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ABSTRACT

MOBILE INFORMATION COMMUNICATION TECHNOLOGY FOR CRISIS MANAGEMENT: UNDERSTANDING USER BEHAVIOR, RESPONSE AND TRAINING

by
Elizabeth Avery Gomez

SMS text-messaging is an interoperable communication vehicle known to be dependable for mass media alert notifications in crisis management. SMS text-messaging also offers potential as one viable two-way communication alternative for field responders in crisis response. Both continuously changing mobile information communication technologies and the importance of precise information exchange constitute a need for communication protocol training and practice. This study introduces a technology-mediated training technique based on speech act and communicative action theories. These theories are used to inform the design of a baseline measure for task performance improvement and to suggest a model to predict communication readiness. Because this research bridges two fields—information systems and communication—it provides a model for full construct-representation of text-based interaction in a technology-mediated environment. The proposed model is validated through a web-based training application with 50 participants who have different crisis response backgrounds, including emergency management practitioners, first responders, public safety volunteers, community volunteers, community citizens, and students over the age of 18. Each group encompasses diverse technological skill and usage levels.

The web-based training application developed in the present study features plain language training so that a clear understanding of user behavior, response, and training would emerge. The training and crisis scenario are rendered through multimedia recordings and designed to measure task response, based on the 160 character per SMS text-message exchange limit. The mixed-methods design begins with a crisis scenario, followed by pre-training measures, three repeated training measures, and concludes with post-training measures. A total of six tasks are introduced (3 pre-training and 3 post-training) in which each participant interfaces with the web-based training application through a high-speed Internet connection. Task response level results show promise for this exploratory research and contribute to a new discourse mode that extends to mobile technology penetration. Future research will focus on refinement of the model's task performance measures and will seek to introduce additional situation-based scenarios and mixed-modes of communication. During this next research phase, the objective is to incorporate the model into mobile device usage and operationalize the model in authentic crisis management contexts. If successful in extended field simulation, the model may have the potential to ensure effective mobile information communication within the context of crisis.

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by
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APPROVAL PAGE

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To my children, with love

Jonathan, Stephanie, Lexi, and Russell

through their eyes, their patience, and their laughter,
I was able to pursue this remarkable journey

To my mentor, co-advisor and friend

Dr. Norbert Elliot

through his guidance, his encouragement, and his faith in me,
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TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

LIST OF TABLES
(Continued)

LIST OF FIGURES

LIST OF DEFINITIONS

Definitions Supporting this Research

Term	Comments
Local Boundary	Defined by a state jurisdiction and is the smallest geographically named physical space (unit) and varies from state to state within the United States. Local boundaries are used when referring to the physical space or location. For example, a city, town, village, or township could be the smallest local boundary depending on the state).
Community Boundary	Defined by a local jurisdiction and is equivalent to a local boundary in size or smaller. Community boundaries are used when referring to the population within a local boundary.
Community of Interest	Defined by the characteristics encompassed in the mission supporting the community of interest. For example, faith-based, ethnicity-based, disease-based. The personal association to the mission or cause draws individuals to a community of interest.
Private Healthcare	Privately funded healthcare services.
Public Funded Healthcare	Publicly funded healthcare from federally funded projects, free clinics, and volunteer practitioners.
Population-Based Health	Defined by the national initiative of health and well-being that focuses on the population rather than on an individual case-by-case basis. Synonymous to public health for this research.
Public Health Domain	Defined as the overarching structure which encompasses all types of healthcare including population-based health, private healthcare, community outreach nongovernmental organizations and secondary influencers, such as schools and private industry.
Community Health	Defined as the population health of a community.
Community Communication	Defined as the exchange of messages (verbal and text) across community organizations.
Small Public Health NGO	The small grass roots NGO who works with community-based goal oriented health objectives. Their role is primarily for outreach services.
Public Health Practitioner	The local community public health practitioner who works for a small community NGO.
Local Department of Public Health; Governmental	The governmental agency whose mission is to protect and promote the health of the local community.
State Department of Public Health; Governmental	The state governmental agency whose mission is to protect and promote the health of the state as a whole.

Definitions Supporting this Research (continued)

Term	Comments
Private Sector	A private organization that operates independently. This research focuses on the private sector whose focus in on aiding in an emergency. For example, a hospital, clinic, medical practitioner, or philanthropic organizations.
Media	An organization (private or public) whose specific purpose is to convey an urgent message publicly for emergency and health reasons. For example, PBS, NPR, CBS, NBC.
Local Non-Profit Organization	The organization whose serves community outreach based on needs of the public health initiatives (trained-primarily volunteer).
Local Churches	A faith based organization who serves the local community (trained-primarily volunteer).
Private Clinics/Hospitals	Private medical facilities who service the local community.
Public Health Official	Provides implementation recommendations for prevention and control actions.
Global Red Cross	A global organization that responds to health crisis (trained-primarily volunteer).
First Responders	Trained individuals who are first to arrive in an emergency (both paid and trained).
Global Private Sector	Those organizations that step in to assist with a health crisis (i.e. Pfizer philanthropy for Tsunami, Community philanthropy).
National Guard	Military called upon for disasters and catastrophes (high severity).
Local Public School	Public institutions that deploy health messages and monitor for potential epidemics.
Center for Disease Control and Prevention (CDC)	A governmental organization within the Department of Health and Human Services to protect the health and safety of Americans.
Knowledge Domains	Knowledge base systems which provide health-related information. Internet sources are also considered systems.
Health Resources	Systems which provide access to health resources, such as educational materials and health care supplies.
Educate the Public (i.e. citizens)	The local community provides training and outreach to bring awareness to the community.
Surveillance	The governmental agency monitors for epidemic health crisis (i.e. avian influenza, seasonal influenza).
Federal/National Pandemic Planning	In conjunction with federal pandemic flu processes, local agencies have joined forces to be prepared for a pandemic flu emergency.
State Pandemic Planning	In-state planning summits.

INTRODUCTION

1.1 Motivation

Mobile information communication technology (ICT) penetration around the globe has increased the potential for interoperable communication. Information communication technology includes a wide range of services, applications, and technologies usually running on telecom networks (European Commission, 2001). Responders of a dynamic crisis response team rely on mobile ICT resources and also on the responder's individual ICT Usage Behavior skills (cell phones, PDA, blackberry). ICT has become a valued resource for initiatives that center on increased homeland security. In 2005, several interoperable communication directives for crisis management were issued that focus on the importance of terminology, procedures, and the use of plain language (FEMA, 2004; NIMS, 2005) across all agencies, jurisdictions, and disciplines. However, the interoperability problem is two-fold: 1) common language; and 2) device compatibility (i.e., continuous device advances making training and practice a challenge).

Internet and cell phone use (i.e., mobile wireless technologies) has become as common as a land telephone line. Mobile phone use exceeds 100 percent of the population in some countries (WISR, 2006), offering promise as an interoperable communication low-richness device, with features, such as SMS text-messaging. SMS text-messaging is one written communication protocol that has witnessed increased use, both as a mass-media broadcast method and for alerts of small inclusion criteria (Textually, 2006; Alert DC, 2005; Mehta, 2005). At present however, the use of SMS text-messaging for crisis response is primarily for one-way mass alerts.

The present research investigates the common language interoperability problem and begins with the use of two-way SMS text-messaging for trans-boundary communication as a means to increase mobile communication readiness for community responders. The main research question is: *Can SMS text-message communication protocol training, increase communication readiness of an individual who may respond in a crisis using a mobile device?* For example, the Strong Angel III Integrated Disaster Response Demonstration interim report highlighted numerous findings and needs for communication, training, and practice for interoperable communication and the integration of communities into emergency response efforts. One intriguing finding that supports this research, reported in August of 2006, is the need to: "Establish and train users on effective trans-boundary communications (#8)" where needs exist for "VOIP voice, radio voice, and text chat both locally in the room and outside to sites beyond either ad hoc or conventional access point range. Being able to distribute a different word of the day over each mode and confirm receipt" were also noted (SA, 2006).

Significantly, communicative action entails speech acts (differences between sentences expressing commands, the differences between sentences and statements, along with other utterances), exchanged between the sender and receiver that correspond with the device being used. Te'eni (2006) notes "the complexity of implementing communicative action grows with the need for coordination, the contextual demands (norms and values) and the use of scarce resources." Moreover, Te'eni (2006) mentions the importance of context and communication quality in goal-oriented communication; dimensions present in crisis management place emphasis on the need for communication strategies that aim to reduce the complexity of communication and the medium.

Crisis response places emphasis on the individual responding in a call for assistance. The responder's communicative action draws upon goal-oriented behavior from Habermas' Theory of Communicative Action (Te'eni 2001, 2006) and focuses on communication to achieve and maintain mutual understanding (Ngwenyama and Lee, 1997). The communication exchange in a request to respond between the sender and receiver of information varies based on the uniqueness of the incident, creating an element of uncertainty. The communication exchange between the sender and receiver offers potential grounding through effective communication and the use of speech acts as a common denominator.

A formal study needs to assess the content of communication protocols for crisis response when paired with the use of an ICT device or the use of an ICT device function. The specific focus of the research presented is on the communication exchange of speech acts between the sender and receiver using SMS text-messaging for mobile devices in a crisis, recognizing that verbal communication (i.e., phone call or text to audio translation) could precede written text exchange. The use of SMS text-messaging provides a bottom-up approach that can reach local community responders who have access to limited ICT resources.

Emphasizing the need for a formal method to evaluate such information exchange, Elliot, Kilduff, and Lynch (1994), state that "writing assessment can cast light on curriculum development (training) and instructional practices by providing empirical information about student performance (study participant)" when performed with a formal framework. Ruth and Murphy's Writing Assessment Model is proposed as the writing assessment framework. Ruth and Murphy's (1988) model introduces the use of a

writing topic as a springboard propelling writers into the creation of essays recognizes the interactive characteristics between the writer and the topic. Applied to the study at hand, the model reveals much about the interaction achieved between the crisis response task (writing topic) and the study participant acting as a community responder (writer). The Ruth and Murphy model serves as the foundation for task development of the Mobile SMS Text-Messaging for Crisis Response research in this study. Given, various discourse modes appear to tap different levels of literacy (Elliot et al. 1994), the use of a writing assessment framework for task design is introduced.

The primary objective of this study is to investigate if SMS text-message communication protocol training can increase communication readiness of an individual who may respond in a crisis using a mobile device. At present, there are no baseline measures for mobile communication protocol crisis response reflected in the literature. Therefore, a secondary objective of this study seeks to establish a baseline measure for role-based training for crisis response. This exploratory study measures both pre-training and post-training speech acts obtained from SMS text-message task responses invoked by task prompts from the Ruth and Murphy Writing Assessment model and include the use of Speech Act Essential Rules (Austin, 1962; Searle, 1969). Task response assessment of parallel pre-training and post-training task responses should reflect improvement once plain language training is introduced. To complement the establishment of a baseline measure for role-based training, the participant's pre-training communication profile is also obtained.

1.2 Background

Originating with the September 11th (2001) and then Hurricane Katrina (2005) disasters, the need to be prepared continues as a critical challenge facing our federal government (Mehta, 2005; FEMA, 2006; Fordahl and Meyerson, 2005). Simple technologies, such as SMS text-messaging thrive in times of chaos (Mehta, 2005), and are portable, extending use to both mobile and stationary computer technologies. However, SMS text-messaging is too often associated with cell-phone use, limiting its full potential. SMS text-messaging, true to its name is a short message service that can be leveraged through mobile devices as well as stationary devices, such as desktops, laptops, and tablet computers.

SMS text-messaging offers promise for crisis response, especially for community responders who have limited access to ICT resources. The caveat when communicating with someone who is using a small device is the limitation of reading and responding across the small device, in addition to the 160 character message exchange limit. Being able to adapt to the size and capacity of the communication device and platform when communicating with SMS text-messaging takes practice for effective use. Fordahl and Meyerson (2005) note communications equipment alone was not to blame during Hurricane Katrina. Moreover, John Pike, director of GlobalSecurity.org, stated that "much-criticized federal response to Katrina shows that even the latest equipment is no guarantee of smooth communications" and "that was not a hardware problem, but a people and procedure problem."

Crisis situations can initiate the need for response from hundreds of people, from different organizations who need to freely exchange information and delegate authority

placing emphasis on where people focus and on what resources are expended as a critical problem (Fruhling, 2006; Turoff, 2002). The ultimate use of written communication serves not only as event logs (Turoff et al. 2004) but also enables agent-based information exchange (Zhu, 2004; Zhu 2006) and remains a primary source of information exchange.

Surveillance mechanisms from public health systems are one source that triggers alerts for resources in a community (Fruhling, 2006). Interoperability limitations due to low-resources and training protocols can impact community responders, namely small grassroots organization volunteers that extend from public health and humanitarian relief agencies. Grassroots organizations in local geographic areas are comprised of local people working together to find solutions in their communities (Idealist, 2006). These practitioners are trained for their organizational position but often lack ICT specific training due to limited financial resources as mentioned by the Institute of Medicine (2003). When crises extend beyond the 911 or 112 public safety emergency (i.e., police, fire, EMS/medical), community volunteers respond until external resources and humanitarian relief organizations arrive. These responders need two-way device quick response tactics, training, practice, and interoperable communication protocols when called upon in a local community crisis (Gomez, Passerini, Hare, 2006).

SMS text-messaging is a form of written communication that exchanges packets of information between information communication technologies (McAdams, 2006). SMS text-messaging has an exchange limit of 160 characters per message sent. Although some devices allow the device user to send more than 160 characters at one time, the receiving service arbitrarily breaks the message into 160 character units regardless of if

the break falls between words or in the middle of a single word. A message that is broken into multiple messages, offers no guarantee that the order of the multiple messages will arrive in the same sequence as the message was written. Some cellular services, such as Cingular Wireless (2006) do label each message (i.e., 1 of 2, 2 of 2) while others do not. Some agent based services provide one message with hyperlinks within the message to allow navigation to each part of the message in sequence, as seen with Google SMS (2006).

Adaptive two-way user response and effective word choice when decreasing written text word count to the SMS text-message 160 character exchange limit are essential for crisis response. Proper use of ICT, especially mobile technologies challenge users and often causes them to side-step important features that could save lives. Ubiquitous computing also causes people to use the features they want and often bypass essential features that may be required in a crisis. Saving even one human life through effective and timely communication is the basis of this research. Introducing SMS text-messaging as one communication protocol alternative along with regular practice is the objective behind this research.

The need for a formal study of both content and the use of ICT calls for research that provides an initial baseline (pre-training) and post-training prior to a longitudinal study and introduction of ongoing practice protocols. Pre-training and post-training measures are proposed as indicators of ICT communication readiness. This study focuses on the initial baseline (pre-training) and post-training measures after one session (three modules) of training introduced through a web-based application. Parallel task prompts (pre-training and post-training) also provide insight on message response patterns.

Moreover, each task will generate actual task performance measures which can be compared to perceived task performance measures.

1.3 Study Overview

This research, formative and descriptive in orientation, investigates individual usage behavior, response, and training of SMS text-messaging as a form of bottom-up, interoperable communication. A Crisis Response Training Framework is presented for use with simulated SMS text-messaging for this study and includes an efficacy model of training based on study results. The data used to support the model as presented in this research is captured both by survey for participant perceptions and by task (six tasks per participant) for actual performance measures. Actual performance measures include: word count, character count, task performance time, task response. Each task response is assigned a task response level, validated by emergency management field experts.

The use of a web-based training application has been developed and pilot-tested for this study. SMS text-message cell-phone simulation and communication protocols within a crisis scenario are the context for the training application. The web-based training application follows usability protocols, applies a procedural writing discourse, and leverages the use of Communication Theory coupled with Media Richness Theory. The Theory of Planned Behavior as it extends from the information systems domain is also introduced.

The crisis situation developed, inclusive of Training Session Type (photo with audio or text with audio), and Task Prompt Type (Speech Act Essential Rule) introduces one continuous scenario, executed through five distinct communication episodes with six

tasks to the study participant. An episode presents the "scene" of the task(s) to be completed by the study participant. For training purposes, the study participant assumes the role of a community responder (Action Team Volunteer), who communicates with a command and control coordinator (Action Team Coordinator). The responder is a person who is taking action in a local community, based on an alert notification and request for assistance. The command and control coordinator is a simulated "persona" who exchanges communication with the study participant to achieve a sender/receiver communication exchange dialogue.

Upon introduction of the overarching crisis scenario, the training process (Appendix D) begins with a pre-training survey, the use of two communication episodes with tasks for baseline written communication measures, followed by three training modules with accompanying communication episodes (i.e., tasks per episode), for a repeated measures design. The training ends with a post-training survey. A total of five communication episodes (six tasks in total) are introduced where each episode contains one or more tasks within the crisis scenario.

The premise is to provide a context rich enough to capture the complex written transactions when SMS text-message training for crisis response is introduced. Multimedia audio/video training segments for the context allows for observation and analysis of each task response and also for analysis of the Training Session Type delivered. Can such training, the study poses, increase communication readiness of an individual who may respond in a crisis using a mobile device? Lessons learned in the qualitative analysis of Fruhling (2006) note the importance of prototyping and iterations for qualitative observations. SMS text-messaging is but one form of communication and

the focus of this study. The need to adapt to different forms of communication is also essential for crisis response. The importance of communication protocol awareness that encourages routine use between emergencies is also an objective of this research and expected contribution.

The web-based training application allows for two types of data collection in this quasi experimental study: actual task response measures and survey results. Elements of the Training Session Type stand as the independent variables and are randomly assigned and equally divided to study participants. The two Training Session Types are: 1) photo with audio; and 2) text with audio.

A pre-training survey is administered at the start of the training session to obtain the participant's communication profile. Thereafter, three pre-training measures and three post-training measures are introduced.

Three repeated measures are taken, in addition to the pre-training and post-training measures resulting in a combined between subjects (photo with audio and text with audio training methods) and within subjects design (pre-assessment, three repeated measures, post-assessment).

The expected contributions of this research include a means to: 1) assess communication readiness for mobile device communication exchange; 2) provide a baseline measure for role-based training; 3) identify SMS text-message response patterns and differences that both increase and hinder message adaptiveness; 4) compare perceived task performance to actual task performance; 5) advance the role of mobile ICT for community responders in emergency management contexts; 6) extend the use of multimedia training applications in the information systems domain for crises response

exercises; and 7) compare the richness of photos with audio in parallel with the use of text audio, for text-based task prompts and responses. The ultimate goal of this research is to develop a framework and underlying model for communication training, practice protocols, and message adaptiveness as new mobile technologies are introduced to increase mobile communication readiness, which is needed for interoperable communication.

1.4 Dissertation Outline

This research begins with an overview of a real-world crisis management domain problem in which interoperable communication is needed for community responders. Chapter 2 presents a literature review that supports the theories hypothesized to address the research problem and serves as the basis of this research. Chapter 3 introduces the research framework, model, and hypotheses. Chapter 4 introduces the research methodologies, the exploratory analysis, and mixed-method experimental design. Background on the web-based training application and steps for execution leveraging the Ruth and Murphy Writing Assessment Model are introduced. Chapter 5 discusses the preliminary qualitative findings and survey results from a small pilot that aim to support the Crisis Response Training Framework of this study. Chapter 6 introduces the study's participants and descriptive statistics followed by Chapters 7 and 8, which present the initial research model findings and hypothesized results. Chapter 9 concludes with limitations, findings, expected contributions, and future research that hold the potential to contribute authentic knowledge to the emergency management domain and information systems domain.

CHAPTER 2

LITERATURE REVIEW

This research encompasses three primary bodies of literature: 1) communication theory, 2) information richness theory, and 3) Theory of Planned Behavior (Figure 2.1). These three theories are seen as interrelated for interoperable communication for the crisis management in the emergency domain. Emphasis for the literature review is placed on the communication exchange between two or more local community crisis responders who are using mobile ICT devices. The important role of local community responders in a crisis is also discussed. The literature review begins with a short review of the real-world interoperability domain problem that exists in the crisis management and emergency domain, followed by theoretical foundations that complement interoperable communication needs in the emergency management domain. The need and use of mobile ICT for community responders who take action in a crisis is discussed. Community responders often assume roles and responsibilities, often until external and specialized resources arrive

Section 2.1 begins the literature review with an introduction of crisis management and the emergency domain. A review of the public health domain and community crisis response organizations including community roles is presented. Section 2.2 provides a discussion of communication theory and implications of speech acts between the sender and receiver when mobile device message exchange is limited. Section 2.3 discusses information richness theory and interoperable communications protocols when media choice and device size have limitations. Section 2.4 of the literature review concludes with a look at Theory of Planned Behavior for the individual responder.

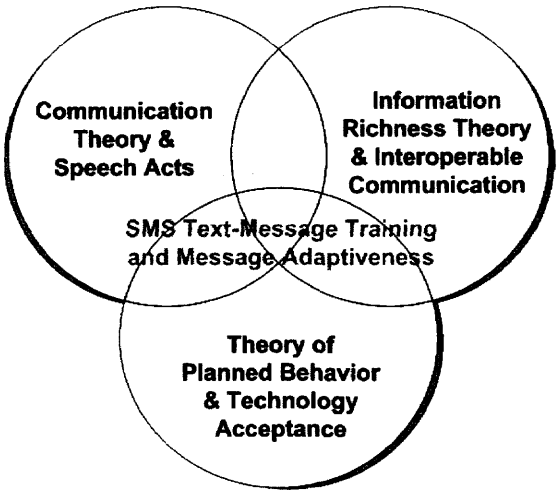


Figure 2.1 Theoretical foundations.

2.1 Crisis Management and the Emergency Domain

Crisis management is defined as a way to prepare and control an emergency or prepare to reach and mitigate the outbreak of a life-binding problem (Kaplan, 2004). Crisis management has at least three public health drivers: 1) chronic-illness (obesity, HIV/AIDS), 2) crises initiated by disasters (for example, a natural disaster such as Katrina), and 3) extreme poverty (daily health, mental health, injury). Regardless of the crisis, a problem-to-solve evolves into a crisis initiating goal-driven behavior where a time factor impacts the lives of citizens and influences the responders (or specialists) who are called upon. Responders need a way to communicate effectively and efficiently. Communicative action applies to goal-driven behavior and is discussed in a subsequent section of this research. The United Nations Development Programme (UNDP): Bureau for Crisis Prevention and Recovery (2004) notes that while most national government and relief organizations have made progress in mitigating the impacts of disasters through improved preparedness and early warning, we still view disasters as exceptional natural

events that interrupt normal development and that can be managed through humanitarian actions (Gomez and Passerini, 2006).

The emergency management domain in the United States, the context for the present study, depends on the public health system for crises, such as bioterrorist attacks, epidemics, etc., and therefore extends to community outreach. Community outreach, as used in this analysis, is information or services provided by organizations that extend to the community (Oxford, 2006). Community outreach also focuses on groups in society who might otherwise be neglected (Gomez et al. 2006).

Although public health in the United States (U.S.) is a well established, multi-discipline field that relies on collaboration and communities of interest for citizen outreach, integrating the role of public health into the emergency management domain is taking time and remains a challenge. In the interim, this research presents a bottom-up approach to complement these initiatives. The Turning Point projects are one example of a community bottom-up approach "to transform and strengthen the public health system in the United States to make the system more effective, more community-based, and more collaborative" (TP, 2006). For example, in the state of New Jersey, preparedness training initiatives continue. McCluskey (2006) notes that it is essential for public health to consistently form part of emergency responder training initiatives and during all phases of emergency management.

