responders to make quick calls which could be linked to a higher number of deceased (Stegall).

Problems with radio frequencies and signal posed a big problem for first responders inside the World Trade Center Towers (Commission, 2011). The 9/11 Commission said:

> The inability to communicate was a critical problem at the World Trade Center, Pentagon, and Summerset County, Pennsylvania, crash sites, where multiple agencies and multiple jurisdictions responded. The occurrence of this at three different sites is very strong evidence that compatible and adequate communications among public safety organizations at the local, State, and Federal levels remain an important problem. (p. 28)

The Commissions also tied slow response, amount of damage, and the loss of lives to the lack of proper communication during September 11. They believed that the technology used by first responders added to the chaos (Commission, 2011).

Dispatcher Bruce Alder said, "To this day, I have nightmares of police officers calling for help and not being able to answer them" (as cited in Long, 2011). The New York Fire Department (NYFD) puts the blame on the signal repeaters (Long). The repeaters left imperative messages from one firefighter to another that were unable to be received. Cell phones were unable to operate due to the fact that networks were jammed from too many people trying to communicate.

Lessons learned. Since the September 11, 2001 attacks, the NYFD has worked hard to prevent a repeat of the events that unfolded that day (Long, 2011). Portable repeaters have been added to their arsenal to combat communication problems. These new repeaters will allow communication inside the high rise buildings that symbolize New York City. Chief Edward Kilduff (2011) said, "We're better-equipped from a technology point of view, from a personal protective equipment point of view and from a communications point of view, and a training point of view" (p. 1). Better relationships have evolved between the fire departments and police force. Now police helicopters can communicate with fire department personnel, which will prevent a repeat of poor response activity seen on September 11. That day the police helicopters were unable to communicate with the firefighters inside the buildings prior to their collapse. If they had been able to communicate, lives could have been saved (Long).

Interoperability

The Department of Homeland Security (2008) defines interoperability as," the ability of first responders to communicate among jurisdictions, disciplines, and levels of government, using a variety of frequency bands, as needed and as authorized" (Department of Homeland Security, p. 2). According to Jenkins (2003), the issues revolving around interoperability are not new to first responders. The federal, state, and local governments must address the problems of interoperability and understand what interoperability truly is. It is also believed that they should establish a set of goals and regulations in regards to interoperability, but allow them to adjust to the needs of each jurisdiction (Jenkins). All these jurisdiction should come together to understand the roles that each one of them play in establishing the problems of interoperability. Increased

federal funding has been a result of the 9/11 event (Jenkins). Everyone has closely watched the roles and abilities of first responders in disaster response. The new funding allows first responders to improve communications and address any other issues pertaining to interoperability (Jenkins).

September 11 interoperability. According to Fox (2004) communications systems that are in working order allow first responders to do their job more efficiently. The lack of interoperability among first responders can be linked to the lack of sufficient funding and the unorganized attempts of multiple agencies to plan a working method of interoperable communication (Fox). During the rescue operations on September 11, 2001, the New York City police officers inside the North Tower were able to receive the orders to evacuate. On the other hand, the fire department did not receive the evacuation order due to the fact that they were operating on a different channel (Peha, 2005). When two entities of the same city, cannot communicate due to the technological issues, it can cause an ineffective response effort. The radio traffic that day faced multiple problems from high traffic volume to lack of signal (Liebenau, 2003). Police and fire departments must be able to communicate with one another and also have the ability to work together during times of disaster. Small things like frequencies or types of radio can effect communication (Liebenau).

Many of first responder agencies have transitioned from analog radios to digital. Those carrying the digital radios cannot pick up the radio traffic from an analog radio, or the other way around. This would force first responders in the field to rely on a middle man to relay the information from one first responder to the other accurately (Liebenau, 2003). Key information may or may not be communicated correctly to do this.

Therefore, radios that will allow first responders to communicate directly will cut out most of the confusion and allow for quicker action.

      Oklahoma City bombing. On April 19, 1995 in Oklahoma City, Oklahoma, Timothy McVeigh bombed the Alfred P. Murrah Federal Building (Oklahoma Department of Homeland Security, 2014). First responders were so overwhelmed by the destruction and the radio traffic was so high and disrupted that messages were written by hand and delivered by means of a golf cart. According to the Oklahoma Office of Homeland Security, not being able to send and receive messages directly and effectively can put the lives of first responders and civilians at a greater risk. The lack of adequate communication also effects the day-to-day operations (Oklahoma Department of Homeland Security).

      The Oklahoma City Police Department only had four radio channels that they could operate on (Mayer-Schönberger, 2002). Due to the events that took place that day, those four channels became highly congested. The fire department only had two channels, but could only use one channel. Communication then turned to the use of cell phones that would later become useless due to the high volume (Mayer-Schönberger). It is important to have the necessary tools to do the job. Better equipment allows emergency personnel to communicate more accurately without disruption, and would help the men and women in the field safe lives and reduce the risks that might await them.

      FIRSTNET. Many jurisdictions are struggling to adhere to the new requirements that will require everyone become familiar with interoperability (Roston, 2013). In Virginia, the city of Winchester is one of many areas that do not have the funds that are needed to purchase the necessary equipment to meet the guidelines set forth by the federal government (Roston). The government is trying to combat these issues with things like FIRSTNET. FIRSTNET is based on the connectivity of a computer network and will not affect the common two way radio communications (Roston).

      Steps have been taken in attempt to eliminate some of the problems with interoperability. The National Telecommunications and Information Administration (NTIA) are responsible for keeping the president informed on telecommunications and information policies (About NTIA, 2016). They operate under the Department of Commerce and address the needs of first responders. The NITA oversees FIRSTNET. FIRSTNET is the first nationwide high-speed network (FIRSTNET, n.d.). It is available for first responders to use in order to save lives and perform daily operations more efficiently. The FIRSTNET program addresses concerns that were present in the 9/11 Commissions report. It also addresses any prior problems of communication such as area coverage and reliability (FIRSTNET, n.d.).

      This broadband network will allow first responders the ability to communicate with one another nationwide without problems of delays (National Broadband Plan Connecting America, n.d.). This will also make the relaying of information easier and will allow for voice, videos and text messages to be used so more detailed information can be provided and more lives can be saved. The goal in the future is to incorporate this new technology into the nation's 911 call systems (National Broadband Plan Connecting

America, n.d.). There are still issues that must be fixed with the broadband system, but it indicates a promising future and addressing the issues of interoperability (National Broadband Plan Connecting America, n.d.).

There are some individuals who are not sure that FIRSTNET will address the country's problems dealing with interoperability (FIRSTNET Update, n.d.). In Virginia, Interoperability Coordinator Chris McIntosh said, "FIRSTNET cannot be expected to understand each state's unique circumstances and needs. It is through a partnership between states and localities, and their existing governance structures, and the FIRSTNET board that this program will be successful" (as cited in FIRSTNET Update, n.d.). Ray Lehr of Maryland's Communications Operability reinforced McIntosh's statement by saying, "Only the states and local public safety leaders can speak to their needs. This early input will ensure the network meets the expectations of each community" (as cited in FIRSTNET, n.d.). FIRSTNET has a long way to go before meeting our interoperability goals. FIRSTNET officials are trying to create something that first responders will want to use and that will be easy to operate (FIRSTNET Update, n.d.).

States have the right to opt out of using FIRSTNET (Moore, 2013). However, any state that chooses to do so must send in an alternative plan to the Federal Communications Commission (FCC). These plans must address operations, maintenance, and any improvements in regard to access. Despite the state's position on opting out of FIRSTNET, the state's plan must meet the standards set forth by FIRSTNET (Moore). States may choose to not participate for reasons of fees that must be paid to FIRSTNET to pay for the operations and maintenance of the system. If the state's plan does not meet

the guidelines that are set forth by the FCC, then the state must adopt FIRSTNET (Moore).

      Communication Technology. Manoj and Baker's (2007) research finds that communications challenges in emergency response go beyond interoperability problems. Through study, observation and discussion, they found communication challenges among first responders can be grouped into categories: sociological, technical, and organizational (Manoj & Baker). When studying technological challenges they found that deployment of communication systems was not fast enough. In many cases, no back-up systems were in place when network infrastructure was damaged in a disaster. They found that dual-use technology or built-in redundancy could be two solutions to allow communication systems to stay in use after a disaster. According to the authors, devices with multiple network and Wi-Fi capabilities should also be integrated into future systems (Manoj & Baker). Four years later, similar research on the topic still continued.

      One general agreement in a study is that technology connections in 2011 still could not withstand a disaster (Panitzek et al., 2011). The study revealed a break in mobile devices and Wi-Fi capabilities. They found that more stores and restaurants were open to offering free Wi-Fi to customers. The article also discusses different technologies that could allow first responders to communicate even if the networks were down (Panitzek et al.). They looked at private access point technology and wireless ad-hoc networks. The only concern they found with this was that only large cities would be able to incorporate this into their existing systems because of cost and resources. The authors did discuss the first responders' use of standalone computers. Their duties do not allow

them to carry large equipment, so some mobile device that allows heavy computation will help first responders (Panitzek et al.).

Two articles discuss different communication technologies that can further allow success to first responders in their duties (Manoj & Baker, 2007; Panitzek et al., 2011). During the four-year difference between the two studies, they discuss completely different technologies. The study of 2007 discussed how Wi-Fi capabilities should be integrated into future systems (Manoj & Baker). In the 2011 study, it reveals that Wi-Fi technology is already in use and communication systems could not use Wi-Fi as reliable networks after a disaster (Panitzek et al.,). In the time between the two studies, a technology did not exist and a few years later, it was widely accepted.

Technology and Emergency Management

Information technology. A study conducted by Christopher Reddick researched information technology in emergency preparedness and planning (Reddick, 2011). He states that there was little research conducted done in this area. He completes his study by surveying state government directors of emergency management, and their use of technology throughout the phases of emergency management (Reddick). The results show that information technology impacts all four phases of emergency management. The greatest area of impact by information technology is the response phase (Reddick). This study completed in 2013 agrees that the impact of technology is the greatest during the response phase (Valecha, Sharman, Rao, & Upadhyaya, 2013). The authors believe that there has been little research done on information technology in response, specifically on communication technologies. The article describes how previous studies focus on radio communication (Valecha et al.).