Government public health authorities have aligned with private sector health care providers, insurers, managed care companies, and nonprofit religious organizations to provide, directly or indirectly, various public health services (Gostin and Hodge, 2002). Recent events, such as September 11 demonstrate the importance of responders in a local community. One example seen in September 11 was the use of a ferry serving as an

ambulance to transport victims to the Liberty State Park area in New Jersey where a triage to local hospitals was set-up (Turoff et al. 2004). These decisions were made at the time of the emergency due to the unforeseen severity of the crises causing an even greater reliance on clear and concise communication protocols. Moreover, the interoperability across public safety agencies assumed to exist cost many firefighters their lives in the September 11 rescue efforts. It is critical that public health professionals are included in the prevention, protection, response, and recovery activities (McCluskey, 2006).

In a crisis, communities draw upon many roles and may span beyond the local geographic boundaries. The definition of a community and its scope may be dramatically affected by the boundaries through which the community is defined (Gomez et al. 2006; Norton et al, 2002). Geographic boundaries are found at the local, state, federal and global levels, whereas mission oriented, religious, cultural, and illness related boundaries also exist within each of these boundaries. Norton et al. (2002) state that "it is important to focus not only on geographical or geopolitical boundaries, but also on the nature of ties or connections that exist within communities, including network connections among individuals and inter-organizational relationships." The collaboration among these local responders during a crisis initiates the formation of a crisis response team, defined as "a real and virtual community of specialists and experts that must have unrestricted access to one another and is able to act as a collective" (Turoff et al. et al. 2004; Hardeman, et al, 1998; Weick 1993, 1995).

2.1.1 Public Health Organizations and Crisis Management

Public health as a domain interfaces with other non-health governmental agencies; the private sector including clinics, hospitals and industry; global non-governmental organizations; and also smaller community outreach non-governmental organizations (NGO). The small community grass root NGOs (herein small NGO) offer unique, goal-oriented services. They seek to bridge the gap from the civilian to governmental organizations or private sector hospitals and medical practitioners on a case by case basis.

The U.S. public health domain is complex and encompasses many knowledge domains, causing them to be treated separately. Emphasis has been placed on the private sector until recent events, such as September 11, 2001 (IOM, 2003). Current public health efforts focus on acquiring data and a means of data extraction. Limited research and efforts focus on the use of this information once it has been acquired and validated. Moreover, this information is presented on governmental websites by initiative, rather than as a body of research.

Public health in the United States differs from other nations. The U.S. federalist system and private healthcare structure impose a clinical model driven by diagnosis and disease rather than by population-based health (herein public health), where individual preventative health and well-being are treated as a whole. Public health is defined as "a field of medicine that deals with the physical and mental health of a population or community (Anderson 1994)," and was established as a U.S. Public Health Service in 1798. The mission of public health is to fulfill society's desire to create conditions so that people can be healthy (IOM, 1988).

The current public health system has been recognized as vulnerable and has outdated information systems, with individuals in the public health workforce who lack

training (IOM, 2003). The events of 2001 demonstrated a need for up-to-date scientific information that responds to rapidly changing circumstances and made weaknesses in the public health system visible to our country (Hooke and Rogers, 2005). Moreover, risk communication messages from government agencies must be consistent, clear and honest, and risks should not be understated (Hooke and Rogers, 2005). Training is identified as critical for many complex problems and in preparation for an environment of uncertainty.

The changes in the public health system, heightened homeland security awareness, and population-based health needs have placed a greater dependency on small public health NGOs. Therefore, a bird's eye view of the business processes across the public health domain is presented, placing emphasis on community health and preparedness toward crisis management. Addressing community health and homeland security shifts the focus away from specific public health knowledge domains, governmental policies, and individual patient records. Leveraging community health places emphasis on population-based health, identified needs, and associated goals and objectives of the U.S. public health system.

Public Health in the 21st Century depends on technology for information delivery and communication through multiple technologies to:

1. Support the critical role of preparing public health professionals to function effectively towards improved population health.
2. Increase Internet and email access and usage by state and local agencies.
3. Teach employees how to apply the use of information and data to the public health practice (IOM, 2003).

Increased communication across community organizations, through the use of information communication technology (ICT), should enhance the role of public health practitioner striving towards improved population health. Individual and community preparedness should also improve and benefit efforts associated with homeland security, independent of the knowledge domain within the public health infrastructure.

President Bush's executive order on October 8, 2001 includes public health and our communities within the realm of Homeland Security. His directive states that "The Office shall work with executive departments and agencies, State and local governments, and private entities to ensure the adequacy of the national strategy for detecting, preparing for, preventing, protecting against, responding to, and recovering from terrorist threats or attacks within the United States and shall periodically review and coordinate revisions to that strategy as necessary (Bush, 2002; Bush, 2001)." Moreover, ensuring health preparedness for a terrorist attack includes current vaccinations, increasing vaccine and pharmaceutical supplies, and hospital capacity.

The categorizations of the public health structure are discussed in seven sections below: 1) surveillance; 2) education; 3) control; 4) response; 5) post-mortem, 6) governmental; and 7) private sector. Three of these sections are explicitly presented in the public health literature, while response and post-mortem are an aggregation of our research to explicitly identify crisis and emergency management related efforts following the September 11 events. The sixth section, governmental, serves as an overarching view of the numerous organizations and domains presented that span all five goal oriented initiatives. The seventh and final section provides a brief overview of private healthcare for balance of context.

2.1.1.1 Public Health Surveillance. The increased health-related crises of our nation include: daily health and wellbeing crises (i.e., obesity, diabetes, mental health, and injury), disease outbreak (i.e., West Nile and SARS); and bioterrorist induced events (i.e., anthrax and smallpox). Early and reliable detection of health crises and detection for the prevention of injury is essential, not only for best possible response and treatment, but also for economic reasons (Cooper, 2004; Halperin, 1992). The need to identify if disease outbreaks are natural or bioterrorist acts further complicates both cost and containment (i.e., control). Bioagent release scenarios estimate as many as 30,000 people could die per day and have an impacted economic cost of 250 million dollars per hour for the outbreak (Cooper, 2004; Kaufmann 1997; Wagner, 2001).

Public health surveillance focuses on the systematic collection, analysis, and interpretation of health data (Halperin, 1992). The health data is essential for planning, implementation and the evaluation of public health practices, and depends on timely and accurate dissemination of this information to identified recipients. Surveillance of weak and noisy signals provides indicators for early detection (Cooper, 2004; Halperin, 1992). The importance of surveillance was presented by the Institute of Medicine (IOM), The Future of Public Health (1988), where a widening gap in training was identified (Halperin, 1992, IOM, 1988).

For example, syndromic surveillance is relatively new to public health due to purchasing patterns of over-the-counter pharmaceuticals (Zhang, 2004). These efforts require multidisciplinary knowledge and advanced technologies (Zhang, 2004). Moreover, as geographic boundaries are erased, increased information technology serves as the vehicle to reach people in places that weren't reachable in the past. Crubezy et al. (2005) identify technical barriers for incorporating physically heterogeneous data sources

into surveillance systems and for retrieval in a manner that can be interpreted for improved public health decision making.

2.1.1.2 Public Health Education and Secondary Influencers. Public health education spans well beyond the local governmental offices and large nongovernmental organizations, such as the Red Cross. Secondary influencers actively working on promoting health awareness, safety and disease prevention, extend to our K-12 school systems and organizations, such as the Girl Scouts, American Diabetes Association, Red Cross and Battered Women's Shelters, who offer youth programs and even youth councils. These initiatives are translated through nutrition and the adjustment of school cafeteria menus or Drug Abuse Resistance Education (DARE) programs to extend the knowledge through households and in support of state initiatives.

DARE programs, for example, filtered through K-12 school systems focus on drugs and violence, which complement physical and mental health, reinforcing a positive message and providing awareness. DARE programs are now offered in 80 percent of our nation's school districts and in more than 54 countries around the world (DARE, 2006). Increasing athletic programs through K-12 school systems also complement these initiatives, with coaches and trainers reminding our youth of healthy habits and introducing exercise that is essential for health crisis, such as obesity, mental health and diet-induced type II diabetes.

2.1.1.3 Public Health Boundaries and Control. The landscape of the public health sector has multiple boundaries, impacting the control of a health crisis. Moreover, globalization is erasing our geographic boundaries and causing a shift towards collaboration and communities of interest. Geographic boundaries are found at the local, state, federal and global levels, whereas mission oriented, religious, cultural, and illness

related boundaries also exist within each of the geographic boundaries or could span several geographic boundaries. The interaction of public health practitioners within a specified boundary, such as the community boundary, not only spans horizontally, but extends vertically depending on the nature of the public health initiative (Figure 2.2). For purposes of our research, we define an initiative as a non-urgent problem-to-solve. A crisis impacts an initiative by decreasing the time to respond. Therefore, crisis management is essential in public health, where the protection of human lives is at stake. Bioterrorism and epidemic outbreaks, such as Avian Flu and SARS, remind us of the importance of crisis management and surveillance. Noninfectious epidemics, such as obesity (Ershow, 2004), remind us that crisis management and surveillance span more than time-sensitive emergencies.

Informed and engaged citizens and communities will play key roles in homeland security (McDonald, 2002). Without full-engagement from individuals and communities, homeland security is unlikely to be achieved (McDonald, 2002). McDonald (2002) further mentions the importance of access to population data and data mining to identify patterns of risk. Risk communication, as discussed by McDonald (2002), is essential for citizen understanding and we look to our communities of interest for guidance on parameters of importance. McDonald (2002) posits that the key to long-term homeland security is to design systems to engage citizens and their communities globally in a manner that is sensitive to cultural diversity and addresses causal links to health and human prosperity.

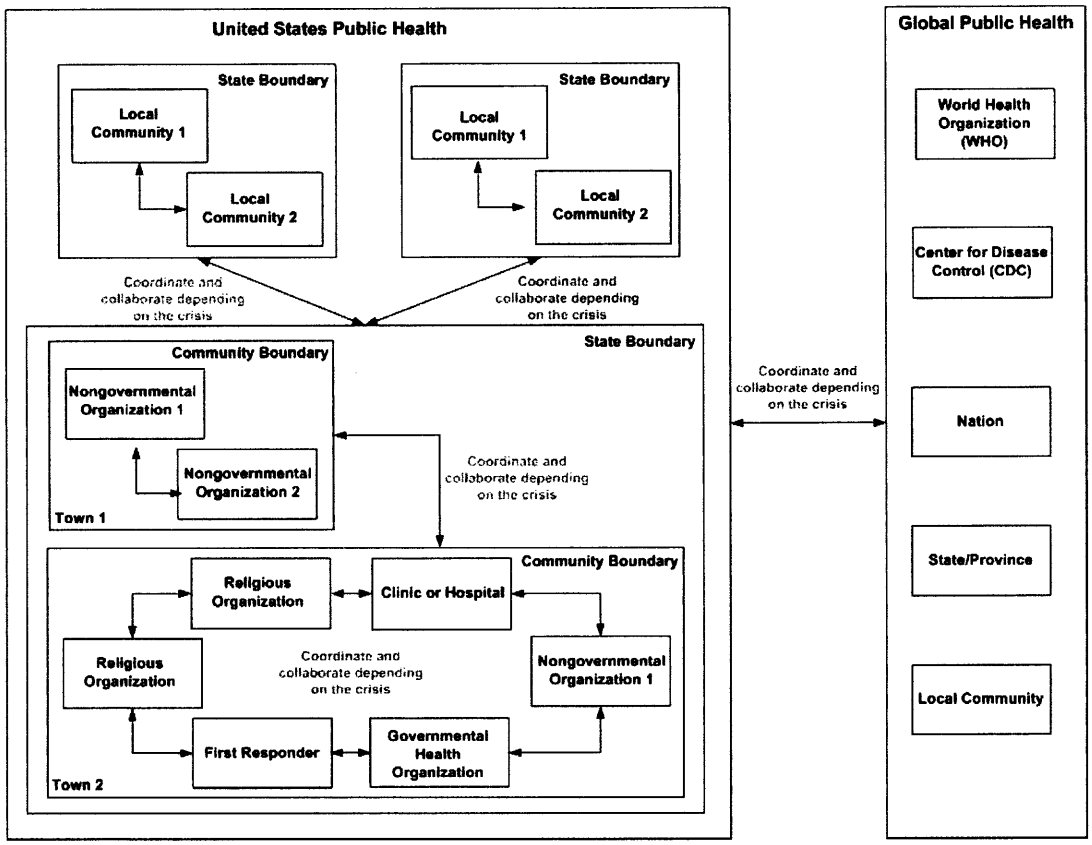


Figure 2.2 United States public health boundaries.
Source: Gomez, et al. 2006.

Looking at U.S. public health is a domestic effort, yet it becomes a global initiative and requires collaboration and interaction with foreign governments and nations for crisis related issues, such as AIDS, SARS, and other infectious diseases, including those invoked by bioterrorism (CDC, 2002). Global collaboration is also important for prevention and control in lieu of waiting for a reactive status. Surveillance and outbreak response needs continuous improvement "because U.S. and international health are inextricably linked, the fulfillment of CDC's domestic mission—to protect the health of the U.S. population— requires global awareness and strategic thinking (CDC, 2002)."

To date, academic research related to information technology is documented at the disease level within the public health domain or towards the architectural

infrastructure; not the usage of the technology. Recent publications, such as McDonald (2002) and Zhang (2004), introduce public health aspects within homeland security, but the emphasis is not on the public health domain in of itself. Homeland security initiatives present a need for domains to remain together. Having a common ground to reach people, such as underserved populations and those of different cultural backgrounds, enables the use of the public health domain as a whole.

2.1.1.4 Public Health Crisis Management and Emergency Response. Public health's role in crisis management and emergency response continues to increase with recent events, such as Hurricane Katrina, and the 2006 Virginia miner incidents. These health-related disasters have highlighted the need for timely emergency response and for updates in public health law.

First responders bring to mind medical, fire, and police (Brady, 2003), yet in a natural disaster, epidemic outbreak or bioterrorist attack, public health practitioners may find themselves on the front line as a responder. This reality was presented with Hurricane Katrina, where all available personnel at the scene were at the front line as a responder. These needs differ from ongoing efforts of dynamic epidemic simulations. Computer simulation techniques, for example, have been used to model the spread of infection disease within humans for several decades now, but are scientific based (Ackerman, 1984; Mollison, 1995; Isham and Medley, 1996; Barth-Jones, 2000) and do not accommodate public health practitioners.

In relation to emergency preparedness and homeland security, Turoff (2002) states that collaborative knowledge systems should exist for useful exchange of professional information based on relevant communities and for advancing the state of their field. This will encourage regular systems use of the technology indirectly

supporting the crisis-planning operation. In the case of the SARS epidemic in Singapore, the e-government system was leveraged to aid in rapid containment (Devados, 2004) due to the threat in public healthcare.

2.1.1.5 Public Health Crisis Management Post-Mortems. Post-mortems are an important part of crisis management and emergency response. The value of a post mortem not only improves surveillance measures and crisis management, but provides feedback on the ability to improve emergency response tactics and also time to reflect. In a Hurricane Katrina post-mortem, one issue presented is federalizing emergency response to catastrophic events. Florida Governor Jeb Bush presents the importance of maintaining innovation, creativity and knowledge that can be lost by federalizing emergency response as seen by hours of interrupted local and voluntary efforts (Devine, 2006). From a healthcare perspective, post-mortems are not only important for crisis management, but also for care as seen in plague patients (OSHA, 2006).

2.1.1.6 Public Health Governmental Organizations from Surveillance to Post-Mortem. The role of the Center for Disease Control (CDC) "which is dedicated to the prevention and control of disease and the promotion of health, works by invitation in many different jurisdictions, including U.S. states and cities and other nations. Throughout its history, CDC has provided international leadership in public health, serving as a technical consultant to other nations (CDC, 2002).

CDC (2002) will help identify the most effective tools and actively encourage their international use, applying expertise and resources in laboratory research, public health policy, program management, and health communications to overcome scientific, financial, and cultural barriers. In a nation whose cultural diversity is changing, we are experiencing a multicultural shift as organizational boundaries are being erased by

technology and globalization. The impacts technology imposes are rapidly changing and have become a challenge for the current public health infrastructure (IOM, 1988).

Websites like the CDC are instrumental for health-related communication. Resulting from September 11, the CDC sites use in October 2001 increased 118 percent, bringing site usage to over nine million visitors. A three year formative evaluation using an information-rich methodology was conducted to assess the objectives of site usage. The goal of this initiative was to "articulate CDC's strategy for the use of the Web as a communication channel and to document what users considered useful on the site (Robinson, 2003)."

Public health has also become a significant player in the governmental structure, with the advent of heightened homeland security and increasing epidemic threats. Being prepared and proactive now is a driving force and begins with the individual citizen who resides in the U.S. As with any time-sensitive crisis, the community is the first to react and assist; this does not mean the community is the initial decision maker or trigger of the message. The message could reach a community in many ways, depending on the timeliness of the crisis. The interactions across the community will vary on a case-by-case scenario basis.

2.1.1.7 Private Healthcare and Public Health. Private healthcare places emphasis on disease and diagnosis. Escalating healthcare costs have uninsured individuals either refraining from medical assistance or turning to emergency rooms once their illness has advanced (Consumer Affairs, 2006). Szolovits (1994) presents a patient-centered approach for healthcare systems and argues that the shift toward the patient, in lieu of placing emphasis on the healthcare provider, is essential. Providing the nongovernmental community with information technology resources would enable the efforts, such as those

of Szolovits, geared toward building and obtaining a health record for the people of our community, whether they are insured or not. Common to the belief of Szolovits (1994) is the potential for "improvements to be gained in both the effectiveness and the efficiency of healthcare if we can empower the user to take a much more active role in monitoring his or her own health status and care, and to take greater responsibility for making informed and guided decisions concerning that care."

Gatenbein et al. (2004) discuss the issue of population dispersion, rural healthcare service delivery and how to overcome the geographic distance and spatial location in their paper "Establishing a Rural Telehealth Project: the Wyoming Network for Telehealth." Findings suggested the need for consortia to increase access to healthcare, create a sense of community and greater opportunities for professional and public health education in communities. Included were results from a small survey (85 respondents out of 464) conducted that revealed a high level of interest in technology. A barrier associated with the respondents interest in technology was the initial equipment expense, having a lack of expertise and the ongoing connection costs for Internet access (Gatenbein, 2004). Telehealth, defined as a telecommunication technology used to support long distance clinical healthcare, was presented as part of the survey with results favorable toward continuing education.

Scientific benefits can be realized by sharing patient health records, such as detection of disease outbreak (Clifton, 2004). HIPAA regulations, and legitimate widespread privacy concerns hinder the exchange of information impacting productivity of the patient health record. Efforts like a National Science Foundation grant supporting a unique collaborative effort between academics and healthcare will investigate how the adoption of technology can be used to improve patient care (Spielman, 2004). The belief

is that the interdisciplinary combination of computing and other disciplines with the practical healthcare environment is very promising (Spielman, 2004). Within the computing discipline, research into computer-mediated communication and collaborative techniques has established a range of available technologies and communications applications (Fjermestad and Hiltz, 2001).

2.1.2 Local Community Crisis Response

Community is defined as a cohesive "social entity within the context of the larger society, due to the presence of a unity of will" (Tonnies, 1887). Unity at will can provide a sense of community. McMillan and Chavis (1986) define sense of community as the "experience of community" rather than the structure, formation or setting. McMillan and Chavis further identify four elements of sense of community: 1) membership, 2) influence, 3) integration and fulfillment of needs, and 4) shared emotional connection. Local community organizations may find themselves responding in a health related crisis once the incident extends beyond 911 or 112 resources (i.e., first responders), These local community organizations share the "experience of community" with citizens who may be in need of resources.

2.1.2.1 Community Crisis Response Organizations. The Association for Research on Non-Profit and Voluntary Associations (2006) considers Community and Grassroots Associations (CGA) to include community organizations, grassroots associations, self-help groups, and other collaborations related to these kinds of groups, such as voluntary associations, all-volunteer groups, small paid-staff nonprofits, faith-based volunteer groups, volunteerism in independent groups, volunteer participation and motivation,

social action/advocacy groups, social movement groups, smaller interest groups, and citizen participation groups.

Public safety organizations in the United States are comprised of police, fire, and medical, in contrast to voluntary small grassroots organizations. These three agencies are typically called upon for local 911 or 112 calls. When an incident occurs in a local geographic area, these three agencies dispatch resources in tandem. While these agencies have always appeared to work as a team, this was not necessarily the case as demonstrated in the Sept 11 terrorist attack. Interoperability across communication devices was one reason these agencies were unable to communicate. The post 911 era is changing this technological setting with many jurisdictions implementing initiatives that encourage public safety agencies to work together. One recent example was the building explosion on the Upper East Side in Manhattan on July 10, 2006, when specialized teams were dispatched immediately to ensure it the explosion was not a terrorist attack. For example, hazmat would be one specialized team that would be called upon for hazardous waste incidents.

Another specialized external resource is the large humanitarian relief organization, comprised of trained volunteers in specific roles and leaders who may be full-time and receiving a salary. Humanitarian relief organizations normally arrive at an incident site once the magnitude of the incident has been categorized as exceeding the host nation's capabilities, have a specific role in a relief effort and provide resources both to help manage the effort and as assistance to the affected population.

At present in the United States, most agencies work within their own agency although they form part of the response team that, as a whole collaborates, on an emergency response incident. For many, interoperable communication across agencies is

not an option with present technology. The language and terminology (i.e., fire and police codes) across a device and channel specific to the agency at present vary. In part this is to allow agency teams to work as a collective and reduce the background noise of the other agencies (Turoff et al.2004). Moreover, the focus is more precise while handling a role specific task. Additional information at times needs to be filtered into these roles specific teams as Turoff et al. (2004) mentions. The increasing number of large scale emergencies has introduced the need for a command and control structure which brings together these individual agencies which each have a respective response team. This research has the community responder interfacing with a simulated command and control coordinator.

2.1.2.2 Community Responder Roles. Roles have always been a key part of any structured group communication process (Turoff, 1993; Turoff, Hiltz, Bieber, Whitworth, and Fjermestad, 2001). Individual roles vary in a crisis situation based on the nature of the emergency and the availability of personnel to respond. A "role" is defined as "a person's or thing's function in a particular situation.." (Oxford, 2007). Data ownership differs in a system and is typically identified by who was responsible for supplying and updating it (Turoff et al. 2004). Zhu (2006) notes that roles are commonly applied concepts in many fields and for different uses, such as natural organizations, task distribution, and application systems. Crisis response complicates roles because of the uncertainty associated with the incident and response. Moreover, when responders move to the field, they reduce access to management information systems (MIS) and rely more on devices of low-richness. Small grassroots organizations and their associated practitioners collaborate together in more of a partnership (horizontal) than managerial hierarchy (vertical).