Geographic information science. Cutter (2003) describes in her article, the use of geographic information science (GI Science) in emergency management. Through the years of technological improvement, GI Science tools have allowed the emergency management field to better recognize hazards in actual time or very close to it. The author goes back to the September 11 attacks when the value of GI Science proved to be recognizable (Cutter). Many geographic information systems (GIS) were used during the catastrophe in the initial rescue and relief activities. Many organizations such as Urban Search and Rescue (US&R) teams used GIS tools and remote sensing in their efforts and to assess damage (Cutter). Other GIS tools were used to identify what daily essentials, such as electricity and water, were backed up and running. They used spatial support systems to create maps for the public and were updated regularly (Cutter).

Mobile devices and location services. Mobile devices and terminals have advanced over the years to where they now allow users to take advantage of location-based services (Ficco, Palmieri, & Castiglione, 2014). In this study to achieve a ubiquitous location service, the authors describe how outdoor location services have proven satisfactory. They explain how there are no devices or systems that allow a hybrid method that would allow devices to switch from outdoor location to indoor location services (Ficco et al.). Stationery satellites allow devices to use location-based services. These global positioning satellites (GPS) can provide a closely estimated position of any device with a GPS receiver. The downfall to using GPS is that it only provides for outdoor locations (Ficco et al.). Through their research, Ficco et al. have proposed an approach that could allow for a true ubiquitous location system. The system would allow

the device to use the GPS in outdoor locations and seamlessly switch to indoor locations using a network-based method.

A similar study conducted a few years earlier examined wearable devices for locating emergency responders (Kunnath et al., 2012). Among the two literatures, it is agreed that GPS devices are still common in being for location services (Kunnath et al.,; Ficco et al., 2014). The location of the scene can play a part if the device is capable of receiving the satellite signal. Large buildings or forests and trees around the scene can block such signals. Kunnath et al. developed a design of a wearable device that uses beacon nodes to track location and monitor vital signs of the user. Multiple beacon nodes are placed around the wearable device in which the location of the beacon nodes are known. When the emergency responder is using the device, the signals and estimated location of the beacon nodes are reported through a monitoring program overlooked by the dispatcher or commander (Kunnath et al.). The researchers believe that the proposed device can satisfy their objective and provide a quick method for monitoring and locating emergency responders in a cost-effective manner.

Mobile devices and first responders. The duties of a first responder require that they be able to be mobile, shift quickly and respond to incidents (Sawyer et al., 2004). To control the situation, they must have all the necessities to perform and fulfill their duties. The United States Department of Homeland Security has even assessed that the need by first responders for accessing and sharing of information is poorly supported (Sawyer et al.). Mentioned in previous sections of the literature review, Sawyer et al. examine a situation where police officers are given mobile devices to use that allow them to access a network of convenient information stored in database known as the Commonwealth of

Pennsylvania's Justice Network (JNET). It was brought to the attention of consumers that wireless service providers were building out their networks, and it was questioned if first responders could use public telecommunications daily and efficiently.

Five participants of the study used laptops while the others used personal digital assistants (PDAs) (Sawyer et al., 2004). For three months during their daily routine, officers accessed JNET on their assigned devices using the public 3G network. The results of the study showed that the download speed was not as imperative as keeping a reliable, secure connection (Sawyer et al.). Sawyer et al. revealed that the reasoning behind speed was not as important with the traditional method because police officers must convey what information they need to dispatchers and wait for their response. The gathering of data by the dispatcher occurs while the officer is managing the scene, which keeps the officer from diverting his or her attention elsewhere. This also led to the proposal by participants that future JNET frameworks should allow it to be implemented into dispatcher systems where it would still be hands-free for police officers to obtain, but they could visually see the needed information.

It was also found in the results that PDAs have a small screen and do not have a long battery life whereas the laptops were too bulky (Sawyer et al., 2004). The researchers found that the use of public networks by first responders is promising as long as coverage capabilities and portability (including insufficient battery life) are met. Such technology can only pertain to certain regions as it does not eliminate the number of people involved and response organizations often have limited technology support. Sawyer et al. stated in their literature that, "participants are hopeful about the roles that

mobile devices and wireless access can play in making their work life safer and also better enable them to perform their duties" (p. 64).

Similar Research and Studies

  Social media. A research completed in 2014 studies the role of social media in emergency response (Giacobe & Soule, 2014). First responders rely heavily on their command and control centers for incidents ranging from small to large. The researchers of this study discussed how use of social media in response phases could become highly effective (Giacobe & Soule). At the local level, operation centers are often minimally staffed, yet social media can still prove effective. The article then discusses services other than social media, such as mass text notification versus the traditional radio and paging system.

  One mass text notification system that is also web-based that the article describes is "iamresponding.com" (Giacobe & Soule, 2014). The system can also be used online and notifies users of who is responding to the call. Systems like "I am Responding" are not only effective for those responding to the call, but volunteer responding agencies as well. The authors state that more tools like that could be effective for multi-agency notifications among dispatch, command and control centers, and multiple responder agencies (Giacobe & Soule). Unlike other tools, social media and web-based applications do not require command center employees to be technically savvy. The purpose of the research was to provide perspective for the use of social media in emergency management (Giacobe & Soule). Local level responders can more effectively respond to incidents and disasters if they have the capabilities that social media technology can provide for them.

Wearable device and automated alert system. Another study that relates to the previous article was also completed in 2014. This study examines ubiquitous interoperable emergency response systems (Passini, 2014). The author specifically looks at wearable and mobile devices, ubiquitous software, and response tracking. In describing wearable and mobile devices Passini mentioned that the number of mobile devices exceeded the population of the United States in 2011, and the number of mobile devices owned by an individual will continue to increase. Although mobile devices will continue to play a role in daily activity; however, in emergency response situations, responders must take the time to take the device out and it occupies their hands (Passini). This reason led the researcher to study wearable devices as they are trending, and can be used in seamless hands-free manner.

An application studied in this article is "I am Responding" (Passini, 2014). As explained by the researcher, "I am Responding" is not a ubiquitous or interoperable system that is practical in emergency management (Passini). The system is a cloud- based system where users respond to an incident via phone call. Users of the application will receive a text message informing them of an incident, and the responder will call an automated phone service which will register the caller. The system then identifies their dispatch center and gives them real-time response information. The first responders can use the mobile application to view directions to the scene (Passini).

The researcher tested a scenario at volunteer fire department, where one group of responders used their traditional method of communication such as their pagers and radios, while another group was assigned radios, pagers, Google Glasses as their wearable device, and multiple mobile devices (Passini, 2014). The mobile device had an

application developed by Passini that was very similar to "I am Responding" but the user replies with a text message or clicks a button to show whether or not they are responding. Each group responded to a mock incident of a kitchen fire in the city limits. The results among the two groups varied (Passini). Group One had only the traditional devices, and had four firefighters ready and a first truck enroute to the scene 3 minutes and 30 seconds after the call and a second truck at 6 minutes and 30 seconds. Group Two had the wearable and mobile devices, and had three firefighters on a truck enroute at 2 minutes and 30 seconds, and a second truck enroute at 6 minutes after the call (Passini).

The findings of the study show that an automated alert system is more convenient and effective for the first responders and dispatch centers (Passini, 2014). It takes longer for the dispatch personnel to access the web application and send out notifications along with sending out a call over the radio. In this case, group two received the notification of the call quicker than the traditional method delivered through the dispatcher, which allowed them to respond to the scene faster. In the case of "I am Responding" first responders must also call an automated phone system to notify that they are responding (Passini). The complication of study was that the "I am Responding" system was not integrated into the dispatch center's CAD (Computer aided dispatch) system. Systems that can get integrated into the CAD system have many benefits over ones that do not (Passini). Passini also describes how future work would involve improvements to the developed mobile application and incorporating devices that monitor vital signs.

Conclusion

The literature review provides a look at the various problems and proposed solutions that deal with the use of technology, more specifically mobile applications in

emergency management. The literature also examines how technology plays a vital role in the day-to-day activities of first responders, and how the technology has evolved. It also observes the field of emergency management and the roles and responsibilities of the emergency managers. Studies within the literature review assess the response phase of emergency management and the response time's correlation to victim survival.

Communication plays a vital role in the effectiveness of emergency response. The literature asserts that information must be shared in a timely manner to allow first responders to execute tasks that lay before them. If the incident command cannot communicate with the responders in the field, the chances of a successful rescue is strongly compromised. As witnessed at the World Trade Center on September 11, 2001, first responders relied on the information that was being fed to them by the incident commanders. Once they lost contact and the certainty of whether or not information was being relayed back and forth, the operation took a turn and put the first responder's life at a greater risk. This resulted in the loss of many fire and police personnel. More actions could be taken in order to reduce these risks including better cooperation and technology. Some similar studies were also reviewed that indicated there was plenty of room for improvement of existing technology in emergency management as well as room for new technology. It is agreed among the literature that technology weaves into our lives a little more each day and can provide strong advancements in the field of emergency management. As there was no literature available for Active911, the study contributes to fill the gap.

Chapter III: Methodology

The objective of this study was to explore and determine, "*Do first responders find Active911 useful?*" To achieve this objective, a sample of first responders using Active911 will be chosen from the Russellville Fire Department in Russellville, Arkansas to complete this follow-up study, based on my previous work done to implement Active911 into their systems. The organization was contacted, and asked if they would like to participate in a study to be used for research purposes. A questionnaire was used as the data collection method and asked semi-structured, open-ended questions. The remainder of this chapter will present the details of the research perspective, methodology, and methods to be used in this study. The chapter will also, in detail, describe the setting and population, and how collected data will be managed.

Epistemology and Paradigm

The mixed methods approach used in the study is based on the pragmatic philosophical worldview. The pragmatic worldview recognizes that answers are centered on the problem, that there are consequences of actions and that real-world situations should be solved logically (Creswell, 2009). Pragmatic researchers focus the study around the problem, and are not bound to a single philosophical system. In the same way they view the world, pragmatists find that there can be multiple approaches to collecting and analyzing data (Creswell, 2009). Pragmatist researchers might also use multiple techniques and methods that best fit their needs of completing their research. For this study, both quantitative and qualitative methods were used to obtain the best data to answer the question.

Participants, Population and Sampling

        Setting and environment. The setting for the study was in the first responders'

natural environment and setting. Removing participants from their natural setting,

especially when being asked to complete a questionnaire, may provide feedback that is

out of context. By providing a link to the online survey, the participants were able to

complete it where it was most convenient.

        Population and sampling methods. The population for the study were first

responders who have used the Active911 mobile application. The population was chosen

based on the research question. The sample for the study were firefighters in the

Russellville Fire Department, who have been using Active911 since spring of 2014 or

earlier. This purposive sampling method was chosen so the study could only gather

information based on people of interest. Available firefighters were invited to participate

in the study so that their experiences and views could be analyzed as part of this follow-

up study. I previously worked with the previous training coordinator to help implement

this application into their system, the experiences of other users in the fire department

will help answer my research question.