Table 2.1 Responder Roles in Crisis Management

Service-Based Organization Type	Organizational Role
Public safety (first responder)	Respond to 911 or 112 calls in tandem (police, fire, EMS/medical). Provide resources from police, fire, or EMS/medical roles. Train for police, fire, or EMS/medical responsibilities.
Community outreach (mission based)	Extend from public health initiatives. Work in local community in a hands-on capacity. Know the needs of the citizens they serve. Serve populations with special needs, faith-based organizations, culturally diverse groups, special medical needs. Typically volunteers with limited to no paid-staff.
Self-help groups	Provide support based on skills and personal experiences, relevant to the respective organization. Motivate others with passion based on the needs of the individuals in the group. Provide an informal structure that is flexible in nature.
Secondary influencers	Promote health awareness, safety and disease prevention.
Specialized response teams	Provide specialized skills associated with a specific incident. Specialized skills.
Humanitarian disaster relief	Respond in a specialized and definitive role. Train for the role and work as a predefined team. Provide resources and help manage affected communities.

Turoff et al. (2004) notes that "In a crisis it is never certain who will take on which role or which combination of roles. It is expected that people will be trained to be qualified in a number of different roles." Increased role-based applications show promise in assisting responders to leverage information and communication technologies (ICT) during a crisis. Zhu (2006) discusses opportunities for role-based agents being applicable for many fields. Responder roles, as presented in Table 2.1, combine both public-safety and small grassroots organizations. Our focus is on those community outreach responders.

2.1.3 Crisis Management and Emergency Domain Summary

As discussed, the crisis response/emergency management domain encompasses a variety of responder roles and also spans both organizational and geographic boundaries. Public health and its extension to local communities for crisis response including next steps in the crisis management and emergency domain were also discussed. The individual tasks within each responder role introduce communication protocols that vary within an organization or based on the nature of the crisis. Community response roles at present remain in a state of flux and are still being established.

2.2 Communication Theory

Roles need to be established to facilitate communication exchange protocols between the sender and receiver. Communication theory plays an important role in crisis response when two or more responders must communicate from the field with limited use of ICT. Focusing on the speech acts of the goal-driven individual behavior between the sender and receiver of a communication exchange, constraints of mobile devices are presented below. The Theory of Communicative Action encompasses goal-driven behavior (Te'eni, 2001; Habermas, 1984), a dimension present in crisis response, in addition to the communicative speech act exchange, between the sender and receiver. Moreover, the behavioral outcomes that result from the context and message being communicated between the sender intent and receiver's behavior (Te'eni, 2001; Miller, 1976) support the interoperability problem of this research.

Behavioral outcomes allow observation of the communication breakdown that occurs when the receiver of a message interprets a message in a manner other than what

was intended. Increased communication device options (i.e., QWERTY keypad vs. alpha use of a numerical keypad on cell-phones; 160 character exchange limit for SMS text-messages) also challenge the sender-receiver exchange of information. Another communication barrier is the space and time between the message sender and receiver. Being able to determine under what conditions ICT access can be made usable and useful (Gurnstein, 2003) is a consideration for health-related crisis management. Overcoming ICT related barriers, such as access and training (Salvador and Sherry, 2004) can improve communication and coordination through appropriate use of static, mobile and nomadic information and communication devices.

2.2.1 Communication Exchange

Te'eni (2001) discusses how technology design can make communication more effective. In changing the medium and the attributes of the message itself, the focus shifts away from the medium of communication to the balance between medium and message form. In a crisis, medium choice may not be an option, forcing the responder adapt the message to the available device.

> Assume you are a responder in the field, during a crisis with limited mobile device capabilities. Through effective communication protocols, you may be able to initiate a request for information to the command and control coordinator. The command and control coordinator, who has extended capabilities can search and retrieve information, will only return a small result set to you.

The process of communication, as Te'eni mentions, is to identify potential areas for computer support, as shown in the brief scenario above. Te'eni discusses the importance of communication strategies and selection of a medium that suits the situation, while reducing communication complexities – what we communicate and how

we can communicate. In the example above, the information retrieval overhead shifts to the command and control coordinator who has extended ICT resources available.

Crisis implications can limit medium/device choice. Te'eni's model aims to explain how people choose the message form and medium according to goals, an aspect essential for action oriented behavior in crises response. For crisis management, the adaptiveness of the message itself is dictated by the medium available and device capabilities that are functioning during the crises. Recent studies on medium effects with action-oriented impact or relationship-oriented impact are noted in Table 2.2. Adaptiveness, offers limited research and is defined as "the potential to adapt (personalize) a message to a particular receiver (Te'eni, 2001; Daft and Lengel, 1984). No studies were reported for action-oriented impact. Relationship-oriented impact study was reported with voice mail being more personal than email. SMS text-messaging is a text-based means of communication. SMS text-message primary use, as seen with teens and young adults, is for rapid two-way communication between a sender and receiver in a predominantly one-to-one message exchange very much like a "chat" between two people. Modeling user behavior's to satisfy these conditions and understanding the communication process are important aspects.

Table 2.2 Medium Effects Summary

Recent Studies on Medium Effects		
Medium Attribute	**Action-Oriented Impact**	**Relationship-Oriented Impact**
Interactivity	Immediate feedback to improve understanding, which in turn speeds communication (Clark and Brennan, 1991; Clark 1992; Walther, 1992; Valacich et al. 1993; Dennis and Kinney, 1998).	Interactivity is important for affect in CMC (Kiesler et al. 1985).
Channel Capacity	Multiple cues can improve but also hinder understanding (Dennis and Kinney, 1998); channel capacity (Chapanis, 1988; Sproull and Keisler, 1992). Video conferencing for more awareness and conversational fluency than voice alone (Tang and Isaacs, 1992).	Mixed results on whether multiple cues seem less or more friendly (Fulk and Collines-Jarvis in press; Walther 1992, 1995). Video conferencing is effective in promoting social activity (Fish et al. 1993).
Adaptiveness	**None found.**	**Voice e-mail seems more personal than e-mail (Adams et al. 1993).**
Combined (FtF versus CMC)	FtF produces better mutual understanding than CMC (Straus and McGrath, 1004) CMC generates less communication than F2F in hierarchical teams (Hodlun et. Al., 1998; Hightower and Sayeed, 1996).	CMC produces less trust than FtF (Rocco, 1996). Web-based conference produces less relational links than FtF (Warkentin et al. 1997).

Adapted from Te'eni (2001).

2.2.1.1 Goal-driven Behavior. Te'eni (2001) notes that effective communication could be adapted into the communication technology and that "recommending to the sender the optimal amount of context information in the message" can be achieved. Two examples demonstrating the one-way exchange of optimal amount of information include: the Lebanon 2006 evacuations and the China 2006 typhoon warnings. In Lebanon, Swedish citizens who were registered with the Swedish mobile network were contacted with five distinct text-messages over four days beginning with a message that evacuations were taking place, followed by additional text-messages with instructions for

meeting locations leading to the actual evaluation (Textually.org, 2006). Pre-registration with the Swedish mobile network enabled the evacuation process. Similarly, over 18 million messages were sent for the five 2006 typhoon warnings in the Fujian province and coastal city. The content of the text was "Typhoon forecast to make land this evening near Jinjiang,=" and "Please attend to preparations." Such content contained essential information that was a match for the task-technology fit yet served as a vehicle for preparedness. SMS text-messaging for early warning notifications was leveraged due to China's mobile phone penetration as the world's biggest population of mobile phone users (ABC, 2006). The 426 million mobile phone users have surpassed the country's 365 million fixed-line phones, and increased mobile phone use spans beyond the urban consumer to the blue collar workers and farmers in the poor countryside where many villages have no fixed telephone lines but dozens of mobile customers.

Mobile device (cell-phones, PDA) penetration and increased use for one-way SMS text-message alerts are indicators of device and communication exchange capabilities. However without training and practice, effective use for two-way communication exchange may not take place. The need for training and associated measures supports the objectives of this study.

2.2.1.2 Mobile Device Behavior and Written Communication. Ongoing studies address how managers choose a medium for a specific situation. However, what happens when there is no choice, and the message must be adapted to the available device to respond in a crisis. The need for an interoperable lowest-common denominator for communication exchange may also be essential? Systems should "be designed to make communication more effective by changing not only the medium, but also attributes of the message itself" (Te'eni, 2006). The use of mobile communication exchange leverages

telecommunication channels and services that do not entail system design and development directly add a reliance on protocols more than on application design.

Te'eni (2006) notes that, rather than building on either cognitive or affective aspects of communication, the model should capture both aspects in order to build a more accurate representation of actual behavior. Past studies have tended to concentrate on one aspect, rather than the other. The importance of understanding "how people choose their communication behavior, including their choice of communication media" is a focal point when addressing communication breakdown during a crisis or disaster as witnessed in Hurricane Katrina where the "message" regarding the need for food and water for the citizen's sheltered in the superdome was not communicated for days. Moreover, "communication complexity results from the use of limited resources to ensure successful communication under problematic and uncertain conditions" (Te'eni, 2001).

Actual behavior is equally as important as cognitive or affective aspects, referred to as "relational" or "action related" communication. Another important aspect of message form presented is how a "single message is produced" and the need for an optimal configuration of the medium, message form and strategy employed (Figure 2.3). SMS text-messaging as a communication exchange is predominantly a single message exchange protocol. A single message exchange protocol focuses on the communication of an event or incident in a single message. The 160 character limitation of can impose dynamic complexity in instances such as that of SMS text-messages (the medium and message form). In referring to channel capacity and interactivity, the message size (limitation of 160 characters) and text method of distribution, the content could present dynamic complexities depending on the crisis.

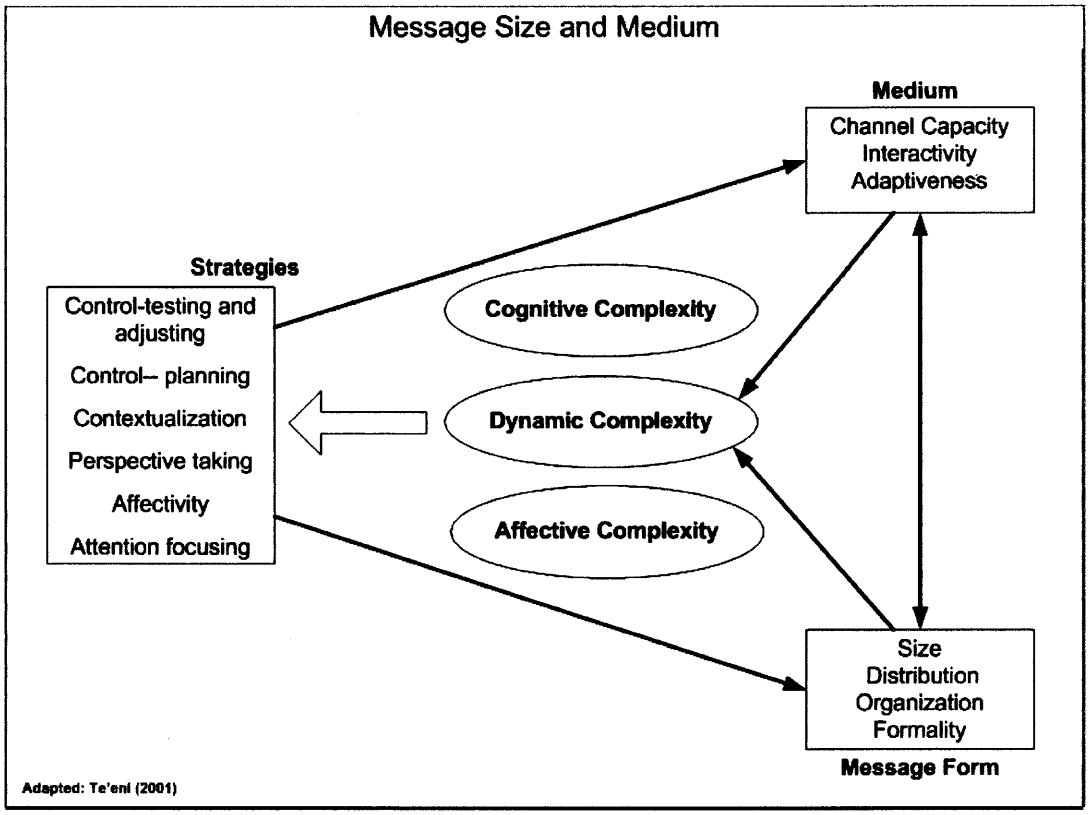


Figure 2.3 Message size and medium.
Adapted: Te'eni (2001).

Communication exchange can also be seen from a rhetorical context, as discussed by Coppola and Elliot (2005), whose research articulates a rhetorical emphasis now nearly thirty years old. For example, Odell and Goswami's (1981) field study aimed to answer the question, "When writers in nonacademic settings address different audiences or try to accomplish different purposes, are they likely to vary syntax or other linguistic features?" Another example of the rhetorical basis of communication research includes, Flower and Hayes (1979) coded "think-aloud" transcripts of writers who juggled a number of simultaneous constraints and demands resulting in a standard method for studying the problem solving strategies that people use in composing. Such studies reveal the importance of rhetorical aim and sentence construction within any study that desires

to articulate a socio-cognitive study of language use. This study introduces a crisis situation with a series of tasks for sender-receiver exchange. The sender-receiver exchange introduces a response (syntax and linguistic features with a 160 character limit) by the study participant.

Crisis communication – when the frequency of message exchange is limited yet vital – indicates the significance of knowing the rhetorical goals of the message in the communication process. Te'eni (2001) refers to communication goals as "the sender's intended impact of communication on the receiver: instructional action, manage interdependent action, manage relationships, and influence." In recognizing the need for message form and the importance of adapting a message form to the medium, a "bottom-up view of how limited resources are used to achieve goals" should complement the top-down view (Te'eni, 2001). When referring to the communication medium of mobility, especially devices such as cell phones, PDA's, and blackberry's, the sender-receiver message exchange at present is not housed by an information systems application but exchanged in cyberspace, creating a greater dependency on limited information the effectiveness of the message form.

Habermas (1998) introduces communication competence theory based on the information being communicated as a means for mutual understanding. Habermas (1998) defines communicative action as "the interaction of at least two subjects capable of speech and action who establish interpersonal relationships. The actors seek to reach an understanding about the actions context, and the plans of action in order to coordinate their action by way of agreement (Te'eni, 2001; Habermas, 1984)." Krashen's (1982) monitor model uses acquisition and learning systems together for language use and intends to link acquired and learned systems together for language use, but depends on

three conditions: 1) time for learners to think and use the rules: 2) focus on form for both the how and what is being said: 3) knowing the rules of the learned system and practicing the associated skills to facilitate ease of use (Gass, 2001). The training model presented in this research is designed to study communication protocols that are restructured to meet the ICT device criteria (i.e., 160 character limit). The associated device/message limitations change the internal representation of the exchange that would benefit from training and thereafter practice to form a pattern (habit) ultimately providing a mental model, aiding in crisis response.

2.2.1.3 Message Adaptiveness. Te'eni (2001) mentions that adaptation to both the circumstances and the devices are factors that constrain user preference impacting the answers to the above questions. Bringing these questions forward to the crisis management context, Turoff et al. (2004) emphasizes technology cannot be introduced in a crisis.

Task and team coordination are also dimensions introduced with an emergency response effort, especially when a community responder steps forward to respond in a crisis. Carmel and Agarwal (2001) present coordination as the act of integrating each task toward the overall objective organized by their respective organizational unit. ICT can mitigate task integration in the field in a crisis to request information, resources, or to provide updated status information for crisis response coordination. Malone (1990) defines coordination theory "as a body of principles about how activities can be coordinated, that is, about how actors can work together harmoniously." For a harmonious process, we extend this definition as a means to coordinate interdisciplinary perspectives and the interoperability of communication across ICT devices. The common problems Malone identifies associated with coordination include: the ability to divide

goals into actions; the assigning of actions to groups or individuals; the allocation of resources among individuals; and the sharing of information to achieve the identified goal (Malone, 1990). Training and practice of communication exchange for SMS text-messaging should aid task coordination and the assigning of actions to those responders who form part of the crisis response team.

Communication is a mediating factor for coordination, where communication serves as the exchange of complete and unambiguous information enabling the sender and receiver to reach mutual understanding (Carmel and Agarwal, 2001). Malone (1990) mentions, good coordination is nearly invisible and is only noticed when lacking which is one objective of the training introduced in this research. Introducing community responders to the crisis response team introduces additional coordination due to the varying roles and different levels of training. Enhancing the exchange of information with mobile device users through SMS text-message protocols, should enable coordination both with human users and also with agent-based systems (Zhu, 2006). Past research suggests that coordination mechanisms can encourage and facilitate communication, which in turn tends to surface alternative perspectives, debate, and potential disagreements (Ocker et al. 1996; Walther 1995). It is well known that teamwork is a communication and coordination-intensive effort characterized by complex group dynamics and the potential for conflict (Putnam 1986; Rahim 1992; Steiner 1972).

2.2.2 Speech Act Theory

Recognizing that goal-driven behavior has been initiated between a sender and receiver in a crisis response incident, the mobile ICT device introduced mediates the communication

message form and therefore the speech act selected. Speech Act Theory, initially introduced by Austin (1962) and thereafter expanded upon by Searle (1969), addresses the differences between sentences expressing commands, the differences between sentences and statements, along with other utterances. Speech Act Theory introduces two fundamental notions referred to as: 1) performative, which is the action of doing something; and 2) constantive, is representative of a true/false statement with meaning (Austin, 1962). In a crisis, a statement surrounding the crisis leading up to response efforts could constitute a progression from constantive to performative, as defined by Austin. Direct speech acts, as Searle (1969) denotes, align with performative utterances. Performative utterances are the primary focus of this research in that:

> Performative utterances "will be used in a variety of cognate ways and constructions, much as the term '**imperative**' is. The name is derived, of course, from 'perform', the usual verb with the noun 'action': it indicates that the issuing of the utterance is the performing of an action – it is not normally thought of as just saying something." (Austin, 1962).

Austin continues to discuss actions taken, whether physical or mental in relation to the circumstances and appropriateness in which the words are uttered and the importance of an action being executed correctly and completely by all participants (i.e., coordinators and responders). However, uncertainties may arise which prevent the action from being carried out either correctly or completely. In addition, the *first person singular present indicative active form* has the advantage of making the speech-situation explicit and indicating the precise action to be performed and not the same as stating or describing (Austin, 1962).

The discussion Austin presents on the difference between primitive language and precision introduce reasons ambiguity or equivocation is preserved, and the effect on

procedures stating that "precision in language makes it clearer what is being said-its meaning: explicitness, or how it is to be taken", noting that "explicit performative is the most successful of numerous speech-devices for developing precision in speech" and is concerned with reactions to behavior and is also beneficial for directions and formula. Likewise, including the circumstances of the utterance can lead to equivocations and uncertainty of reception. In general, speaking a language is a "rule-governed" form of behavior and people internalize different rules (Searle, 1969). Speech acts can also be referred to as "minimal units of communication." In a crisis, speech acts and precision are essential due to the incident implications.

Austin (1962) describes three primary characteristics defined as distinct levels of action beyond the utterance (Table 2.3), applicable to the proposed crisis management literature: 1) locutionary acts, "roughly equivalent to uttering a certain sentence with a certain 'meaning' in the traditional sense," 2) illocutionary acts, "such as informing, ordering, warning, undertaking, (i.e., utterances) which have a certain (conventional) force," and 3) perlocutionary acts: "what we bring about or achieve by saying something, such as convincing, persuading, deterring, and even, say, surprising or misleading." This research leverages the three speech acts for training and SMS text-message training and task response.

Table 2.3 Speech Act Types

Speech Act Types		
Locutionary Acts	**Illocutionary Acts**	**Perlocutionary Acts**
Asking or answering a question	*Performance of an act in saying something where a certain effect is achieved*	*What we bring about or achieve by saying something and includes some consequences*
Giving some information, Assurance, or a warning Announcing a verdict or an intention Pronouncing a sentence Making an appointment or an appeal or a criticism, Making identification or giving a description, and the numerous like.	Informing Ordering Warning Undertaking	Convincing Persuading Deterring Surprising Misleading

Adapted from Austin (1962).

Illocutionary Speech Acts use a commanding structure. Searle (1969) introduces the use of Essential Rules for illocutionary speech act (Table 2.4) and are the basis for the task prompts of this study. The illocutionary act as reflected invokes the responder (study participant) to respond.

Table 2.4 Speech Act Characteristics

Illocutionary Speech Acts – Essential Rules	
Illocutionary Acts	**Essential Rule**
Asking or answering a question	*Performance of an act in saying something where a certain effect is achieved*
Assert (confirm)	Counts as an undertaking to the effect that ***p*** represents an actual state of affairs.
Warn	Counts as an undertaking to the effect that E is not in H's best interest.
Advise	Counts as an undertaking to the effect that A is not in H's best interest.
Question (ask for)	Counts as an attempt to elicit this information from H.
Thank	Counts as an expression of gratitude.
Request	Counts as an attempt to get H to do A.

Adapted from Searle (1969).

2.2.2.1 Speech Acts and Plain Language. Leveraging the singular imperative active voice structure, similar to the performative speech acts, plain language's focus offers an active voice structure. Recognizing multiple definitions for plain language exist, this research stems from the definition of plain language as the presentation of information in a way that makes it as easy as possible for people to understand while considering audience, clarity, and comprehension (PL, 2006). Robert Eagles defines plain language as clear, straightforward expression, using only as many words as are necessary. It is language that avoids obscurity, inflated vocabulary and convoluted sentence construction. They make sure that their audience understands the message easily (PL, 2006). The premise of plain language is to improve accuracy, certainty, and precision (PL, 2006). These three dimensions are essential for crisis response.

Plain language provides a written language base for effective communication protocols. Plain language is also becoming a standard (FEMA, 2004) for interoperable communication in emergency response. As of May 2005 a directive on new procedure codes was issued phasing out agency and jurisdiction specific codes and introducing the use of standard language. Plain language initiatives in emergency preparedness are begin realized at the international, national, and local levels. For example, FEMA documents (2006) state that plain language must be used with interoperable communication systems (enabling fire, police, EMS/medical to collaborate) and will replace the use of 10-codes when two or more agencies are working together. At the local level, the Caribbean has instituted the use of plain language for their standard operating procedures (Lopez-Portillo, 2006). The Imperative Forms of Verbs are used to convey a request, command or strong injunction (Gogol, 2006). Most imperative verbs are used in the 2nd person singular and plural--for example, "Come here!" We use the imperative form of the verb

to make requests, give directions or instructions, and give orders or commands (Aarsvold, 2006). The use of language in following standard operating procedures (SOP) can be extended to SMS text-messaging as noted in the use of SOPs for Emergency and Health Planning initiatives of the Caribbean (Lopez-Portillo, 2006). Imperative verbs are one of the primary writing styles recommended for procedures. Participants in these areas who attend training also become active learners by writing their own SOPs during the training.

For example, a procedure could include the following steps that follow a plain language imperative verb structure (Lopez-Portillo, 2006):

> Step 1: Go to command post located 221 Baker Street.
> Step 2: Call by the phone Doctors x, y and z.
> Step 3: Request them to go immediately to command post
> Step 4: Send immediately one ambulance to the place x
> Step 5: Maintain permanent communication with the ambulance personnel.

The use of plain language can promote awareness for device adaptation (large-to-small device and vice versa). At present, the challenge is finding ways to increase usage through everyday needs, as a way to increase practice and readiness to respond for situations of uncertainty. Practice can occur for responders through everyday personal crisis, such as getting lost when traveling. In this study, the use of parallel structures for rhetorical cohesion plays an important role to both establish a baseline measure and means of comparison (pre-training and post-training) but also as an indicator of habit. For example, SMS text-messaging would be useful when encountering a detour in trying to get to the airport or an important business meeting. However, this task using SMS text-messaging would be complex and increase task completion time without practice.

2.2.2.2 Speech Acts and Plain language Training. October 1, 2005 was the good-faith deadline to implement the National Incident Management System (NIMS).

Included with the implementation plan is the use the same terminology and procedures all the time "to achieve interoperability among jurisdictions and disciplines." A bulletin dated August 23, 2006 addresses the directive that NIMS enforce the use of plain language rather than the traditional 10-codes. Although resistance is evident, a bulletin stipulated the loss of federal preparedness funds if plain language use was not implemented. At present, plain language training is offered online through the Internet with a series of HTML navigated pages. The focus of the training is on documentation and standard operating procedures for federal regulation writers. The National Institute of Health (NIH) also provides Internet-Based plain language training for medical writing professionals. The US Army has developed a plain language document, which is recommended for training. The document discussed the difference between the active and passive voice for plain language use. Three key outcomes when using the active voice are 1) sentence length, typically 20% less than the passive voice, 2) the use of an agent (i.e., person or organization), and 3) that it takes less time to read. These outcomes benefit communication when responding in a crisis (PL, 2006).

2.2.3 Communication Theory Summary

Communication theory complements this research from several aspects beginning Communicative Action Theory, thereafter the emphasis on message form which is the actual content exchanged between the sender and receiver of a message. The speech acts and use of plain language of the message content introduce new constraints for text-messaging due to the 160 character limit of a text- message. The action oriented nature of text-message exchange for crisis response stresses the importance of the active voice and illocutionary speech acts use of the essential rule.

2.3 Information Richness Theory

Speech-acts and the use of plain language address message form, whereas information richness pertains to the learning capacity of the communication (Lee, 1994). Information Richness Theory (IRT) is defined as the ability of information to change understanding within a time interval. Recognizing that communication media vary in the capacity to process rich information, written communication means tend to be low in richness. The dimensions of SMS text-messaging are such that they could align with the use of electronic mail, and therefore be assumed a low-richness medium. In a crisis, SMS text-messaging could be the only means of communication causing the exchange of information and richness to be critical.

Daft and Lengel (1986) leverage uncertainty and equivocality as champions of media richness theory back in 1984. Distinct communication exchange implications when addressing uncertainty associated with the lack of information, flow of information, and the transmission of the correct amount of information (Carson and Davis, 1998) exist. The correct amount of information may be inhibited by the media device and communication exchange, such as with the 160 character text-message exchange limit. Equivocality is associated with ambiguous situations and the need to enable rapid exchange of information cycles to clarify meanings initiating the need for media richness (Carson and David, 1998; Daft and Weick, 1984, Weick 1979). Using rich media for rich information is predicted to resolve ambiguity and equivocality. Face-to-face (FtF) is considered a rich media, but not always an option for crisis responders. For example, community responders working in the field may not be able to communicate face-to-face with a command and control coordinator. Another responder addressing a contagious

epidemic may need to collaborate with another laboratory in another jurisdiction or even in another state or country.

Uncertainty has been associated with low-richness media. Uncertainty is a prevalent dimension in a crisis or emergency where each incident varies creating unknown situational elements. While equivocality and ambiguity may exist in a crisis, the driving force is the uncertainty of the incident that has occurred. Acquiring more data is not always the solution. It is more important to have a structure around the means to best utilize the requested information. The objective of Daft and Lengel (1986) is to demonstrate how organizations can increase media richness with structural design, reducing uncertainty and equivocality. However, media of low-richness is predicted to be most effective in resolving uncertainty. Mobile device communication exchange does not rely on a structurally design application, but rather depends on how the features (uncertainty) are deployed and the protocols that accompany device usage. For example, text-messaging is considered a low-richness medium, yet one that could play an important role in large scale crisis communication management through effective communication protocols.

In a crisis, the uncertainty of the impact can affect individual communication behavior, adding dynamic complexity as Te'eni mentions, where "the communication process depends on time constraints, unclear, or deficient feedback and changes during the process. Dynamic complexity increases the likelihood of misunderstanding the required action (Diehl and Sterman 1995). For example, when the receiver's behavior is highly unpredictable (e.g., lapses of attention), the communicator needs to adapt the communication" where mutual understanding is the impact. Turoff et al. (2004) place emphasis on the impact of dynamic conditions in crisis response. One dynamic condition

in of itself is "Influencing of behavior and attitude in order to conform to the sender's wishes, but realizing the receiver can behave differently. Influencing is often concerned with resolving conflicts and, thus, it reflects high interdependence between communicators, more so than thinking collectively (Te'eni, 2001; Straus and McGrath 1994)."

Te'eni (2001) continues to improve upon existing theories of communication by providing a new model. Over the past two decades, there has been an enormous shift in the role of task-oriented functions. Today's technologies allow us to measure and increase performance by linking tasks and communication mediums. "The review suggests the importance of considering task requirements in terms of interdependencies between workers. The higher the interdependency, the higher the cognitive complexity, and the more intensive the need for managing collective action becomes. Higher interdependency is assumed for judgmental tasks (Daft and Lengal, 1986) and introduces a need for a task-technology fit, viewed as an important factor in determining whether the use of technology would result in performance improvements (Lim and Benbasat, 2000; Goodhue and Thompson, 1995; Tan and Benbasat, 1993; Vessey, 1991; Vessey and Galetta, 1991). Having the right technology for a task is essential. The communication medium (i.e., device) must be suitable for that objective.

Markus' et al. (1994) empirical study revealed that high information richness could be achieved through email – a written communication medium. Marcus notes that effectiveness could suffer if managers (user) choose media that are not sufficiently "rich" in information for they task they need to accomplish (Markus, 1994). In a crisis, the user (community responder) responding in the field may not have a choice of preferred media and only have low-richness communication protocol ability, such as text-messaging of a

cell phone, placing the focus on maximizing the effective use of written communication to convey vital information. Markus (1994) mentions that information richness theory remains as one of the most influential theory of media choice for individual perceptions of media characteristics are assumed to play a causal role. Measured in the Markus (1994) study was both the behavior and perceptions, where perceptions were consistent with information richness theory. The distinct characteristics of SMS text-messaging, also considered a lean medium, should be analyzed and compared to findings similar to those of email noting the distinct characteristics of SMS text-messaging when in a mobile setting.

2.3.1 Discourse Theory and the Transmission of Correct Information

The 160 character Short Message Service (SMS) architecture of a text-message challenges writing fluency and the full text of speech or writing of discourse theory and the basis for this study. Discourse theory, "which deals with the development of full texts in speech or writing (Kinneavy, 1971), provides another source of knowledge that influences the design of writing assignments for both instructional, and testing occasions (Ruth and Murphy, 1988)." Extending beyond instructional learning and testing, to practice and use beyond instructional learning is an important measure for crisis response communication exchange. D'Angelo (1980) notes the importance of the occasion (circumstance, event, problem) for the writing situation (crisis).

The message (writing) form of a SMS text-message during crisis response is initiated by a purpose (crisis). Purpose or aim as Ruth and Murphy discuss arises from the interaction of writer, subject, and audience, and relates to writing form. Te'eni (2001) also discusses the importance of message form (purpose or aim). In an SMS text-message

with a 160 character limit, the message form (purpose and aim) in a crisis increases in criticality. The communication exchange (subject) between the writer (community responder) and the audience (command and control coordinator) can influence the action taken and timeliness of the response (urgency).

Lloyd-Jones (1977) explains the importance of a discourse model to identify the creation of exercises, which stimulate writing in the appropriate range but not beyond it. Speech Acts are introduced in the Lloyd-Jones (1977) Model of Discourse with emphasis on Illocutionary and Perlocutionary Speech Acts. The SMS text-messaging for crisis response study focuses on the Illocutionary Speech Act Essential Rules from Speech Act Theory (Section 2.2.2), as the range in the creation of exercises (task prompts).

Lack of information, flow of information, and the transmission of the correct amount of information (Carson and Davis, 1998) are prevalent in crisis response due to the unique conditions and impact of each crisis. The effect writing ability has on text-based communication protocols in a crisis situation are one behavioral observation of the study. The importance of writing assessment is to gather information about writing ability. Unlike an evaluation, writing assessment does not require comparison or ranking of students. Primary trait scoring is "based on a theory of discourse, the method assumes that different writing tasks engage different writing strategies. Thus, when the task is created, certain rhetorical strategies are identified and then cued in the task itself (Ruth and Muphy, 1988)."

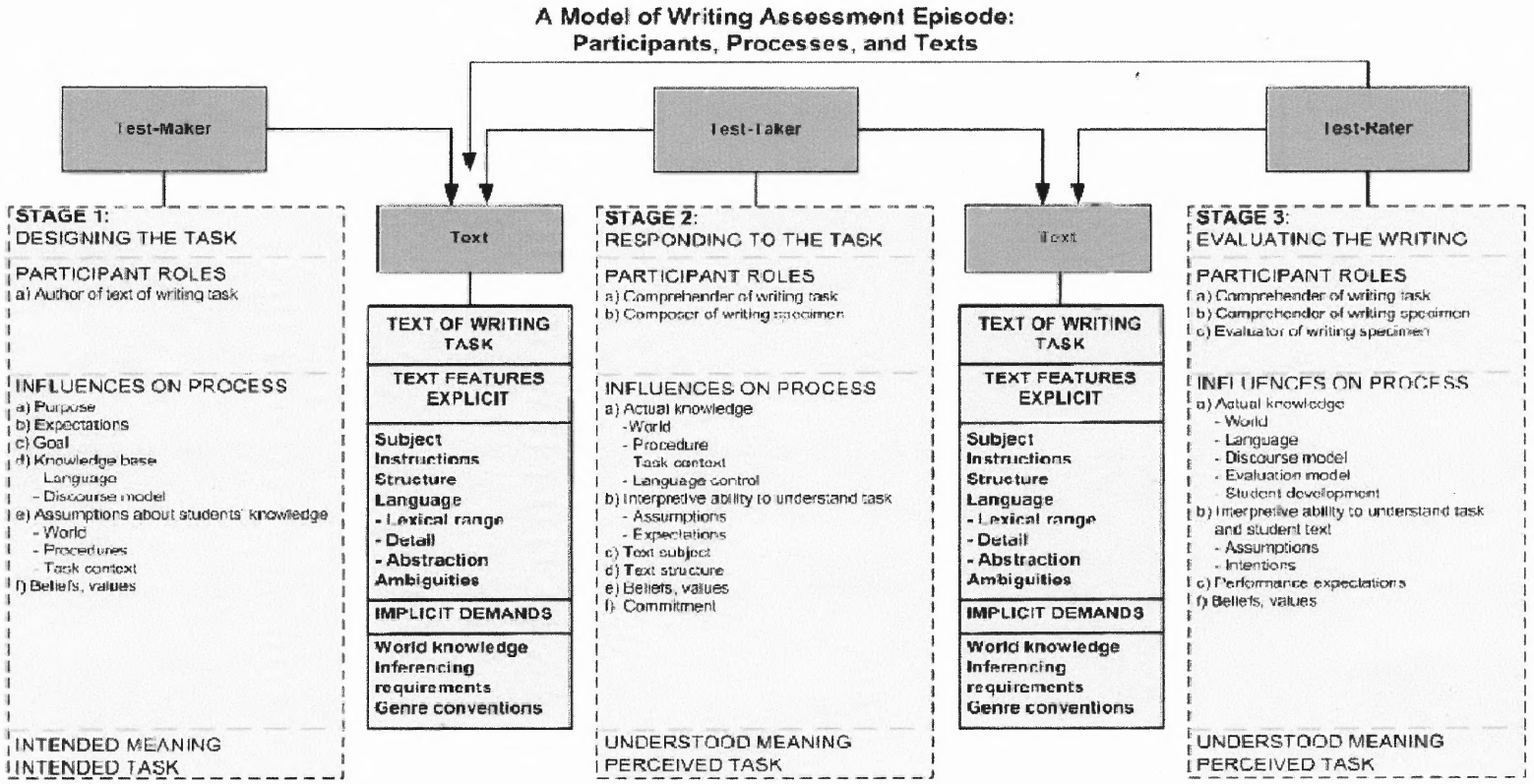
The ability to approximate the expected traits or characteristics for a particular type of discourse and specified criteria are essential to parallel the test-maker, test-taker and test-rater task prompts and responses in the Ruth and Murphy Writing Assessment Model (Figure 2.4). In addition, the importance of clear instructions is necessary for any

writing task, although the student's ability to interpret can vary. The Ruth and Murphy Writing Assessment Model noted the "Understood Meaning/Perceived Task" as the interpretation that varies by student. The interpretation of the test-rater can also vary and is noted in the Writing Assessment Model.

Sometimes a "single word may mislead the students" as in a case described by Tanner (1981). A well framed topic for writing assessment "provides an occasion for writing in which the student's powers of expression and communication are stimulated to their maximum (Ruth and Murphy, 1988)." Braddock, Lloyd-Jones, and Schoer (1963) discuss the assignment variable noting that it can be controlled but often is not. However, the assignment variable does introduce four aspects: the topic, the mode of discourse, the time afforded for writing, and the examination situation. The crisis response study does capture the assignment variable aspects noted above. Also noted is the limited research to guide test-writers in the wording of prompts noting the importance of intention and outcome recognizing that changing even a single word by directly affect the interpretation.

The Ruth and Murphy Writing Assessment Model (Figure 2.4) applied to the study at hand, reveals much about the interaction achieved between the crisis response task (writing topic) and the study participant acting as a community responder (writer). The Ruth and Murphy model serves as the foundation for task development. The "interaction evoked by the subject (topic) as well as by any accompanying instructions, written or verbal" need to be understood (Ruth and Murphy, 1988). Moreover, the ability to assess the performance (task response) is essential for training. Extending beyond training is the need for participant feedback and protocols for ongoing practice as an objective for increased communication readiness.

Task prompt and task response should be matched for performance assessment, noting different kinds of writing will vary in difficulty level (Ruth and Murphy, 1988; Freedman and Pringle, 1981; Pearce, 1974; Rosen, 1969). The discourse purpose suggests different writing tasks may tap different cognitive skills causing more difficulty for some tasks (discourse purposes) impacting the evaluation of writing performance (Ruth and Murphy, 1988; Matsuhashi, 1982; Quellmalz, Capell, and Chou, 1982; D'Angelo, 1976)). Quellmatz, et al. (1982) note that writing profiles derived by tests differing in discourse modes show "that levels of performance varied according to the purpose of the writing task." In a crisis, the purpose of the communication exchange will vary resulting in differing discourse modes for different communication exchanges.



Adapted from Ruth & Murphy, 1985, p.414

Figure 2.4 Writing assessment model.

2.3.2 Mobile ICT Penetration

SMS text-messaging and information richness theories, encompassing uncertainty and equivocality bring separate implications with the wireless revolution. The 2006 World Information Society Report (WISR) notes that mobile penetration is greater than 100 percent (Figure 2.5) of the population given multiple subscriptions and active service plans. Mobile Internet subscribers are tracked for usage including mobile applications and are a "crucial indicator to monitor, given the growing impact that the mobile Internet will have in the future (WISR, 2006).

2002	2003	2004	2005	Rank 2005
Luxembourg	Hong Kong, China	Czech Republic	Austria	11
Taiwan, China	Luxembourg	Hong Kong, China	Bahrain	12
	Taiwan, China	Iceland	Cyprus	21
		Israel	Czech Republic	7
		Italy	Denmark	18
		Luxembourg	Estonia	10
		Norway	Finland	17
		Sweden	Greece	13
		United Kingdom	Iceland	20
			Ireland	15
			Israel	5
			Italy	3
			Hong Kong, China	4
			Jamaica	16
			Lithuania	2
			Luxembourg	1
			Macao, China	6
			Netherlands	22
			Norway	25
			Portugal	9
			Singapore	19
			Spain	23
			Sweden	24
			Taiwan, China	26
			United Arab Emirates	14
			United Kingdom	8

Source: ITU/Korea Digital Opportunity Flatform.

Figure 2.5 Countries ranked with 100+ percent population usage.

Mobile devices – such as pagers, cellular phones, personal digital assistants, nomadic tablet computers (laptops with embedded touch screens and wireless connectivity cards) – can play a pivotal role in emergency situations as they can serve three purposes: to be reachable anywhere and at anytime, to obtain information while in

an outreach situation; and, to be 'visible' and traceable through a device enabled with GPS positioning capabilities (Gomez and Passerini, 2006). A mobile device maximizes flexibility, increases timeliness to reach community partners, and increases readiness for a crisis related health alert. Recognizing the limitations of obtaining extensive information across a mobile device, protocols and standards for communicating with an individual who has access to limited display size with a limited connection speed can be created to ease interactions during emergencies. The use of a command and control structure (Turoff et al. 2004) in a stationary location to mediate information retrieval and content transmitted for high mobility of field use can compensate for the low-mediation of mobile devices. High collaboration, process improvement, and optimization (Xue, 2004) are one means to offset the limitations of low-mediation devices.

Although data transfer capabilities are increasing through wireless-wide area cellular network third generation channels, the need to shrink data and content of 'what' is communicated is vital for mobile devices in emergency scenarios (Gomez and Passerini, 2006). In addition to connectivity options on the mobile device, it is important to identify codes and alter messages that may quickly trigger responses, for example, through a specific set of pre-loaded icons or tools (such as the already famous 'emoticons' used in chat rooms).

2.3.3 Interoperability

Stillman (2005) raises the importance of interoperability with communication systems and standardization as a key variable across all organizational levels. Further discussed are the individual-collaborative levels (i.e., family circles or a closely collaborative workgroups) of meaning being conveyed through linguistics and other semiotic systems.

However for information sharing to be meaningful and widen the diversity of participants at the organizational or societal and inter-societal levels (define) there has to be a commensurated effort at standardization of communication codes (languages, protocols such as TCP/IP, metadata systems) to accommodate all the parties to such communication (Stillman, 2005).

Achieving interoperability is a challenge in today's world of globalization where geographic boundaries are less evident. The increased methods of communication coupled with the numerous devices from which to communicate pose a challenge for standard communication protocols. Harrison (2006) mentions one of the most difficult hurdles to overcome in emergency response has been in "creating interoperable systems, both technical and organizational, that are capable of sharing data." Interoperability issues that keep emergency responders connected continues as an issue four years after the 2001 terrorist attacks that exposed the need for more robust, interconnected communications during such calamities. The communication breakdown of Hurricane Katrina continued the notion of interoperability issues with emergency responders when FEMA did not know for days that the people sheltered at the convention center without food or water for days. For example, rescuers in helicopters couldn't talk to crews patrolling in boats and the National Guard commanders in Mississippi had to use runners to relay orders (Mehta, 2006).

2.3.3.1 Mobile ICT Device Usage. Increased communication across community organizations, through the use of mobile ICT, should enhance the role of the public health practitioner striving towards improved population health. Through the administration of public warning systems, alert notifications are now being utilized in local communities.

At present the alert notifications are for residents or those who work in a local area. The public warning alert notifications allow the user (i.e., community practitioner or citizen) to register multiple ICT devices and mediums (i.e., text messaging, voice notification, email). At least five communities in the United States are using alert notifications managed through an external company. The five locations and case studies that leverage the same choice of ICT devices and have a similar overall approach include: 1) Arlington, VA; 2) Fairfax, VA; 3) Fairfax, VA (Medical Reserve Corp.); 4) Philadelphia, PA; 5) Washington, DC (Roam Secure, 2006). Subscribers from these locations can select the type of alert notifications to receive, such as local schools. Strong Angel III, an international demonstration conducted in August of 2006, brought together local and global partners to test 50 real-world challenges (SA, 2006). Included were mobile telecommunication components, such as, SPOT wristwatch technology's use of an SMS gateway to allow SMS text-message exchange between cell-phones and SPOT wristwatch users. Among users exchanging messages were medical, NGO, private and public sector participants. Alternately, Codespear notification gateway developed by Bell Canada allows for multi-cast group messaging across laptops, cell phones, SPOT watches and multiple radio frequency bands.

Recognizing that interoperability is gaining importance, places emphasis on the need to not only work within your own team/role (i.e., firefighters working together, while police work together), but across teams. David Boyd from the Department of Homeland Security states that "while interoperability issues continue to exist, the larger problems involve culture and even language" (Wood, 2006). Moreover the ongoing unresolved issues with interoperability across multi-governmental levels complicated first

responders and governmental official's efforts to work together during hurricane Katrina (Wood, 2006). Quicker solutions are being presented for use with phone, satellite, Internet and video conferencing, yet these emergency communication systems need to ensure the system isn't overloaded with too many people trying to talk at once. Sprint/Nextel leverages satellite cell sites and equipment for rapid service restoration without the need for local power or telephone utilities. Sprint Nextel also hashttp://www.oed.com/ a surplus of phones and go-kits ready for public sector use in crisis. The go-kits are designed for rapid activation during emergencies, drills, or pre-planned events (Taylor, 2006). Communication exchange protocols can carry-over to the use of go-kits and satellite cell-phone use.

2.3.3.2 SMS Text-Messaging Usage. The implications of a health-related emergency vary depending on the nature of the emergency and whether the emergency is of a contagious or non-contagious nature (Cooper, 2004). Natural disasters and man-made events can also result in health-related response, such as the Chicago heat wave. Roberts (2006) discusses the "2004 U.S. Conference of Mayors Interoperability Survey which found that two-thirds of the 192 cities surveyed are using 800 MHz to communicate with other public safety organizations. Just 2 percent were using 700 MHz." The study also concludes that in 77 percent of the 192 cities surveyed, police and fire departments could not talk to one another, and in 66 percent of them, police, fire and EMS agencies weren't interoperable. The actual technology, however, can be viewed as separate from the experience of the user across the technology itself; primarily the asynchronous nature of text messaging and email when time pressure is a factor.

SMS text-messaging is a simple low-cost technology that is durable due to its small packet exchange technology. SMS has begun inroads to an SOS equivalent due to the alternate delivery route to voice channels. During Katrina, SMS text-messages got through when other communication methods failed. Coast guard officials used the technology for direct life-saving helicopter rescues during the Gulf Coast Hurricanes. SMS text-messaging can be considered a simple technology. However, SMS text-messaging has proven advantages. The ability to send small packets that sit in a message queue outweighs the use of voice calls that require the device user to continuously redial. There are approximately 190 million Americans with text-messaging functionality on their cell phones. The use of text-messaging won't overload the telecommunication systems (SA, 2005). The federal government is currently piloting its use with four major wireless carriers. Mass text-messaging could be problematic if not carefully tested. The preferred design is for smaller distributions resembling that of a community of interest. "There is no doubt SMS has the ability to save lives in an emergency (SA, 2005)." As mentioned in the Strong Angel III press release, in an emergency, messages sent out are very controlled and local media are viewed with some suspicion. The Strong Angel III disaster response training focused on information dissemination. Efforts involved local citizen's sharing information about the disaster through SMS text-messaging and blogging. "The disparate reports could be geographically mapped to improve disaster response." Interviews noted presidential alert levels via SMS text-messaging are proposed by the cellular industry with opt-in subscriber capabilities. Going forward, there should be a continuing process for identifying the emergency alert environment and

merging it with industry capabilities. For example, zip codes are one way to designate text-messaging for area specific alerts.