Methodology

        Research questions. The methodology used for this research is the concurrent

mixed methods approach which is based on the pragmatic researcher worldview and the

nature of the research question (Creswell, 2009). The research question sought to explore

a specific topic, understand experiences and analyze performance and observational data.

In seeking to explore the topic, both quantitative and qualitative questions were used in a

questionnaire with open-ended questions (Creswell, 2009). A questionnaire allows the

researcher to collect standardized and comparable data. Both quantitative and qualitative data were collected in the single questionnaire and were used in the analysis in the final results (Creswell, 2009). Some of the questions asked in the questionnaire included (see Appendix A for all survey questions): How does the application compare to traditional methods of communication? Has the application provided a significant difference in response times since it's been in use? How does kind of technology impact first responders and their daily duties? Do you feel that mobile technologies have a place in today's first responders' duties? By asking these questions and leaving some of them open-ended, it allowed the participants to each give their own personal answers and experiences to use for analysis. Close-ended questions aided in the analysis of their processes.

Data collection and analysis. With a mixed methods approach, both the quantitative and qualitative data were required to be analyzed. The collected data from the questionnaire was downloaded from QuestionPro and converted from Microsoft Excel into Microsoft Word. The minimal quantitative data was analyzed using Microsoft Office Excel. The quantitative data was analyzed first in order to help with understanding their processes before identifying themes. Descriptive, manual coding was completed in Microsoft Word to assist in the analysis of the qualitative data. Coding is used in qualitative analysis to help identify the key topic of a statement or paragraph (Saldana, 2013). After coding the data, the analysis of the data included highlighting the important messages and completing an interpretive analysis which software cannot do. An interpretive analysis allowed the participants' response to be identified and provided an understanding of what was being implied and the meaning behind it.

Positioning and Ethics

Since the study required interviewing and interacting with humans, an application was completed and submitted to the Institutional Review Board (IRB) committee at Arkansas Tech University to show that the benefits of participants' involvement in the study outweighed the potential risks. Along with the application, an informed consent form was also submitted for approval by the IRB committee. Before any participant took part in the study, the Russellville Fire Department was contacted for organizational consent to participate in the study. The legal consent of each individual participant was then obtained thereafter. The participants were informed of what the research involved, and that they can at any time, could choose not to participate for any reason. The confidentiality of records, and whom they could contact for questions and concerns of the study or their rights were also detailed in the consent. All consent was obtained before each participant could proceed with the questionnaire provided through QuestionPro.

The past experiences of prior work with Russellville Fire Department did not influence the analysis of the data in any way, being that the experiences and views being researched are theirs, as first responders. I, in no way, shape, or form have used the Active911 application other than helping to implement it into their system. The sole purpose of this study was to understand the participants' views of the application, and by no means were my personal opinions involved in the analysis.

Trustworthiness

To enhance credibility, transferability, dependability, and confirmability of the research, there were different factors incorporated into the process. The researcher ensured that all study participants were first responders who have been using the

Active911 mobile application since being implemented. Any changes that arose in the process were documented for the reader to understand. Data was checked and rechecked for error or findings that contradict any part of the study.

Summary

The chosen methodology and process of the data collection and analysis goes back to the nature of the research question and my approach as a pragmatic researcher. The participants were chosen for this study based on the availability of the Russellville Fire Department. The questionnaire and mixed methods were chosen to understand and explain participants' feedback and views.

Chapter IV: Results

This study was conducted with the purpose of answering the following research question: *Do First Responders find Active911 useful*? To answer this question, the study tested the hypothesis: *After using the Active911 mobile application, first responders will find that the application is useful and has advantages*, where the null hypothesis was *after using the application first responders will find that the Active911 mobile application was useless and not beneficial*.

In order to determine whether or not the null hypothesis would be rejected, both qualitative and quantitative data was collected from six first responders who are assigned to the Fire Department's Central Station located in Russellville, Arkansas. The participants for this study varied in age and were comprised of various ranks and positions. The variables of rant, position, and tenure in service were not considered in this kstudy. In addition, each participant used the mobile application for various lengths of time.

Survey Results

Figure 1 illustrates the age range for each of the participants. Of the six participants, no participants were in the 18-24 or 55 plus age ranges.

Three participants identified themselves as 25-34 year-old age range, while only one

identified with the 45-54 year-old age range.