In Manchester England, initiatives surround preparedness and planning to encompass opt-in subscriber options for SMS text-messaging for mobile phones, email, or pagers. Included in the messages are details such as details of the incident, location, zones being evacuated, updates on the situation, details on when it is safe to return, details on security arrangements (MUK, 2006). Ongoing status messages as the situation progresses are also planned. In the United States, and around the world initiative such as the above mentioned are also being introduced (DC Alert, 2006; Textually.org, 2006; ABC News, 2006).

2.3.4 Information Richness Summary

Recognizing that communication media vary in the capacity to process rich information, written communication means tend to be low in richness. However, the use written communication, such as SMS text-messaging may be the only or preferred option for communicating in a crisis, depending on the situation. Increasing writing ability and communication protocols for SMS text-messaging by adapting writing style and increasing the use of plain language strategies offers potential for communication exchange of rich information.

2.4 Individual Usage Behavior

Alert notifications and SMS text-message exchange place a dependency on the behavior of individuals who respond and need to engage in communication with a low-cost, low-richness device. Individual Usage Behavior begins with two perceived measures:

Perceived Usefulness and Perceived Ease of Use. Perceived Usefulness is defined here as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989). Perceived Ease of Use, in contrast, refers to "the degree to which a person believes that using a particular system would be free of effort." Self-efficacy as Davis (1989) mentions is similar to Perceived Ease of Use when defined as "judgments of how well one can execute courses of action required to deal with prospective situations" (Davis, 1989; Bandura, 1982). Adoption and diffusion of innovations research parallels "perceived ease of use in that the innovation is perceived as relatively difficult to understand and use" (Davis, 1989; Rogers and Shoemaker, 1971). The study places emphasis on self-efficacy in lieu of Perceived Ease of Use given the device use (cell phone) is simulated.

Te'eni (2001, 2006) presents the need for actual behavior measures beyond failures which are commonly identified in applications. Simulations and training can now capture actual behavior through database updates and screen recording software, such as Camtasia, to obtain actual task performance measures, as proposed in this research. Moreover, measuring user behavior provides an assessment on "how a single message is produced if we are to support message production (Rice 1992; Webster and Trevino 1995). Ideally, such support would be an optimal configuration of medium and message attributes" where a communicator will generally choose how to communicate, including their choice of communication media (Te'eni, 2001).

In parallel, new communication technology and mutual knowledge research continues (Te'eni, 2001; Clark, 1996; Krauss and Fussell, 1990) and then Crampton (2001) whose approach is geographic dispersion and the impact on mutual knowledge

when new communication technologies are introduced. Moreover, Crampton's focus is on organizational or classroom settings, more so than the field setting dimensions presented in crisis-related events. Crises by nature vary where no two crises are alike, creating a greater need to establish mutual knowledge in the crisis context (i.e., conditions and impact), rather than manage mutual knowledge in the crises context for the field responder role. Mobile device communication exchange displays additional dimensions in addition to geographic dispersion where information exchange limitations are a primary limitation because the device mobility is continuously changing and shrinking in size, yet the need for greater amounts of accessible information increases. The nature of SMS text-messaging use, for example, presents dimensions that reduce the pooling of information and focus on the uniqueness of information in lieu of multi-directional information pooling (i.e., one sender to one receiver exchange). Responders in the field during a crisis primarily exchange information that is unique and goal-driven. Crises use of SMS text-messaging at present focuses on one-way alert notifications.

2.4.1 Theory of Planned Behavior

Individual behavior for any community responder, whether from a public safety agency, community health agency, private sector, or humanitarian relief organization brings individual beliefs, and values that fall outside of the responding team and incident circumstances. The theory of planned behavior (TPB) developed in 1988 by Izek Ajzen, aims to predict and understand motivational influences on behavior that are not always under an individual's volitional control (Ajzen 1985). Additionally, TPB targets strategies for changing behavior explain the associated human behavior (Bhattacherjee and Premkumar, 2004; Venkatesh et al. 2003; Ajzen, 1985). TPB provides a framework

to study attitudes toward behaviors. Attitudes towards using the technology focus on the affective reaction to using a system (Venkatesh et al. 2003). Bhattacherjee and Premkumar (2004) study of beliefs and attitudes towards usage, takes a repeated measures approach toward IT usage and triangulate with qualitative measures.

Human behavior is influenced by the presence, behavior, and products of other human beings, individually and collectively, past, present, and future (McGrath 1964). As McGrath mentions, there is ongoing disagreement to the "hows" and "whys" of human behavior. Social psychology deals with phenomena at each of three levels of analysis: the individual, the small groups of which he is a part, and the total society and culture within which he is embedded (McGrath2). As McGrath states, groups are composed of individuals and human interaction in groups is the interplay of behaviors of the set of individuals involved.

Learning as defined by McGrath occurs through systematic associations of different stimulus patterns one with another and through selective reinforcement (reward and punishment) of certain responses (McGrath 1964) Moreover, the significant others in a person's life beginning from infancy form the social environment of an individual (McGrath). This interaction or in a social environment (socialization) develops an individual's personality. Personality refers to the total organization of the individual's motives, attitudes, beliefs, ways of perceiving and ways of behaving (McGrath). Both instructional and associative learning generate a stimulus pattern in relation to time and space (McGrath 1964). Learning is innate from early childhood development. This association or stimulus pattern becomes connected to the drive-satisfaction sequence to which it is associated (McGrath 1964). As discussed by McGrath, behavior patterns

associated with drive satisfaction are learned and occur usually when an existing pattern is blocked.

Beliefs and attitudes influence information technology usage. Resistance can occur in the adoption process and reduce IT usage. Bhattacherjee and Premkumar's (2004) empirical study looks at changes in beliefs, attitudes, and intentions of IT usage overtime based on the theory of planned behavior and the technology acceptance model. Through the expectation-disconfirmation theory (Oliver, 1980), a pre-usage, post-usage, and two-stage repeated measures model was developed which leverages the technology acceptance model and the theory of planned behavior (Bhattacherjee and Premkumar, 2004; Ventakesh and Davis 2000; Taylor and Todd 1995b; Davis, 1989; Ajzen and Fishbein 1977). Alike to the study at hand, the computer-based training was administered for two different technologies and contexts. This study uses two technology delivery methods for photo with audio and text with audio training. The Bhattacherjee and Premkumar (2004) study also mentions that little research is directed at why and how beliefs and attitudes change over time with temporal changing being the goal of their repeated measures study. This research seeks two Training Session Types to observe if usage can improve communication readiness for mobile ICT device communication exchange, and compares how beliefs and attitudes change. The changes in beliefs and attitudes of IT usage (Bhattacherjee and Premkumar, 2004) are the underlying measures supporting intention to use and the proposed research framework because the exchange of written communication takes place across technology where device usage and message exchange take place 3 times allowing for an end-of-training intention to use measure.

Stemming from the conditions "where individuals do not have complete control over their behavior, TPB is formed by one's attitude and desire to perform the behavior and constraints on behavior" (Taylor and Todd, 1995b). Important to the real-world problem of this research, "perceived behavioral control reflects beliefs regarding access to the resources and opportunities needed to perform a behavior, or alternatively, to the internal and external factors that may impede performance of the behavior (Taylor and Todd, 1995b; Ajzen 1985, 1991; Ajzen and Driver, 1992; Ajzen and Madden, 1986, Madden et al. 1992)." Igbaria and Zinatelli (2001) study indicate that Perceived Ease of Use is a dominant factor in explaining Perceived Usefulness and system usage in small firms which are a closer representation to the small NGO's where volunteers focus on this study, more so than the organization literature of many studies or the use of students in a classroom setting. The small firm financial, training and specialized computer expertise are resource limitations (Nooteboom, 1988) that also parallel the limitations of small NGO's where volunteers presented in the proposed study and need to rely on external resources more than large organizations.

Facilitating conditions as Triandis (1979) present "reflects the availability of resources needed to engage in a behavior, such as time, money or other specialized resources" (Taylor and Todd, 1995b). In a crisis, communication with specialized resources is needed and the role of mobile technologies for responder task responses (communication exchange) becomes facilitating conditions. Also introduced in the Taylor and Todd (1995b) research is self-efficacy (Bandura, 1977, 1982) where an individual's self-confidence in his/her ability to perform a behavior. Adapting the repeated measure constructs of the above mentioned research is proposed to provide insight on believes and

attitudes for this study. The beliefs and attitudes repeated measure constructs presented above were adapted from the previous research (Ventakesh and Morris, 2000; Sjazna and Scamell, 1993) and used in this research as a way to measure individual preparedness to participate (i.e., respond). The *Habit Intention Model*, extended from the Technology Acceptance Model introduces habit and facilitating conditions (Limayem, 2001). Incorporating facilitating conditions (Triandis, 1980) and intentions along with habit is also predicted to increase usage behavior (Limayem, 2001). Facilitating conditions reflect those behavioral acts that are assisted or inhibited from occurring (Triandis, 1980; Limayem, 2001). This research initiative strives to leverage the behavioral control research of Piccoli and Ives (2003), and intends to extend that of Limayem (2001) by placing emphasis on individual usage behavior within a crisis response context. Limayem's research also places emphasis on behavior and the introduction of habits to the Technology Acceptance Model by leveraging both the Theory of Reasoned Action and Theory of Planned Behavior (Fishbein and Ajzen, 1975; Limayem, 2003).

Individual usage behavior is operationalized as automatic behavior associated with a pattern/habit (Gomez and Patten, 2006; Limayem, 2001) whereby, the repeated measures being introduced and observed through the task prompts, introduce SMS text-messaging practice to understand it's potential for a habit forming facilitating condition. Learning theories such as Schema Theory treat organized knowledge as an elaborate network of abstract mental structures; representing an individual's understanding of the world (Bandura, 1997). Behavioral theories compliment the schema with time, interaction and performance factors. Critical thinking is often associated with problem solving and formulating inferences for the particular context and type of thinking task

(Halpern, 1996). The most important factor is the training to develop good mental habits that consist of acquiring an attitude to suspend conclusion (Dewey, 1991). Dewey (1991) attributes thinking as specific, in that different things suggest their own appropriate meanings, tell their own unique stories, and in that they do this in very different ways with different persons.

Triangulation was also used in the Bhattacherjee and Premkumar (2004) study with qualitative results compared to the quantitative survey results and "demonstrates that Perceived Usefulness (the extent to which users believe that system usage will enhance their job performance) is the primary belief driving IT usage intention whose effect on the dependent variable is partially mediated by attitude (personal affect toward IT usage).

2.4.2 Individual Readiness

Behaviors that increase practice for increased mobile device readiness are needed for community responders. Active learning strategies can complement the need for practice with today's multimedia technologies. Placing emphasis on individual readiness, is often referred to as the state of being prepared to engage in an event has become a focal point in crisis management and emergency response, alternately we could compare readiness to adaptiveness when training and practice are introduced. Brady (2003) discusses readiness and critical incident response in reflection of the 9/11 terrorist incident. Brady (2003) notes that prior 9/11 emergency management focuses primarily on weather, traffic, and industrial-related incidents. Emergency response plans and physical simulation drills assist in validating current emergency plans and as additional insight for plan revisions. New guidelines have been developed by the Homeland Security Department regarding

funding for disaster relief and are based on local emergency agencies having plans in place for terrorism-related incidents (Brady, 2003).

Initial response time as presented by Brady (2003) is categorized into four sections for emergency planners: 1) communication delays from incident discovery to incident reporting 2) time from dispatch to first arrival of emergency resources 3) time it takes for the assessment 4) time to return to respective stations (normalcy). Community involvement takes place at two of the four time intervals: incident discovery and post assessment of incident. Typically, public safety and emergency resources are dispatched first and supplemental resources after an assessment of the incident is conducted. Community responders are at times present at incident discovery. An additional issue expressed by Brady (2003) is the behavioral implications that accompany emergency management, such as remaining calm and following out action plans where control of people affected and time delays in response activities.

2.4.3 Individual Behavior and Crisis Response

How an individual responds (behaves) in a crisis often depends on the initial information conveyed about the incident. Public health systems, just like businesses and organizations, first need to be able to recognize the crisis and then be able to respond quickly in order to leverage the opportunities and minimize the threats (Dove, 2001). Moreover, risk communication messages from government agencies must be consistent, clear and honest, and risks should not be understated (Hooker and Rogers, 2005). Training, timing and coordination issues in relation to communication are also needed amongst public health officials (IOM, 2003). Training is identified as critical for many complex problems and for preparation in an environment of uncertainty. Unexpected

situations that require a group to be created could present a need for training opportunities (Turoff et al. 2004). Turoff et al. (2004) suggests the importance of allowing the users to self-organize the information by their actions.

Individual usage behavior is a cornerstone to crisis response readiness. In a crisis, an individual cannot learn to use a new system or find an alternate way of responding without a time relay. Response in a crisis relies on the individual training and automatic responses placing emphasis on individual usage and ongoing practice. Mobile technologies increased availability and capacity make individual usage and ongoing practice possible for field workers, such as those from public health or non-profit organizations.

2.5 Literature Review Summary

This literature review aims to integrate three primary bodies of literature: 1) communication theory, 2) information richness theory, and 3) Theory of Planned Behavior (Figure 2.1) to focus on the communication exchange between two or more local community crisis responders who are using mobile ICT devices. These three theories are seen as interrelated for interoperable communication for the crisis management in the emergency domain. The Writing Assessment Model of Ruth and Murphy (1988) was selected for the study because it's based on an entire writing assessment episode. The "interactive relationships of the participants (community responder and researcher), processes (SMS text-message task prompts and task responses), and texts (crisis scenario episode details), which comprise the total event (crisis scenario episode)" are all essential for crisis response performance assessment.

CHAPTER 3

RESEARCH FRAMEWORK AND HYPOTHESES

The need to leverage mobile technologies in a crisis for clear and concise message exchange is presented in Chapter 2. The need to adapt a message for mobile device communication exchange is also discussed. Real-world events associated with individual human wellbeing, loss of human life, and mass-casualty disasters, coupled with today's ubiquitous mobile technology, drive the research questions for the proposed study.

Training availability and measures on current text-message communication as a writing discourse for mobile devices, considering message adaptiveness and individual behavior in a crisis situation, have not been studied at the time of this literature review. Moreover, limited research exists in information systems that compare perceived task performance measures to actual performance measures.

The research questions and Crisis Response Training Framework posit to support the discourse study of this research. Section 3.1 presents the research questions for the current study. Section 3.2 presents the training framework and the underlying model that supports the framework. Each variable is also discussed in detail. Section 3.3 discusses the research hypotheses. Section 3.4 provides a summary of the research direction.

3.1 Research Questions

In a crisis, the responder needs two-way communication with others. The ability to request resource needs (assert/ask for), describe incident details (warn/advise), and exchange status updates (thank/question) during a crisis are three essential, two-way

communication needs that align with the Illocutionary Act Essential Rules of Speech Act Theory (Table 2.4). During the communication process, each communication exchange between the sender and receiver can impact subsequent actions. The precision of language can make a message clear and explicit during a communication exchange.

In this study, the framework and model provide the underlying architecture for the web-based application developed to answer the research questions. The web-based application delivers a crisis scenario and asks the study participant to assume the role of a community responder. The crisis scenario introduces a series of episodes (audio/video multimedia recordings) and tasks, which prompt the study participant to respond with a simulated SMS text-message. The web-based application is integrated from start to finish of the training and includes both pre-training and post-training tasks and survey questions. A training module is introduced through audio/video multimedia recordings before each post-training task. Actual task performance measures and task response content are collected both before and after training. Pre-training and post-training perceptions (survey) are also collected and provide insight for communication readiness. The main research question for this study may be stated as follows:

> Can SMS text-message communication protocol training, increase communication readiness of an individual who may respond in a crisis using a mobile device?

Additional research questions (Table 3.1) for this study and the direction of the training experiment are discussed below before introducing the Crisis Response Training Framework, supporting model and hypotheses. The Ruth and Murphy (1988) and Odell (1979) literature have provided a foundation for some of the research questions.

Training Session Type (Section 3.2.1) is the independent variable for the study and compares photo with audio to text with audio to introduce each episode. The importance of the Training Session Type is to assess the effect the episode presentation has on the study participant's performance, learning, and communication readiness. Study participant communication preparedness is also a focus of the research questions.

Table 3.1 Research Questions

Research Questions	
Number	**Question**
RQ1	How does Training Session Type affect responder's perception of Task Performance of speech act with plain language training?
RQ2	How does Training Session Type affect responder's Task Performance?
RQ3	Do responder's with higher ICT Usage Behavior perceive higher Task Performance, after plain language training, for photo with audio than text with audio Training Session Type?
RQ4	Do responder's with stronger Writing Behavior perceive higher Task Performance, after plain language training, for photo with audio than text with audio Training Session Type?
RQ5	Do responder's with higher ICT Usage Behavior perceive higher Intention to Use SMS Text-Messaging, after plain language training, for photo with audio than text with audio Training Session Type?
RQ6	Do responder's with higher Perceived Task Performance perceive higher Perceived SMS Text-Message Response Readiness, after plain language training, for photo with audio than text with audio Training Session Type?
RQ7	Do responder's with higher ICT Usage Behavior perceive higher Motivation, Enjoyment and Learning, after plain language training, for photo with audio than text with audio Training Session Type?

3.2 Research Framework

The Crisis Response Training Framework (Figure 3.1) introduces an instructional strategy to measure study participant task performance of communication exchange protocols before and after ICT communication training is introduced. The study at hand places emphasis on SMS text-message communication protocols applicable to low-cost

mobile devices. The framework and model can extend in both depth and breadth over time as new technologies and agent-based interfaces become available. For this study the use of speech acts and written SMS text-message responses are the basis for the task response strategy. The message adaptiveness strategy targets the message content (i.e., SMS text-messaging) coupled with the message limitations of the device used (i.e., cell phone, PDA, or blackberry, computer).

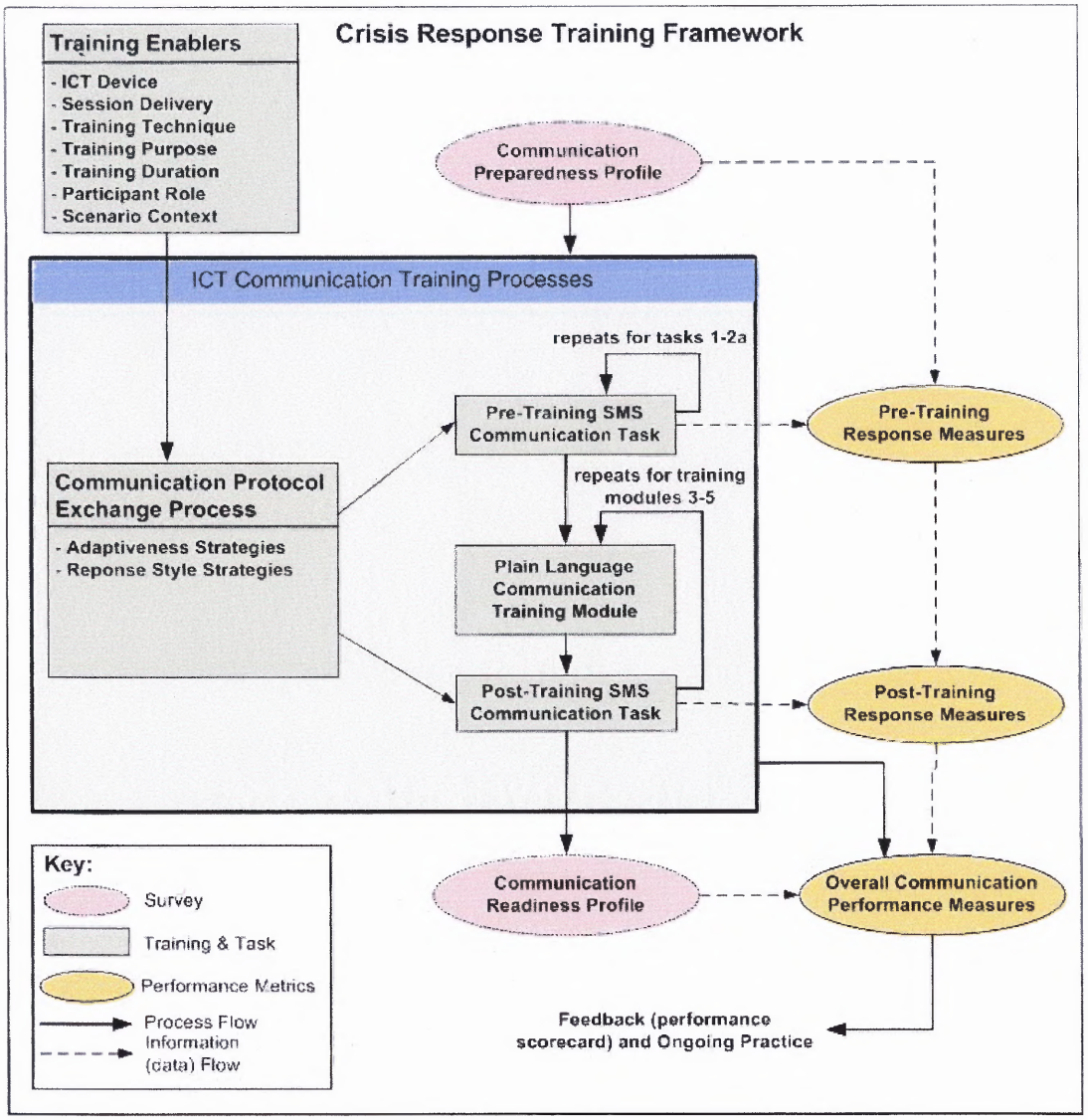


Figure 3.1 Crisis response training framework.
Note: See Appendix E for a larger copy of the framework

Training enablers (Table 3.2) are defined for the training framework (Figure 3.1) and establish the context for task performance assessment. A Communication Preparedness Profile (ICT usage, behavior, SMS attitude) is formed from the pre-training survey before the ICT Communication Training Process begins. The pre-training measures are used to establish a communication preparedness baseline measure. The communication protocol exchange process drives the training strategy and is comprised of message adaptiveness and task responses. Message adaptiveness plays an important role in the ICT communication process when the ICT device of the sender varies from the ICT device of the message receiver (recipient). Te'eni (2001) mentions that adaptation to the circumstances is a consideration (Section 2.2.1.3). Moreover, the ICT device or even the communication exchange architecture (i.e., 160 character SMS text-message limitation causing a message to split into two) could impose a limitation on the communicator/user (study participant). Message creators aware of this limitation can adapt the message to benefit not only the exchange process but message recipient.

Table 3.2 Training Enablers

Training Enablers	
Enabler	**Study Context**
ICT Device	Simulated mobile device (cell phone, PDA, blackberry).
Session Delivery	Training Session Type (Photo with Audio or Text with Audio).
Training Technique	Web-based application.
Training Purpose	To increase communication readiness for crisis response.
Training Duration	One 45 minute session.
Participant Role	Local community responder (primarily volunteers).
Scenario Context	Flooding alert in New Jersey.