Number of Participants in Each Age Range
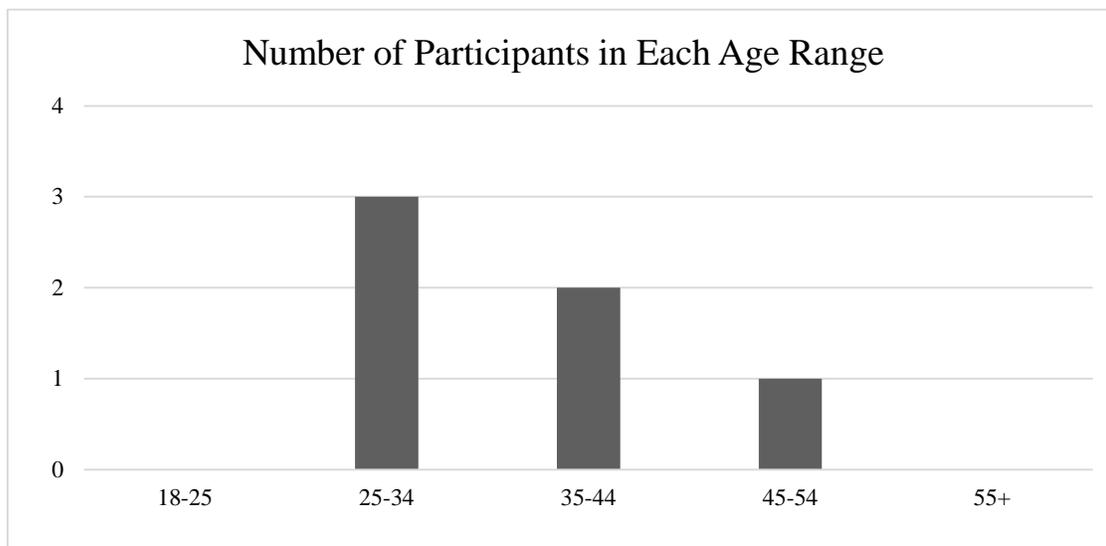
Figure 1.1: Participants Age Range

All participants indicated that they have used the Active911 application for more

than a year. Table 1 below illustrates the devices that each participant utilizes in order to

access the Active911 program.

Table 1. Devices being used with Active911

Participant	iPad	Desktop	Cell Phone
1	X	X	
2	X		
3			X
4	X		
5	X		
6	X		X

When asked in the survey to discuss the benefits provided by Active911, there were several responses that addressed how Active911 provided the location of hydrants, call information, and speed. Participant Two answered, "Informs me of type of call, units responding, location of call, locations of responding units, and the location of the nearest hydrants to a fire." Among the responses, participants also discussed that they did not have to ask the dispatcher for additional information, which aided in their rapid response to calls. When asked about the downfalls and drawbacks of the mobile application, four participants concluded that there were no downfalls. However, two participants did identify potential issues with the lack of interface with the Firehouse software currently in use and occasional issues with map and location updates/information.

The survey also asked the participants to compare Active911 to the traditional methods of communication used by first responders such as the radio. Again, the participants discuss having easy access to the call information without having to repeatedly ask the dispatcher. Other feedback commented on the accessibility of visuals of directions to the scene, and the application providing reliable information faster than the traditional methods.

When asked if the participants thought that the mobile application was user-friendly, they unanimously agreed that it was user-friendly, simple and easy to navigate. The survey also asked about the amount of training required prior to using the application. All six of the participants agreed that it required very little or about 30 minutes of training. Question nine of the survey asked if there were any significant differences in using the application on one device than the other. Most of the participants responded that they have only used the application on an iPad and one respondent

indicated, "It is very convenient to use on my cell phone, especially if I am off-duty. I can choose to respond to an event and my squad knows I am en route."

The survey also questioned if the participants had seen a difference in response times since the application has been in use. All participants agreed that they have seen a difference in response times. Participant Five provided, "Yes it has improved but I can't say by how much exactly" and Participant One claimed, "I think response times have increased [decreased] because it gives you a route to a location instantly." Question 14 of the survey asked the participants to describe how Active911 affects first responders. The participants provided answers that included how information can be received through the application before it is dispatched over the radio and how Active911 aids the first responders in being able to focus more on their duties. Feedback was also given on its capability to ensure the safety of those responding through its ability to show the location of first responders and provide updates in real time.

When the participants were asked if they felt that mobile technologies had a place in today's first responders' duties, all of the participants agreed that mobile technology did have a place in their duties as first responders. Participant Six provided, "Yes. We rely more on technology everyday [every day] and so far its [it's] been effective." The last question of the survey asked the participants to provide any additional comments. Participant One answered, "This has been a helpful application for our overall goal of having integrated mapping, hydrants, and other necessary information literally at a finger touch away." Participant Six provided that they enjoyed the notification features and that it would be helpful if the application was able to run with Firehouse software.

Chapter V: Discussion

As the field of emergency management continually evolves, the need for technology increases. Advanced technology can assist first responders in performing their daily duties as well as potentially saving lives. To a first responder, technology is just as important as body armor or a respirator. If a first responder's technology does not function properly, it can lead to the first responder being subjected to unnecessary risks. For example, a police officer responds to a domestic call, but is unaware that one of the suspects is armed with a gun. Once on the scene, the officer begins taking fire and radios for help. This Active911 application can assist officers in pinpointing the responding officer's location through GPS tracking. The integration of this technology reduces the confusion and stress of relying on directions issued by dispatchers and reduces the time it takes to arrive and aid fellow officer. Time is not a luxury that first responders generally have, so seconds can be the difference between life and death.

Conclusions

The purpose of this study was to answer the research question, *do first responders find Active 911 useful?* A thorough literature review was conducted over the subject matter in order to answer the research question. As a result of the literature review, it was determined that there have not been any prior studies pertaining to Active911 in its use by first responders. In order to answer this question, a questionnaire was distributed via QuestionPro to fire departments in Russellville, Arkansas. The sample population was comprised of firefighters ranging from one to two years of experience and from various age groups. In addition, the participants held various positions within the fire departments and used mobile devices as well as desktop computers. As a result of the survey, it was

determined first responders believed that the Active911 program provided them with a multitude of benefits that not only increased their abilities to perform their duties more efficiently, but also provided benefit to those impacted by an emergency. For example, the participants indicated that their response times improved with the use of the Active911 application. This would allow the first responders to arrive on scene sooner and potentially save lives. Furthermore, the participants were pleased with how user friendly the Active911 application was.