This study leverages the Ruth and Murphy Writing Assessment Model to invoke each of the six task responses. The context for the task prompt (Speech Act Essential Rule) development is defined by the training enablers. The pre-training and post-training tasks use parallel communication protocols for message adaptiveness (simulated SMS text-message) and also parallel task prompts (Speech Act Essential Rule) that invoke the task response, allowing for post-training task performance assessment in addition to perceptions on task response strategies. Three short training modules are introduced that associate the use of plain language to a Speech Act Essential Rule. The objective of each module is to provide training content that should improve task performance (i.e. task response) with each task prompt introduced.

The framework is designed to handle a variable number of pre-training and post-training tasks and the training modules can also be adapted for alternate training content. For this study, the first three task prompts of the crisis scenario obtain pre-training task performance measures. The second three task prompts (post-training) that parallel the pre-training task prompts are introduced after each training module (Figure 4.1). Task response measures for both pre-training and post-training task prompts are captured for each study participant. Overall task performance measures and a post-training communication readiness profile (survey) are produced from the study analysis. The post-training communication readiness profile includes dimensions related to ICT usage, perceived performance, and learning perceptions. The use of parallel task prompts for overall performance assessment is a critical element for the framework presented.

3.2.1 SMS Text-Message Communication Training Model

The SMS Text-Message Communication Training Model is designed to support The Crisis Response Training Framework. The model uses an Input→Process→Outcome relational design to ultimately capture overall responder (study participant) performance (Figure 3.2). The between subjects independent variable is Training Session Type (photo with audio or text with audio). The within subjects independent variable is Task Prompt Type. For this study, the Task Prompt Type is the crisis scenario episode and associated Speech Act Essential Rule. The SMS communication tasks (Table 3.3) for all episodes use task prompts based on the Ruth and Murphy Writing Assessment Model (Figure 2.4). The task prompts are proposed to influence task performance.

The moderating variables, ICT Usage Behavior Dimensions, ICT Usage Dimensions, SMS Text-Message Attitudes, of this research are designed to take a closer look an individual's demographic dimensions (Pre-training Communication Preparedness Profile) before beginning the ICT communication protocol (SMS text-message) training.

The process variables (intervening) focus on the message adaptiveness (perceived) and the response style (actual). In this study the message (task response) is being adapted for SMS text-message communication protocols. To maximize the message content, the plain language training modules are proposed to improve the message and also assist with the 160 character per text-message limitation of each message exchange.

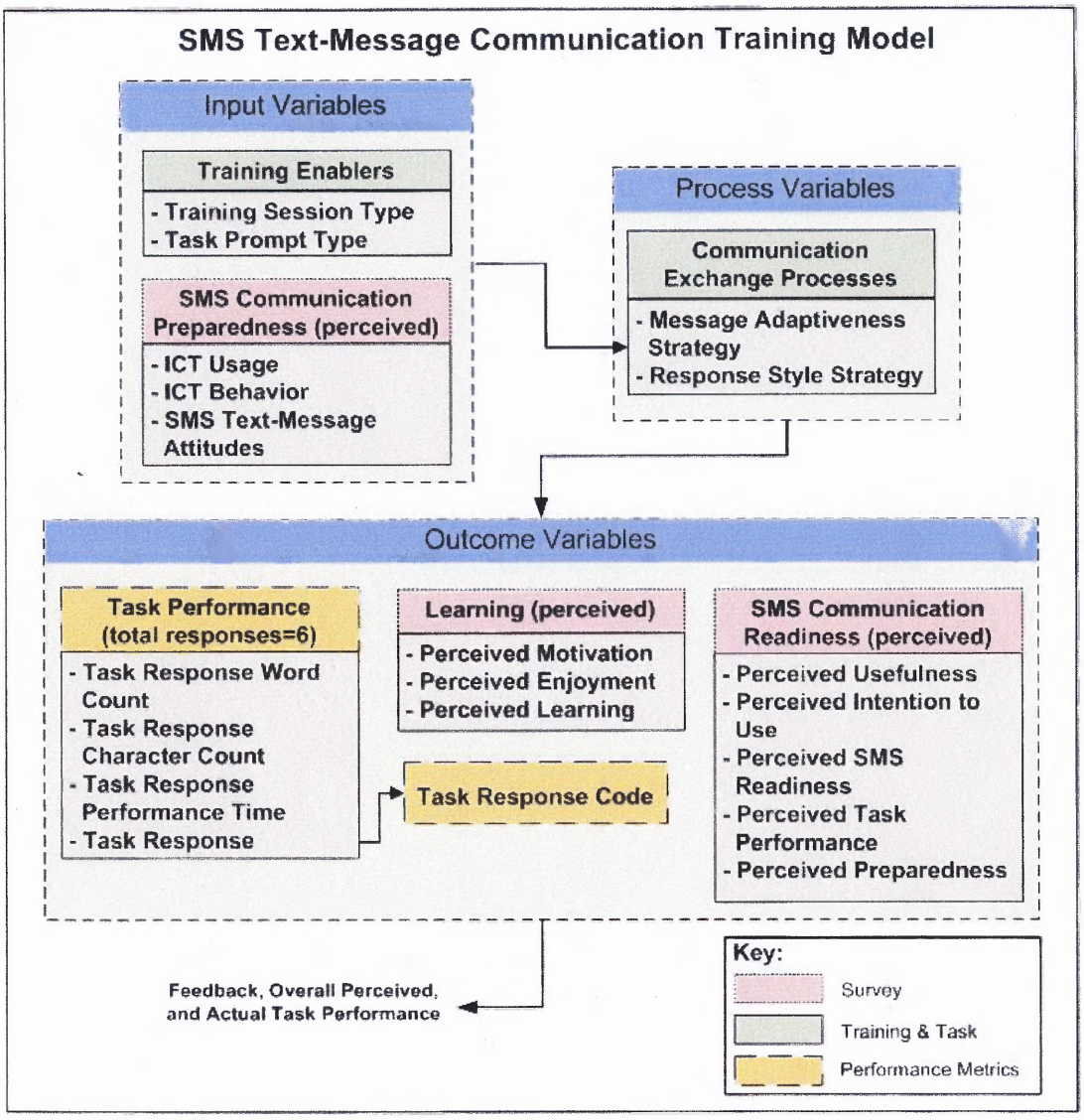


Figure 3.2 SMS text-message communication training model.
Note: See Appendix E for a larger copy of the training model

The outcome variables include both actual performance metrics and dependent variables. The performance metrics include: Task Response (content), Task Response Word Count, Task Response Character Count, and Task Response Performance Time. The dependent variable that measures actual performance measures is Task Response Code (coded). The dependent variables that measure perceptions include: Perceived

Usefulness of SMS Text-Messaging, Perceived Intention to Use SMS Text-Messaging, Perceived SMS Text-Message Readiness, Perceived SMS Text-Message Preparedness, Perceived Task Performance, Perceived Motivation, Perceived Enjoyment and Perceived Learning. These measures are captured for both Training Session Types (photo with audio and text with audio). The outcome measures from the post-training survey aim to measure perceptions of the task responses and readiness. Learning measures are also captured because the web-based application offers training and is part of the assessment process. Answering the research questions of this study (Section 3.1) entailed an empirically-oriented mix of qualitative and quantitative research that solicits both user perceptions and actual observations.

3.2.2 Input Variables

The input variables for the SMS Text-Message Communication Training Model include both independent and moderating variables for an input→process→outcome relational design to ultimately capture overall responder (study participant) performance. The independent variables for the study at hand present the task (Task Prompt Type) and technology (Training Session Type) for which the overall participant performance is measured.

3.2.2.1 Independent Variables. The Training Session Type (between subjects) is introduced in the research framework (Figure 3.1). Training Session Type (between subjects) dimensions distinguish between:

1. Photo with audio
2. Text with audio.

Training Session Type is manipulated through the multimedia video clip of each episode for the crisis scenario. The photo with audio is manipulated in the web-based application for each episode for the crisis scenario. A series of photos with audio (voiceover narrative) descriptions for the task context are displayed before each task prompt. A series of written text with audio (voiceover narrative) descriptions for the task context are displayed before each task prompt. A part of the crisis response scenario is introduced for each task and is the basis for each SMS Text-Message Response. The response process generates the task response performance metrics. Integrated in the crisis scenario are pre-training, and post-training measures (actual and perceived) for both Training Session Types. The web-based training application introduces the crisis scenario, thereafter prompts the study participant to complete a pre-training survey. Following the pre-training survey, two episodes with three pre-training tasks are introduced (differentiated by the Task Prompt Types independent variables). Three plain language training modules (same for both Training Session Types) are also introduced and paired with an associated post-training episode and task for each module. Upon completion of all tasks and training, the study participant is prompted to complete a post-training survey.

Each episode introduces a task and the context for the crisis that is taking place (i.e., encountering an unexpected detour). The task context supports the task prompt (instruction) that invokes a response from the study participant. The context for the task and the task prompt are used to invoke the participants SMS text-message response.

The Task Prompt Type supports the within subjects independent variable. Three combinations of Task Prompt Types were introduced; each in a separate module. Each combination (Table 3.3) was introduced for pre-training and then post training tasks.

After each training module, the crisis scenario context and the task prompt are introduced to the study participant to obtain the task response, an outcome variable (Section 3.2.4).

Table 3.3 Speech Act to Task Assignment Mapping

Illocutionary Speech Acts – Task Assignments		
Illocutionary Acts	**Essential Rule**	**Task Assigned**
Asking or answering a question	*Performance of an act in saying something where a certain effect is achieved*	
Assert (confirm)	Counts as an undertaking to the effect that ***p*** represents an actual state of affairs.	Pre-Train Task 1 Post-Train Task 3
Warn	Counts as an undertaking to the effect that E is not in H's best interest.	
Advise	Counts as an undertaking to the effect that A is not in H's best interest.	Pre-Train Task 2 Post-Train Task 4
Question (ask for)	Counts as an attempt to elicit this information from H.	
Thank	Counts as an expression of gratitude.	Pre-Train Task 2b Post-Train Task 5
Request	Counts as an attempt to get H to do A.	

3.2.2.2 Moderating Variables. The moderating variables of the study focus on the study participant's Communication Profile. The profile of the study participant is viewed by looking at ICT Usage, ICT Usage Behavior, and Attitudes toward text-messaging for crisis response. Writing behaviors are also an important part of the study participant's Communication Profile.

Each moderating variable is discussed, beginning with ICT Usage which is defined as the "utilization of information technology (IT) by individuals, groups, or organization" and affects performance (Straub, Limayem, Karhanna-Evaristo, 1995). System Usage, is a core variable in information systems research (Straub, et al. 1995). ICT Usage was adapted from previous research is measured with multiple-act indicators (i.e., different acts indicating the same behavior) rather than a single-act indicator (Igbaria and Tan, 1997; Igbaria, Zinatelli, Cragg, and Cavaya 1997; Fishbien and Ajzen, 1975). Indicator's used for ICT Usage focused on Internet and cell phone use related to

the types of tasks performed similar in output (i.e., email, map, messaging). A total of 14 task types were listed for the Internet and 10 task types were listed for cell phone use (Appendix D).

ICT Usage Behavior is defined as "an individual's positive or negative feeling about performing a targeted behavior." (Venkatesh, Morris, Davis, Davis, 2003). Targeted behavior includes tasks performed on the Internet (browser functions, email, planning), or cell-phone (text-messaging, phone directory) and Writing Behavior/apprehension. The targeted behavior types focus on ICT for communication exchange or for crisis response related functions.

SMS Text-Message Attitudes towards SMS text-messaging for crisis response dimensions are measured twice for each participant. The constructs were adapted from Bhattacherjee and Premkumar (2001) and Davis (1989). The first measures are taken at the start of the training and before the crisis scenario is introduced. The second measures (post-training) are taken at the end of the training and after all training and tasks have been introduced.

Attitudes and beliefs are reflected in prior studies of IT usage and the technology acceptance model (TAM). Bhattacherjee and Premkumar (2001) and Davis et al. (1989) note that "any change in beliefs or attitudes will likely have a corresponding impact on and may even reverse user continuance intention and behavior from initial acceptance to later discontinuance." Taylor and Todd (1995) also leverage Davis et al. (1989) constructs for attitudes and beliefs in addition to the Theory of Reasoned Action research (Ajzen and Fishbein, 1980; Ajzen, 1985). Pre-usage beliefs and attitudes in general are

based on second-hand information, such as mass media channels, vendor claims, and industry reports (Bhattacherjee and Premkumar, 2001).

Obtaining measures at both the pre-test and post-test phases allows for baseline measures and changes, resulting from the training. Bhattacherjee and Premkumar (2001) study examined the pre-usage to usage stage and change overtime. Usefulness, attitudes, and beliefs towards SMS text-messaging are important aspects for ICT individual readiness.

3.2.3 Process Variables

The process variables for the SMS Text-Message Communication Model include Message Adaptiveness Strategies (perceived) and Response Style Strategies (actual). Message Adaptiveness Strategies are the processes the study participants adopt when responding to a task prompt. The strategies are where the study participant goes from thought (critical thinking) to the written word. This study focused on: response style (rereading the inbound message content (task prompt) and the use of plain language. These variables are predicted to influence performance outcomes.

Response style is an intervening variable and focuses on the message response strategies used to construct a task response. Response style is measured by perceptions (survey measures). Response Style Strategies look at the adoption of plain language practices presented in the actual task response. The content of the study participant's response is captured in a MySQL database. The content should use the active voice, use clear and concise words with no acronyms or abbreviations, reduce wordiness and redundancy, use a simple sentence structure, and eliminate greetings and closings. The task response of the study participant must meet the 160 character SMS text-message

limitation causing the study participant to adjust their response to fit within the confines of the 160 character limitation. Combined with the 160 character limitation, the message response must address the task response with syntactic language rather than writing fluency.

3.2.4 Outcome Variables

The outcome variables include performance metrics (actual) and dependent variables (actual and perceived). The performance metrics from actual performance include: Task Response (content), Task Response Word Count, Task Response Character Count, and Task Response Performance Time. The dependent variable associated with the performance metrics is Task Response Code (coded). The dependent variables that measure perceptions include: Perceived Usefulness of SMS Text-Messaging, Perceived Intention to Use SMS Text-Messaging, Perceived SMS Text-Message Readiness, Perceived Motivation, Perceived Enjoyment, Perceived Learning, and Perceived Task Performance. These measures are captured for both Training Session Types (photo with audio and text with audio). The outcome measures from the post-training research aim to measure perceptions on the task responses and readiness. Learning measures are also captured because the web-based application offers training and is part of the assessment process. Moreover, Perceived Learning and its associated model (Gomez, Wu, Passerini, and Bieber, 2006) are a precursor to this research (Appendix E).

Task Response (content) is captured for each of the six task prompts. The content for each response is stored individually and contains a maximum of 160 characters. For each Task Response, Word Count is calculated and equals the number of words for each task response. Character Count is calculated and equals the number of characters (length)

for each task response. Performance Time is calculated from the time the task prompt is introduced (photo with audio or text with audio) to the time the "send" message (response) is invoked.

Perceived Usefulness of SMS text-messaging for crisis response as one communication option is the extended from a "users believe that system usage will enhance their job performance (Bhattacherjee and Premkumar, 2001; Davis, 1989)." In this study system usage refers to the use of SMS text-messaging for crisis response (job performance).

Perceived Intention to Use SMS Text-Messaging is a post-training measure (survey), and also affected by perceived usefulness (Bhattacherjee and Premkumar, 2001; Davis, 1989). This study looks at the study participant's Perceived Intention to Use Text-Messaging after training.

Perceived SMS Text-Message Post-Training Preparedness (Attitudes, Beliefs) is the result of the second measure taken at the end of the training and after all training and tasks have been introduced. The questions parallel the SMS Text-Message Attitudes of the pre-training survey questions. The constructs were adapted from Bhattacherjee and Premkumar (2001) and Davis (1989).

Obtaining measures at both the pre-training and post-training phases allows for baseline measures and changes resulting from the training. Usefulness, attitudes, and beliefs towards SMS text-messaging are important aspects for ICT individual readiness.

Perceived Readiness of SMS Text-Messaging measures the responder's perception of readiness to utilize SMS text-messaging at the end of the training and after all training and tasks have been introduced.

Perceived Task Performance is the result of the individual's Perceived Task Performance toward the SMS text-message responses (i.e., three repeated measures taken for each episode with tasks where speech act with plain language training was introduced).

Perceived Motivation and Enjoyment is the result of both the episodes and tasks introduced in addition to the Speech Act Type (photo with audio or text with audio) introduced to the responder. The Perceived Motivation questions were adapted from previous research where there is a distinction between intrinsic and extrinsic motivation (Appendix F for additional information). Intrinsic motivation is the focus for this research and aims to capture students' perceptions of their motivation to learn (Gomez et al. 2006). The Perceived Enjoyment questions were also adapted from previous research (Gomez et al. 2006; Davis, 1989). The focus is on the learning experience (SMS text-message training) and if the study participant perceives the experience to be pleasant and satisfactory to the learners.

Perceived Learning of SMS Text-Messaging measures the responder's perception of learning to utilize SMS text-messaging at the end of the training and after all training and tasks have been introduced. The perceived learning construct is adapted from previous research (Gomez et al. 2006) The learning focuses on the individual perceptions related to personal factors and may be impacted by motivation and enjoyment.

The Training Session Type predicts to affect learning and intention to use, while providing insight on the presentation of the training (episode and training modules). Task Performance, the dependent variable captures actual word count, Character Count, performance time, and the response content for each associated task prompt. Perceived

Intention to Use, perceived SMS Readiness, Perceived Task Performance each contribute to SMS Communication Readiness.

Overall Communication Performance (Figure 3.1) is the result of task response content coded then compared with pre-training and post-training task performance improvement. Overall communication performance measures are obtained bringing together both actual and perceived measures for both performance feedback and for ongoing practice. Overall communication performance improvement is also compared for paired tasks (parallel pre-training and post-training task prompts).

3.3 Hypotheses for Research Questions

The main hypotheses (Table 3.4) for this research are listed below and are associated with a research question listed in Section 3.1.

Table 3.4 Research Questions and Hypotheses

Research Questions and Hypotheses	
RQ1	How does Training Session Type affect responder's perception of Task Performance of speech act with plain language training?
H1	Responders completing a scenario employing photo with audio SMS text-message training will have increased Perceived Task Performance after plain language training. That is, those responders receiving this scenario will have a greater sense of Perceived Task Performance than those responders completing a text with audio Training Session Type for plain language training.
RQ2	How does Training Session Type affect responder's Task Performance?
H2	Responders completing a scenario employing photo with audio SMS text-message training will have decreased SMS text-message content uncertainty than responders taking the text with audio SMS text-message training. That is, those responders receiving this scenario will have a greater sense of content certainty than those responders completing a text with audio Training Session Type for plain language training.

Table 3.4 Research Questions and Hypotheses (continued)

Research Questions and Hypotheses	
RQ3	Do responder's with higher ICT Usage Behavior perceive higher Task Performance, after plain language training, for photo with audio than text with audio Training Session Type?
H3a	Responders completing a scenario employing photo with audio SMS text-message training and demonstrating higher ICT Desktop Usage Behavior will have increased Perceived Task Performance than those responders with lower ICT Desktop Usage Behavior.
H3b	Responders completing a scenario employing text with audio SMS text-message training and demonstrating higher ICT Desktop Usage Behavior will have increased Perceived Task Performance than those responders with lower ICT Desktop Usage Behavior.
H4a:	Responders taking photo with audio SMS text-message training and have higher ICT SMS Usage Behavior will have increased Perceived Task Performance than responders taking the text with audio SMS text-message training with lower ICT SMS Usage Behavior.
H4b:	Responders taking text with audio SMS text-message training and have higher ICT SMS Usage Behavior will have increased Perceived Task Performance than responders taking the text with audio SMS text-message training with lower ICT SMS Usage Behavior.
RQ4	Do responder's with stronger Writing Behavior perceive higher Task Performance, after plain language training, for photo with audio than text with audio Training Session Type?
H5	Responders taking photo with audio SMS text-message training and have improved Writing Behavior will have increased Perceived Task Performance than responders taking the text with audio SMS text-message training with increased Writing Behavior.
H6	Responders taking photo with audio SMS text-message training and have decreased writing apprehension will have increased Perceived Task Performance than responders taking the text with audio SMS text-message training with decreased Writing Apprehension.
H7	Responders taking photo with audio SMS text-message training and have increased Writing Enjoyment will have increased Perceived Task Performance than responders taking the text with audio SMS text-message training with increased Writing Enjoyment.

Table 3.4 Research Questions and Hypotheses (continued)

Research Questions and Hypotheses	
RQ5	Do responder's with higher ICT Usage Behavior perceive higher Intention to Use SMS Text-Messaging, after plain language training, for photo with audio than text with audio Training Session Type?
H8	Higher ICT Desktop Usage Behavior will increase responder's Perceived Intention to Use from SMS text-messaging training in preparation for crisis response once SMS text-message training has been completed.
H9	Higher ICT Mobile Device Usage Behavior will increase responders' Perceived Intention to Use SMS text-messaging in preparation for crisis response.
RQ6	Do responder's with higher Perceived Task Performance perceive higher Perceived SMS Text-Message Response Readiness, after plain language training, for photo with audio than text with audio Training Session Type?
H10a	Responders completing a scenario employing photo with audio SMS text-message training and increased Perceived Task Performance will have increased responder perceived readiness than responders with decreased task performance. That is, those responders receiving this scenario who have increased task performance will have a greater sense of perceived readiness than those responders completing plain language training with decreased task performance.
H10b:	Responders completing a scenario employing text with audio SMS text-message training and increased Perceived Task Performance will have increased responder perceived readiness than responders with decreased task performance. That is, those responders receiving this scenario who have increased task performance will have a greater sense of perceived readiness than those responders completing plain language training with decreased task performance .
H11a:	Responders completing a scenario employing photo with audio SMS text-message training and increased Perceived Usefulness will have increased responder perceived readiness than responders with decreased task performance. That is, those responders receiving this scenario who have increased task performance will have a greater sense of perceived readiness than those responders completing plain language training with decreased Perceived Usefulness.
H11b	Responders completing a scenario employing text with audio SMS text-message training and increased Perceived Usefulness will have increased responder perceived readiness than responders with decreased task performance. That is, those responders receiving this scenario who have increased task performance will have a greater sense of perceived readiness than those responders completing plain language training with decreased Perceived Usefulness.

Table 3.4 Research Questions and Hypotheses (continued)

Research Questions and Hypotheses	
RQ7	Do responder's with higher ICT Usage Behavior perceive higher Motivation, Enjoyment and Learning, after plain language training, for photo with audio than text with audio Training Session Type?
H12a	Responders completing a scenario employing photo with audio SMS text-message training and increased perceived ICT Desktop Usage Behavior will have increased Perceived Motivation than responders with decreased ICT Desktop Usage Behavior. That is, those responders receiving this scenario who have increased ICT Desktop Usage Behavior will have a greater sense of Perceived Motivation than those responders completing plain language training with decreased ICT Desktop Usage Behavior.
H12b	Responders completing a scenario employing text with audio SMS text-message training and increased perceived ICT Desktop Usage Behavior will have increased Perceived Enjoyment than responders with decreased ICT Desktop Usage Behavior. That is, those responders receiving this scenario who have increased ICT Desktop Usage Behavior will have a greater sense of Perceived Enjoyment than those responders completing plain language training with decreased ICT Desktop Usage Behavior.
H13a	Responders completing a scenario employing photo with audio SMS text-message training and increased perceived ICT SMS Usage Behavior will have increased Perceived Motivation than responders with decreased ICT Desktop Usage Behavior. That is, those responders receiving this scenario who have increased ICT SMS Usage Behavior will have a greater sense of Perceived Motivation than those responders completing plain language training with decreased ICT SMS Usage Behavior.
H13b	Responders completing a scenario employing text with audio SMS text-message training and increased perceived ICT SMS Usage Behavior will have increased Perceived Enjoyment than responders with decreased ICT Desktop Usage Behavior. That is, those responders receiving this scenario who have increased ICT SMS Usage Behavior will have a greater sense of Perceived Enjoyment than those responders completing plain language training with decreased ICT SMS Usage Behavior.
H14a	Responders completing a scenario employing photo with audio SMS text-message training and increased Perceived Motivation will have increased Perceived Learning than responders with decreased Perceived Motivation. That is, those responders receiving this scenario who have increased Perceived Motivation will have a greater sense of Perceived Learning than those responders completing plain language training with decreased Perceived Motivation.

Table 3.4 Research Questions and Hypotheses (continued)

Research Questions and Hypotheses	
RQ7	Do responder's with higher ICT Usage Behavior perceive higher Motivation, Enjoyment and Learning, after plain language training, for photo with audio than text with audio Training Session Type? (continued)
H15a	Responders completing a scenario employing photo with audio SMS text-message training and increased Perceived Enjoyment will have increased Perceived Learning than responders with decreased Perceived Enjoyment. That is, those responders receiving this scenario who have increased Perceived Enjoyment will have a greater sense of Perceived Learning than those responders completing plain language training with decreased Perceived Enjoyment.
H15b	Responders completing a scenario employing text with audio SMS text-message training and increased Perceived Enjoyment will have increased Perceived Learning than responders with decreased Perceived Enjoyment. That is, those responders receiving this scenario who have increased Perceived Enjoyment will have a greater sense of Perceived Learning than those responders completing plain language training with decreased Perceived Enjoyment.

3.4 Research Framework Summary

The Crisis Response Training Framework including the underlying SMS Text-Message Communication Training model is designed to support the needs of this research. The framework offers a vehicle for training and assessment based on task prompts. The framework is designed from theoretical foundations that aim to support the writing assessment process and the ICT writing discourse. The research questions and hypotheses are answered through study participant participation of the web-based application.

CHAPTER 4

METHODOLOGIES

The methodology for this research is a mixed-methods quasi-experimental design with a combined between-subjects and repeated measures within subjects design where both actual performance measures and perceptions are captured. The web-based training application includes data collection using Training Session Type, as the independent variable, in addition to pre-training and post-training survey measures resulting in a combined between subjects (photo with audio and text with audio training methods) and within subjects design (pre-training measures, task performance measures, post-training measures). Study participants are assigned randomly to the Training Session Type.

The execution of the study takes place on a stationary computer (desktop or laptop) with a high speed Internet connection to access the web-based application. The individual participant (i.e., responder) interacts with a simulated command and control coordinator, while receiving SMS text-messaging and speech act training. The actual task performance measures are collected through a MySQL database and are mapped to the Ruth and Murphy Writing Assessment Model (1988). The task creator, task taker, and task rater as represented in the Ruth and Murphy Writing Assessment Model are all aligned with each task prompt (Appendix A). The results identified below are coded as indicated.

Triangulation is used for this study as follows:

- Performance measures (actual, obtained through a MySQL database)
- Survey measures (perceived, through surveys).

4.1 Field Experiment Conducted

The field experiment is introduced through a web-based application developed for this research. The SMS text-message for crisis response training allows the study participant to access the training from their own home or work computer with a high-speed Internet connection. To control and randomize administration of the independent variable Training Session Type (photo with audio vs text with audio), a login ID was administered via email to the study participant. Participation in the photo with audio or text with audio version of the application was randomly assigned as participants requested a login id.

In-person administration of the study was not needed; all directions were provided at the start of the training application. The design of the web-based application included the IRB human subjects consent to participate form, instructions for participation, and then automatic system navigation through each task until reaching the "thank you for participating" splash screen.

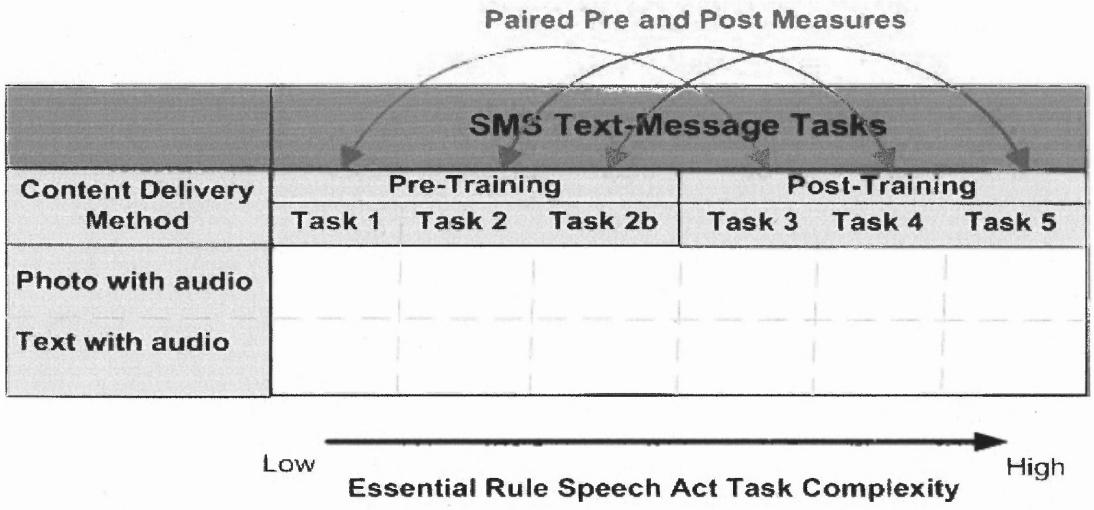


Figure 4.1 Research design.

The web-based training application allows for survey data that captures demographics and participant perceptions, and also actual task response data with performance metrics.

Table 4.1. Data Collection Methods

Variable Type	Variable	Data Collection Method	Appendix
Independent	Stimulus (Training Session Type: photo with audio vs. text with audio)	Randomly assigned to study participants	D
	Training Sequence Type: three levels	Assigned in order of task performance (pre-training and post-training paired	D
Moderator	ICT Desktop Usage Behavior	Pre-training survey	D
	ICT mobile device usage behavior		D
	Writing Behavior	Pre-training survey	D
	Writing ability	Pre-training survey	D
	Writing Enjoyment	Pre-training survey	D
Intervening	Task Response Level	Coded response leve 1-4	D
	Attitudes, beliefs	Interim survey (tasks 3-5)	D
Dependent	Response code validity (assigned based on task response (repeats 6 times))	Coded (scale 1-4) from task response	D
	Perceived Intention to Use	Post-training survey	D
	Perceived Learning	Post-training survey	D
	Perceived SMS text-message response readiness	Post-training survey	D
	Perceived Task Performance	Post training survey	D

4.2 Subjects

The focus of this research is on the local community responder who aids in a crisis that has extended beyond the 911 or 112 emergencies. Local community responders at present do not have a clearly established role in crisis response. Responders may also have dual roles as recruitment has demonstrated. Moreover, this research relies on participation from practitioners, academics, students, first responders, healthcare practitioners and some citizens in communities as a means to establish a baseline for comparison. This study reflects a total of 50 participants (Table 4.2) covering urban, suburban, rural areas

in six states (NJ, NY, MD, PA, UT, CT, MA) and two countries (United States and Canada).

Table 4.2. Study Participants (N=50)

Participant Type	Organization Type	Approximate Geographic Location
Emergency Practitioner (n=)	Public Safety and Transportation	New York, New Jersey
Healthcare Practitioners	Public Health Clinic Physician Psychologist Nurse Practitioner	New York New Jersey Massachusetts Canada
Academics	University	Pennsylvania, New Jersey, Utah, Canada
Students	University	New Jersey
First Responders	Local community and private sector	Maryland, Massachusetts, Connecticut, New York, New Jersey, Canada
CERT volunteers	Community organizations and private sector	Maryland, Massachusetts, Connecticut
Untrained community volunteers	Community organizations and private sector	Maryland, Massachusetts, Connecticut, New York, New Jersey, Canada

An initial list of participants was planned. This list of participants was then circulated by the first group of participants which expanded the geographic location. The criteria for selection were carefully noted, yet the role as self-recorded by each individual in the survey instruments differed from the role noted during the recruitment process. This is one of the initial finding (discussed later) of this research that community responders need a more established role. Other responders need to understand they do play an important role in crisis response.

The two versions of the training application (photo with audio and text with audio) were randomly assigned as participants requested a login id. This method of randomization presented an uneven amount of participants between the two methods. The assignment of a login id did not guarantee participation leaving the participation level for

each training method varying. In some cases, a location-based administrator or practitioner provided a list of participants in which case the list was equally divided. In other cases, as individuals requested an id, the list was varied between photo with audio and text with audio. Because the request id process was via email, there was no idThe participation also varied by participant type and demonstrated a difference between what the recruitment person and actual categorization of the individual participant. To account for the noticeable imbalance of early participants, more login ids were assigned in order for subsequent participants to better balance participation. This stratified sampling method was introduced once total participation reached 40 participants.

Over 100 emails with login ids were circulated with a total participation count of 50. The web-based application remains open for future research so participants still have the opportunity to participate. Requests for a login id continue to be received.

4.3 Web-Based Training Experiment

The web-based application begins with a unique login id assigned randomly to interested study participants. Upon login and consent to participate, the participant is directed to either the "photo with audio" or "text with audio" application overview. An overview of plain language background/initiatives are introduced, before the participant is prompted to respond to the pre-training survey.

The proposed training scenario inclusive of Training Session Type introduces one continuous scenario to the study participant. The role of the study participant is be that of a responder (Action Team Volunteer) and is anyone who is taking action from an alert notification for assistance. The training process (Figure 4.2) begins with a pre-training

baseline measure, followed by three communication episode repeated measures for each training task, and finally an end-of-training survey. This study proposed 40 subjects with a total of 6 tasks (5 episodes) for a total of 240 communication exchange episodes. A total of 50 participants for this study were used with 49 complete sets of data.

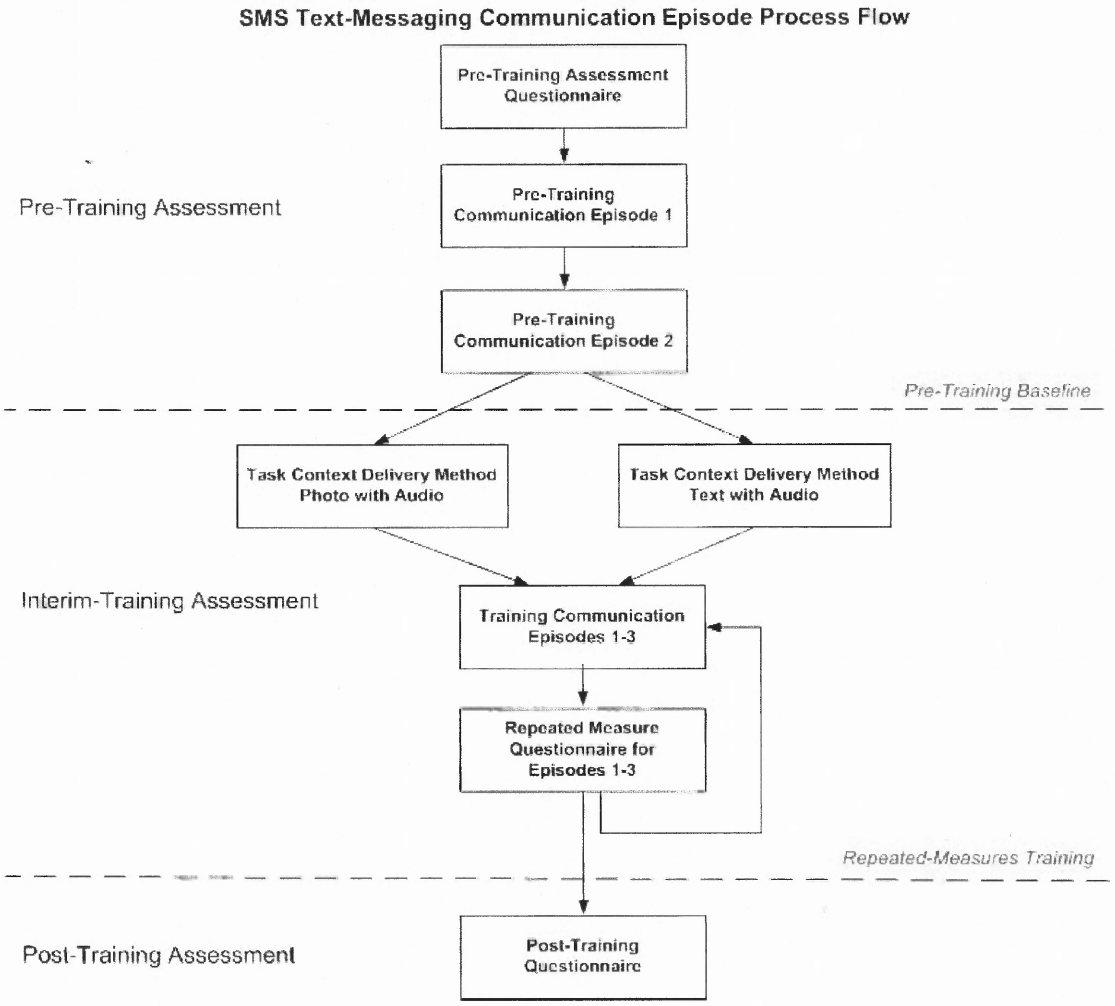


Figure 4.2. SMS text-messaging communication episode process flow.

4.4 Research Instruments

The research instruments used were interleafed in the web-based application for a seamless transition between tasks. Three types of data collection were used: 1) Database

participant response 2) Survey Instruments 3) Camtasia (only a few participants) for observational comparison to the database metrics.

4.4.1 Participant Response Collection

Access to this research is by invitation and only once an associated login was assigned. Database updates begin with the acceptance or decline for the consent to participate. The database also records if participants abandon the study before completing all tasks. At present, there are no participants who declined to participate and less than 5 participants have left the training application without completing all tasks.

The essential information to support the research model for each task includes: 1) Word Count, 2) Character Count, 3) Task Performance Time, 4) Task Response Level (used to code a response level between 1-4).

4.4.1.1 Coding of response level. The coding of each response level was performed by the researcher with concurrence from one co-advisor. Approximately, 20% of the study results were externally validated by two experts in the field who are currently assigned to Office of Emergency Management initiatives. Both experts are working with Homeland Security initiatives and have a long history of involvement with emergency response, community initiatives, and training.

4.4.2 Survey Instruments

The survey data collection takes place at three distinct intervals during the training process, as reflected in the Crisis Response Training Framework (Figure 3.1). The three survey instruments include:

1. Pre-training.
2. Interim-training.
3. Post-training.

Data collection is web-based (online), including study participant consent. The electronic consent follows the IRB Human Subjects guidelines at NJIT by forcing the study participant to "click" for participant agreement before continuing. These conditions are included in the IRB approval and consent letters found in Appendix C.

4.4.2.1 Pre-training Survey. The pre-training survey is administered at the start of the training application. The purpose of the survey is to record the participant's demographics (gender, age) and role in crisis response, technology usage behavior (desktop and mobile), writing ability/confidence and beliefs of text-messaging for crisis response and preparedness to respond before training is introduced. These measures are used for the participant profile.

4.4.2.2 Interim-training Survey. The interim-training survey is administered at the end of each training module. The purpose of the survey is to record the perceived behavior towards SMS text-message task response after each task response is created.

4.4.2.3 Post-training Survey. The post-training survey is administered at the end of the training application. The purpose of the survey is to record the participant's perceptions of the text-message training, their perceived readiness to respond for crisis response after training is introduced and attitudes towards text-messaging for crisis response after training is introduced.

A post-training survey is completed once all five communication episodes have been introduced and completed. The constructs of the survey are designed to both compare pre-training and post-training measure, in addition to overall Perceived Usefulness of SMS Text-Messaging, Perceived Intention to Use SMS Text-Messaging, Perceived SMS Text-Message Readiness, Perceived Motivation, Perceived Enjoyment, Perceived Learning, and Perceived Task Performance.

4.4.3 Training Application Execution

The training application begins with a login screen and consent to participate entry page (Figure 4.3). Upon acceptance to participate, the training application is launched and runs automatically from start to finish by the use of a "continue" button. The left navigation bar (Figure 4.4) demonstrates the steps of the training, but use of the left menu for navigation is not necessary.

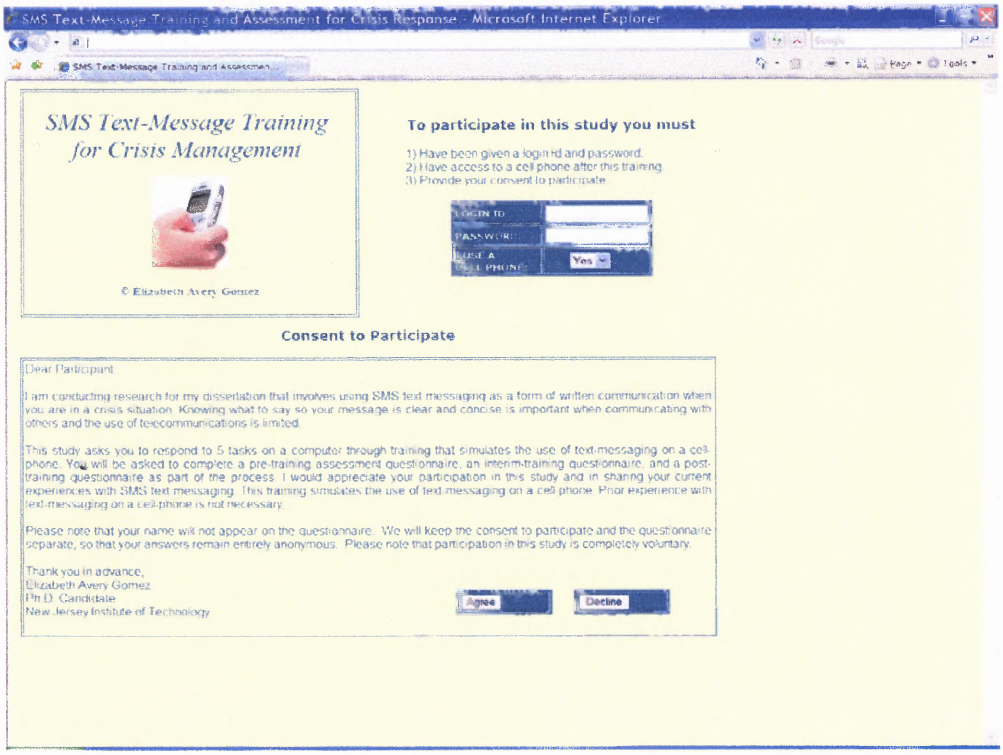


Figure 4.3 Web-based application login page.

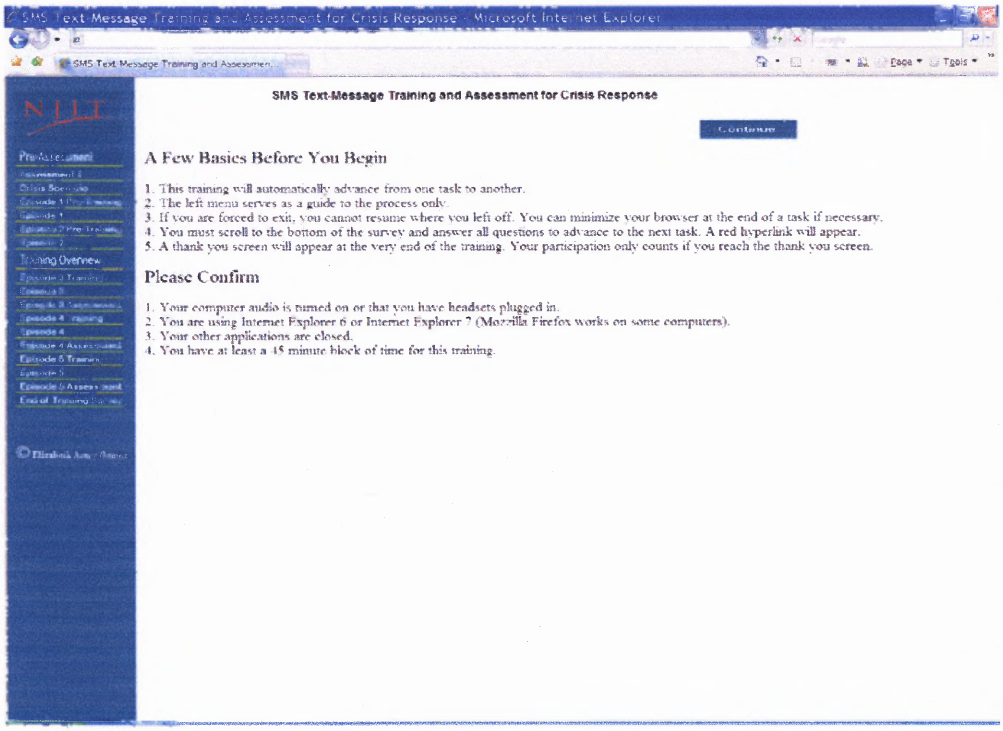


Figure 4.4 Web-based application getting started page.

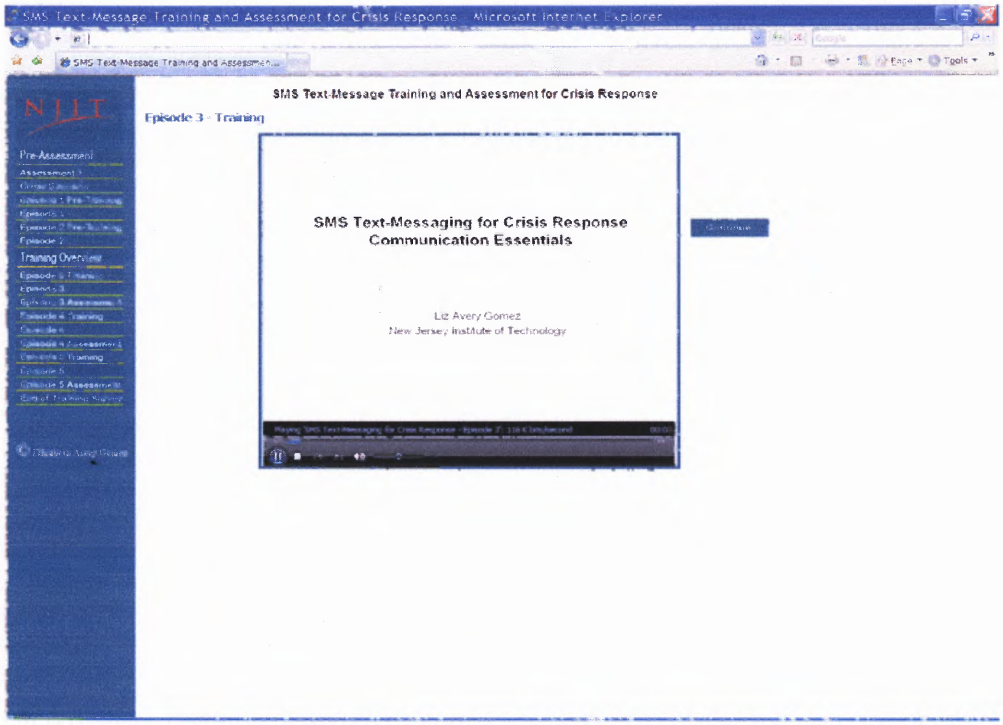


Figure 4.5 Example of training module.