Limitations

A limitation of this study was the small sample population. The Russellville Fire Department only utilizes the Active911 application in one of their four fire stations. The original research design included 18 participants from the fire station. Due to time restrictions and personal choice, only six first responders participated. It should be noted that the six individuals who did participate may be fundamentally different than those who chose not to participate. Since I can only consider those that did participate, I am unable to identify what those potential differences are.

Methodological Insights

First responders from the Russellville Arkansas Fire Department were surveyed regarding their interaction with the Active911 application. The sample population was selected due to being a nearby location and previous contact. However, if I were to recreate this study, I would select first responders from larger jurisdictions and compare them to more rural jurisdictions. Furthermore, I would look at agencies with the capabilities of having full-time personnel and compare them to agencies with volunteer personnel. Another area I would like study at is the abilities of younger generations

versus older generations of first responders. This would allow me to truly understand how user friendly the software is.

Recommendations for Research

The finding that Active911 was readily accepted and integrated exemplified that first responders believed that the Active911 application improved their capabilities in performing their daily duties. Thus, additional future research questions could include:

1. *Do the more urbanized agencies find the Active911 more useful than rural agencies?*

2. *Do younger generations prefer using mobile applications more so than older generations?*

3. *Are urban agencies more likely to implement the Active911 application than rural agencies?*

4. *What are the differences in response times using Active911 versus using traditional methods of communication?*

I also believe that future research should look at the technologies utilized to access Active911 to determine if Apple or another brand of tablet improves Active 911 adoption and performance.

Recommendations for Practice

When emergencies and disasters occur, it is the first responding men and women who race towards the life threatening dangers that await. In most cases, first responders only have minutes to act. It is important that they have up-to-date and accurate information at the palm of their hand (Sawyer et al., 2004).

By implementing the Active911 application into all aspects of a first responder's daily routine, those minutes used to obtain information from dispatch could be eliminated and result in lives being saved. According to Vivacqua and Borges (2012), communication during the response phase is the most critical. Therefore, with the information provided by the Active911 application, first responders will have access to up-to-date information more promptly, allowing them to shave minutes off of their response times.

In addition, there are times during emergency situations where radio communications can be overrun with traffic, and hinder the response efforts and the acquisition of information during critical times. However, with the Active911 application, overcrowded radio traffic could potentially be a thing of the past. No longer will those responding need to keep asking for directions to a call. This is because the Active911 application provides the location of the responding first responders, to others utilizing the application.

The application of Active911 could also be utilized by law enforcement agencies who primarily operate in rural areas. For example, if a sheriff's deputy is responding to a call on a remote county road, other law enforcement agencies using the application would be able to track that officer's whereabouts. This could prove itself extremely helpful if the responding officer finds himself in a life threatening situation and his closest back up is miles away. Those responding would have a better idea of the endangered officer's location prior to arriving on-scene.

In order for first responders to be as effective as possible, they must provide the necessary tools that will allow them to perform their daily duties more efficiently. For example, if a police officer were to go to work without a gun, (s)he would be putting not

only their lives in danger, but also those who they have sworn to protect. Furthermore, hindering his or her ability to perform their daily duties. The Active911 application could be compared to the police officer's gun. If first responders do not have access to the application, he or she will not have all the tools available to optimize his or her performance. Both urban and rural departments could gain from assimilating this technology into their arsenal of live saving tools.

Before this technology can be introduced into the everyday lives of first responders, both first responders and dispatchers must undergo training on the usage of the Active911 application. Fortunately, the application is user friendly and would not require an extensive amount of training. Future session trainings would also be recommended so users can stay familiar with the application's features.

Summary

The purpose of this research was achieved. As a result of the study, it was determined that first responders do find the Active911 application useful in performing their daily duties. The study also indicated that the application was user-friendly and had additional benefits for first responders, dispatchers, and those requesting assistance. During an emergency situation, every second counts. Seconds can be the determining factor between life and death. The participants of this study confirmed that the Active911 application enhanced their response times allowing the first responders to perform their duties more efficiently. The knowledge obtained from this study adds to the field of emergency literature pertaining to mobile technology used by first responders.

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Appendix A

Questions for Questionnaire

What is your age?

What is your role at the Russellville Fire Department?

What kind of device do you use Active911 on?

How long have you used Active911?

What kind of benefits has this application provided to you?

What kind of drawbacks/downfalls do you see related to this application?

How does the application compare to traditional methods of communication?

Are there any significant differences in using the application on one device than the other?

Would you say that Active911 is user-friendly? Please explain.

How much training is required for the use of the application?

If using the web application, how does it compare to the mobile application?

Have you seen a difference in response times since the application has been in use? Please explain.

Can you describe how Active911 affects first responders in emergency management?

Do you feel that mobile technologies have a place in today's first responders' duties?

Please provide any additional comments about the Active911 application that might be useful for this study. (Ex. What you liked or did not like about the application.)

Appendix B

Questionnaire Script

Dear Participant,

My name is Tina Phouthavong and I am a graduate student in the Department of Emergency Management at Arkansas Tech University. I am writing my thesis over the mobile application, Active911, and if first responders find Active911 useful. Because I helped implement Active911 into the Russellville Fire Department, I would like to invite you to participate in this voluntary research study by completing a questionnaire.

The entire process will take approximately 30 minutes of your time. Your answers from the questionnaire will be organized and analyzed by NVivo software. There will be no compensation for participating in the study. There are no known risks to anyone who chooses to participate in the study. At any time during the study, you can choose not to continue on with the study.

I want to thank you for your time in assisting me with this research and the furthering of my education. The data collected will help to fill the gap in research conducted on the use of mobile applications by first responders. If you have any further questions or concerns, feel free to contact me at the number provided below. You may also contact my thesis chair, Dr. Sandy Smith, at the information provided below.

Sincerely,

Tina Phouthavong
Graduate Student,
Emergency Management & Homeland Security
Arkansas Tech University
479-622-0456
tphouthavong@atu.edu

Dr. Sandy Smith
Thesis Chair
Department Head, Department of Emergency Management
Arkansas Tech University
479-498-6039
ssmith107@atu.edu

Arkansas Tech University
Informed Consent Agreement

Do First Responders Find Active911 Useful?

You are being asked to participate in a research study. Before you give your consent to volunteer, it is important you read the following information and ask as many questions as necessary to be sure you understand what you will be asked to do.

<u>Investigators</u>
Tina Phouthavong, Master Student, Arkansas Tech University, Emergency Management and Homeland Security
Dr. Sandy Smith, Research Advisor, Arkansas Tech University, 479-498-6039

Arkansas Tech University
Department of Emergency Management
402 West O Street
Russellville, Arkansas 72801
Phone: 479-356-2092

<u>**Purpose of the Research**</u>
The purpose of this study is to fill the gap in research done on mobile applications in emergency management. The research will answer, Do First Responders Find Active911 Useful? This research will contribute to my thesis in partial fulfillment of the requirement of the Master in Emergency Management and Homeland Security.

<u>**Procedures**</u>
If you volunteer to participate in this study, you will be asked to complete a questionnaire with open-ended questions. Your participation will take approximately 30 minutes.

<u>**Potential Risks or Discomforts**</u>
There are no foreseeable risks or costs associated with the study.

<u>**Potential Benefits of the Research**</u>
You will receive no benefits from participating in this research; however it is hoped that this research will be used to benefit the use of mobile technology and applications in the field of emergency management.

<u>**Compensation for Participation**</u>
You will not receive any compensation for being in this research study.

<u>**Confidentiality and Data Storage**</u>
This survey is anonymous. No one, including the researcher, will be able to associate your responses with your identity. No personally identifiable information will be gathered.

Data will be stored electronically in a password protected file. Raw data will be available to the

principle investigator and the research advisor. They will be destroyed upon approval of this thesis as deemed necessary by the research advisor.

Participation, Withdrawal, and Questions about the Research
Your participation in this research study is voluntary. You may refuse to participate without penalty. If you decide to participate, you are free to stop at any time without penalty by just stopping and/or telling the investigator.

You may not withdraw from the study after data collection has been completed since your name is not linked to the data.

Questions about the Research
If you have any questions about the research, please contact Tina Phouthavong at tphouthavong@atu.edu.

This research project has been reviewed and approved by the Institutional Review Board for the Protection of Human Subjects at Arkansas Tech University. If you believe there is any infringement upon your rights as a research subject, you may contact the Research Advisor at 479-498-6039.

Subject's Agreement
My decision to proceed with the questionnaire indicates my voluntary agreement to participate in this research study.

- **APPLICATION FOR REVIEW OF HUMAN PARTICIPANTS RESEARCH**
Submit hard copy with signatures to the
Arkansas Tech University, IRB, Jack Tucci, Ph.D., College of Business, Rothwell 445

Email application as an attachment to jwarnick@atu.edu

Principal Investigator(s): *I acknowledge that this represents an accurate and complete description of my research.*

| Tina Phouthavong	*Tina Phouthavong* (signature)	10/28/2015 Revised 01/26/2016
Name of Primary PI	Signature of PI	Date

Additional Researchers' Names

_____

Emergency Management &
Homeland Security
Department

219 S. Phoenix Avenue

Mailing Address

(479) 622-0456	tphouthavong@atu.edu
Telephone Number	PI Email address

Adviser (complete if PI is a student): I agree to provide the proper surveillance of this project to ensure that the rights and welfare of the human participants are properly protected.
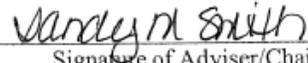
Dr. Sandy Smith	*Sandy M Smith* (signature)	Revised 01/26/2016
Name of Adviser/Chair (typed)	Signature of Adviser/Chair	Date

402 West O St, Dean Hall 110 Russellville, AR 72801	ssmith107@atu.edu	(479) 498-6039
Adviser's Address	Adviser's Email address	Telephone

Do First Responders find Active911 useful?

PLEASE NOTE: All applications should be typewritten and edited prior to submission for review. If sufficient space is not provided below for a complete description of the proposed project, please use additional pages as necessary.

IRB Approval: _____   _____
                    Signature of IRB Chair   Date