Figure 4.6 Web-based application episode 2 (photo with audio version).

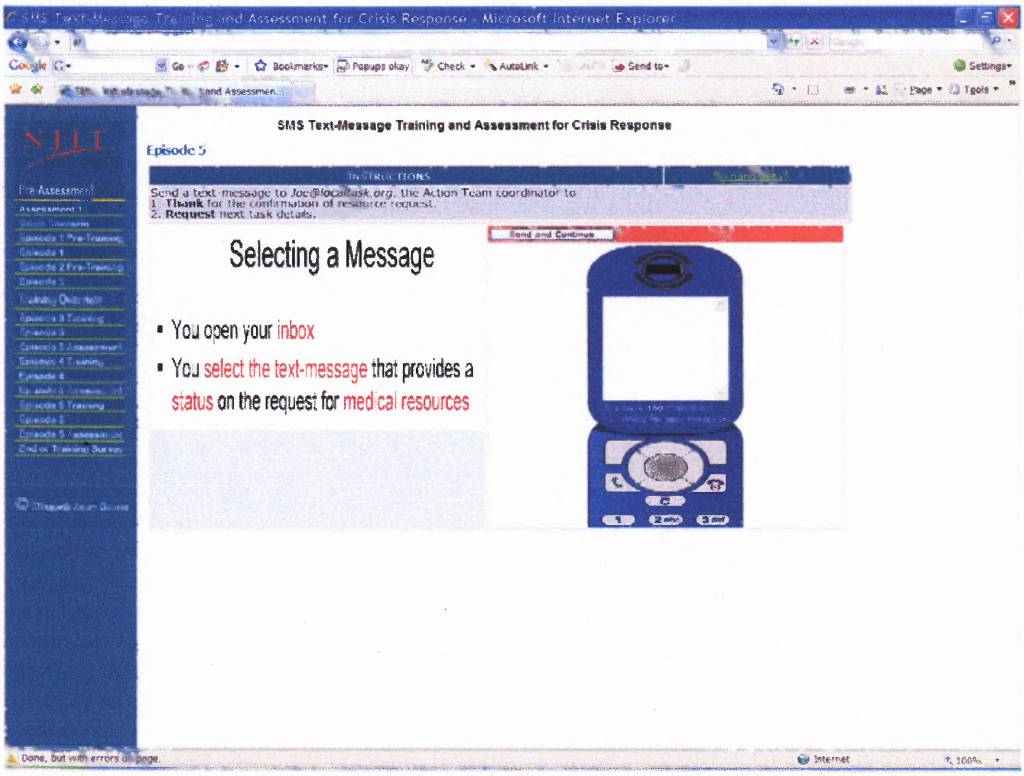


Figure 4.7 Web-based application episode 4 (text with audio version).

The sequence of events from start to finish is presented in Table 4.3 and depicts the actions as either application invoked or participant invoked. The average training time from start to finish takes between 30-45 minutes to complete. Some participants take a little longer to answer the survey questions increasing participation time to about 1 hour. Most participants completed training in 45-50 minutes.

Before beginning the training, the participant is presented with a splash screen (Figure 4.4) in text only (no audio). This step is important to ensure the participant knows what to expect during the training and to ensure audio is available before the first audio/video is presented. The participant should also be able to recognize when they have reached the end of the training application. Figure 4.5 demonstrates an example of the

training module for episode 3. Figures 4.6 and 4.7, show a comparison between the photo with audio and text with audio versions of the web-based application. Figures 4.6 and 4.7 are also parallel pre-training and post-training paired tasks. Audio/video was the delivery method used for both the crisis scenario details and for the training modules. Each of the five episodes begins with a short audio/video of the step within the crisis that prompts the responder (i.e., study participant) to reply with a text-message response. The approximate length of each audio/video recording is noted in Table 4.3.

Table 4.3 Training Application Procedures

Event	Application	Participant
Login screen	Study consent information	Participant accept or decline participation
Instructions for participation	Textual information for the study	
Before you Begin	Audio/video with background information on the study and plain language mandates (approx. 7 min.).	
Pre-Training Survey		Survey monkey pre-training questions
Crisis Scenario	Audio/video of the crisis scenario is introduced (approx. 5 minutes).	
Episode 1 scenario	Audio/video of the episode 1 is introduced (approx. 2 min.).	
Episode 1 task		Prompts for Essential Rule: confirm and warn. Task response and task performance time are recorded in database.
Episode 2 scenario	Audio/video of the episode 2 is introduced (approx. 2.3 min.).	
Episode 2 task		Prompts for Essential Rule: advise and question (ask for). Task response and task performance time are recorded in database.
Episode 2b task		Prompts for Essential Rule: thank and request. Task response and task performance time are recorded in database.

Table 4.3 Training Application Procedures (continued)

Event	Application	Participant
Training Overview	Audio/video with communication essentials and SMS text-message background information (approx. 6 min.).	
Episode 3 scenario	Audio/video of the episode 3 is introduced (approx. 4 min.).	
Episode 3 task		Prompts for Essential Rule: confirm and warn. Task response and task performance time in database.
Episode 3 Survey		Survey monkey interim training questions
Episode 4 scenario	Audio/video of the episode 4 is introduced (approx. 4 min.).	
Episode 4 task		Prompts for Essential Rule: advise and question (ask for). Task response and task performance time are recorded in database.
Episode 4 Survey		Survey monkey interim training questions
Episode 5 scenario	Audio/video of the episode 5 is introduced (approx. 2.2 min.).	
Episode 5 task		Prompts for Essential Rule: thank and request. Task response and task performance time are recorded in database.
Episode 5 Survey		Survey monkey interim training questions
Post-training Survey		Survey monkey post training questions
Thank you	Textual information	Thank for participation in the study background.

4.4.4 Crisis Scenario

One continuous crisis scenario introduced for this study. The crisis scenario is designed for the role of a community volunteer who has been requested to respond in for an early storm warning. As the scenario unfolds, a series of five episodes (six tasks) are introduced. The action team volunteer is asked to communicate with the command and control coordinator for each task.

4.4.4.1 The Action Team Volunteer Role. This scenario requests assistance from the Action Team volunteer for the *Independence for Seniors and People with Disabilities Organization* located in Wayne NJ. For severe weather alerts, the Action Team's mission is to ensure seniors and people with disabilities who are living alone have enough

resources (food, flashlight, and battery operated radio) at their reach for an upcoming crisis.

The Action Team volunteer has an on-call status. The call for assistance is usually unknown although it can predict in some cases (i.e., torrential rain and flooding). The role of most Action Team volunteers is to provide neighborhood assistance. A few volunteers are cross-trained to assume the role as the Action Team coordinator. However, most Action Team coordinators are paid-staff.

During a severe weather alert, the Action Team volunteer who operates in the field responding to resident needs communicates with the Action Team coordinator as the primary contact. The Action Team coordinator communicates from a stationary desktop computer with a high speed Internet connection. Once an early warning notification to respond is initiated, your task as an Action Team volunteer is to begin communicating with the Action Team coordinator (Figure 4.7) as you personally contact each of the seniors and special needs residents identified on your list. As you stop at each home, you confirm that each resident has enough emergency supplies within their reach. Often supplies are stored in locations that are difficult to access and simply need to be moved to a central location for easy access during a storm warning. Those residents who are low on supplies are noted and identified to the Action Team coordinator.

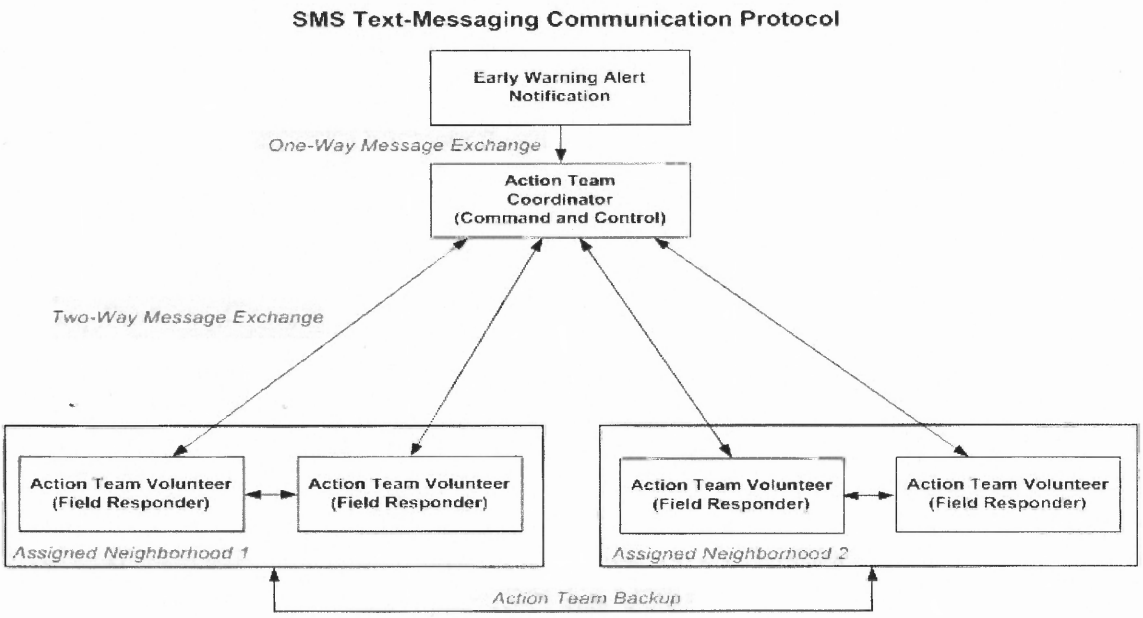


Figure 4.7 SMS text-messaging communication protocol.

The benefit of the Action Team coordinator is to monitor weather pattern changes, traffic changes, and have access to additional resources such as a land telephone, high speed Internet access, and other applications that manage information and resource needs. Essentially, the Action Team coordinator bridges the gap to your response needs (access to driving directions, dispatch additional resources, etc) and also alerts you of sudden changes. The primary protocol between the Action Team volunteer and Action Team coordinator takes place through low-bandwidth text-messaging.

4.4.4.2 Crisis Initiative. This initiative supports FEMA's statement that "individuals may need to be on their own for at least 72 hours" until external resources can assist. Seniors and people with disabilities are a population who are able to take care of themselves with limited assistance on a daily basis, but are vulnerable to "individually preparing" in a timely manner for sudden weather changes. The Action Team supplements the needs of seniors and people with disabilities by checking in with each

senior and person with disabilities who has registered with the Action Team service when a severe weather advisory is issued. A volunteer is assigned to a primary neighborhood and also to a secondary neighborhood for backup coverage.

4.4.3.3 Scenario Setting. Several times a year, the riverside in Wayne is known to flood causing road closures. Most houses are situated high enough to minimize flooding, reducing the need to evacuate. However, the flooding causes the roads to flood leaving residents house-bound for up to a few days. The power fluctuates during heavy weather changes placing importance on flashlights and battery operated radios.

The scenario begins with a severe flooding alert for Wayne, New Jersey. The storm warnings are rapidly changing with a 10 hour lead time for the eye of the storm. In addition to your role as an Action Team volunteer, you are a Financial Advisor working in Jersey City full-time. This week you have your annual certification training in New York City and are not in your Jersey City office. Days are long this week and you have neglected to follow the weather advisories. As your training ends on November 12th, you decide to check email from New York City before returning to your home in Wayne. In checking your email, you notice an alert to begin follow-up with residents for the rapidly approaching storm. It is 3pm and the storm is expected to touch down at 1am. Joe@localtask.org has assumed the role as Action Team coordinator (command and control). You anticipate leaving New York City at 4pm. Before confirming your ability to respond, you review the storm details on the Internet. You need to get to your assigned neighborhood as quick as possible, and are not used to traveling from Route 80 to get there. You quickly email Joe@localtask.org to initiate your ability to respond and request detailed directions to your assigned neighborhood.

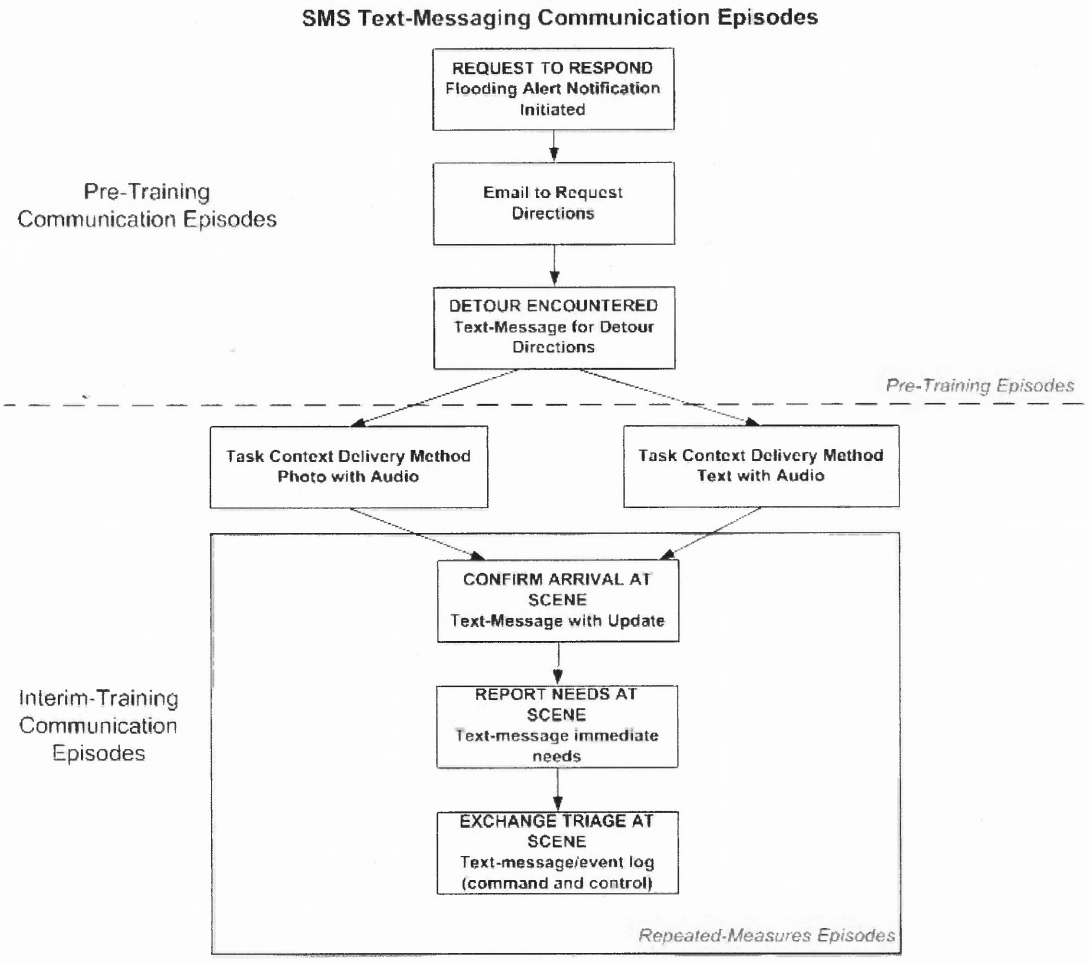


Figure 4.8 SMS text-messaging communication episodes.

4.4.5 Pre-Training Self-Assessment Survey

A short survey was completed before the participant began either Training Session Type. The constructs of the survey were designed to measure study participant characteristics, such as communication application usage and behavior, prior to training and scenario exposure. These measures served as a baseline in conjunction with the two pre-training communication episodes completed before either method of training is introduced. The communication episodes (i.e., tasks) for both the simulated training and self-initiated

training are the same. Each communication episode (i.e., task) prompted the participant to reply using a different speech act and written communication discourse mediated by mobile text-messaging.

4.4.6 Training Session Type

This study has two Training Session Types (Section 4.1):

1) photo with audio; and

2) text with audio.

Half of the study participants received the photo with audio training while the other half of the study's participants received the text with audio training. Random assignment to each multimedia training session type was used.

4.4.7 Pre-Training - Communication Episodes

The Task Prompt Type (within subjects) introduces six Speech Act Essential Rules (two prompts/essential rules per task). The same six tasks are completed for either training session type. A total of three tasks are pre-training and three parallel post-training tasks (Table 4.4).

Tabe 4.4 Communication Episodes

Communication Episodes and Tasks		
Communication Episode	**Essential Rules**	**Task Complexity**
1 and 3	Confirm and Warn	Medium
2 and 4	Advise and Ask for	High
2b and 5	Thank and Request	Low

4.4.8 Speech Act Training – Communication Episodes

The three training modules each focused on a distinct plain language.

Table 4.5 Training Communication Episodes 3-5

Training Communication Episodes 3-5	
Communication Episode	**Training Emphasis**
3	Active voice
4	Wordiness
5	Sentence structure

4.5 Research Methodology Summary

This study used a mixed-methods quasi experimental design (actual and perceived performance measures). Responder pre-training assessment measures serve as a baseline before training is introduced. Two episodes with three tasks are performed before training is introduced as a way to obtain a pre-training baseline communication exchange message and capture three task responses. Three short training modules with associated communication episodes and tasks are then introduced. This one-to-one relationship of Task Prompt Type with an associated episode and tasks allows for the Task Prompt Type to parallel the speech act invoking the SMS text-message response. To conclude the training session, a post-training assessment measures are collected.

CHAPTER 5

PILOT STUDY RESULTS

5.1 Pilot Study Setting

The pilot study results are based on four study participants. Camtasia Studios screen recording software and the completion of the three survey instruments were used for the data collection. The screen recordings captured actual performance measures in addition to usage behavior. The survey instruments captured study participant perceptions.

5.2 Pilot Tested Instruments and Findings

All quantitative survey instruments (discussed in Sections 4.4.2.1, 4.4.2.2, 4.4.2.3) have been adapted from previous empirical research (Table 5.1) or through classroom use at the New Jersey Institute of Technology (NJIT). The source for the three survey instruments (pre-training, interim training, and post-training) is noted below and in Appendix D.

Table 5.1 Survey Instrument Constructs

Survey Instrument Constructs	
Construct	**Reference**
Internet usage	Igbaria et al. MISQ 9/97
Cell-phone, blackberry, and PDA usage	Igbaria et al. MISQ 9/97
ICT usage	pilot tested with students 2005-06
ICT individual behavior	pilot tested with students 2005-06
ICT communication	Daly & Miller, 1975
Perceived Usefulness	Igbaria et al. MISQ 9/97
Perceived Attitude Towards Behavior	Bhattajeree, Todd & Taylor; Davis, 2001
Perceived Beliefs	Bhattajeree, 2001
Perceived Learning, Perceived Motivation and Enjoyment	Gomez, Wu, Passerini, Bieber, 2006

5.1.2 Qualitative Pilot Results

The web-based training application was pilot tested in December 2006. The initial study participants (i.e., assuming the role of a community responder) were encouraged to think aloud while completing the training. A total of four participants were observed from start-to-finish for pilot testing. Camtasia Studios screen recording software recorded all mouse and keystrokes during the training.

The initial study participants were not familiar with the web-based training application and possessed a mix of ICT Usage Behavior levels. Table 5.2 reflects the qualitative SMS text-message responses for the five communication episodes (six tasks in total for each study participant) of the study.

Some of the considerations that surfaced during the preliminary pilot study were the manner of navigation on the screen: how participants were responding to the application. An additional observation was the response style (pause, backspacing, rewording). body position, facial expressions, and utterances were indicators of interest and careful attention paid to the use of technology and the task instructions for this study.

Usage behavior patterns were noticeable through mouse-movements and keystrokes recorded by Camtasia. The importance of behavioral patterns during training with SMS text-messaging, especially those designed for increased task complexity will be used to develop a rubric for future research and to improve the proposed training model.

Message adaptiveness and task performance were the primary data points for the qualitative analysis. Mouse movements, length of text-message response, choice of plain language terms, and speech act are examples represented in Table 5.2. Cursor blinking,

time to respond, and replaying the scenario are a few other task performance measures that can be obtained through Camtasia. Moreover, the study participant data was cross-referenced to the quantitative data in Tables 5.3-5.10 of Section 5.1.4.

Overall, the initial qualitative observations reflected a high level of concentration on the evolving scenario details. The task instructions and observations of participants re-reading the text-message reply resulted in text editing (changes & backspacing). The details presented in the photo with audio tasks appeared to influence the content of the text-message itself. This shows promise for level of perception in relation to what is actually being communicated in a message. The independent variable was adjusted as a result of initial pilot findings from the proposed training/no training to photo with audio/text with audio. Factor analysis of the pilot study was not conducted due to the small pilot size of participants.

Table 5.2 Qualitative Comparison of Four Test Subjects

Episode		Pilot Test Subject 12-11	Pilot Test Subject 12-12	Pilot Test Subject 12-14	Pilot Test Subject 12-21
1	Email for alternate directions	hi, I have received your email and will head to Wayne to respond. I am leaving New York now. I expect heavy traffic on route 80, please send me better driving directions to Wayne.	Joe, Am able to respond. Heavy traffic reported on Route 80, please provide alternate directions.	Enroute from NYC. Need better directions from Rt 80 W; backrd, if U know them.	I am leaving City at 4:00 and responding to your location. Once on I-80, where shall I exit to get to assigned neighborhood? I will watch for your alert. (Subject 4)
2	Text-message for detour directions	help! Route 80 closed. need directions from 54 frederick place to wayne asap	Forced onto a detour. Current location is 54 Frederick Place. Please provide new directions to assigned location.	Problem. Detour. Need directions from 54 Frederick Ave or Pl., Clifton.	JOe, I-80 closed, detoured off of at rte 19. Currently at 54 Frederick Place. (Subject 4)
2a	Confirm detour directions received	thanks	Directions received.	TY. Enroute.	JOe, received directions. Should be there in 20 minutes. (Subject 4)
3	Arrived in Wayne-road flooded	have arrived in Wayne. streets are flooded and not drivable. we need public safety vehicles able to negociate high water	Have arrived at designated location. Heavy road flooding. Require sewage/drainage support.	Almost arrived. Need to walk 2 blocks due to flooding at 19th & Main. Need boots!	JOe, proceeding on foot from Grey Rock and Island. Water rising, may need boats to move people through to safety. Will confirm, (Subject 4)
4	Checking houses	I am still in Wayne it is still raining, people are stranded outside a house. Send two boats	Arrived at the corner of 23rd & Main. Heavy flooding & no power. Please provide sewage and electrical support.	Arrived at 19th & Main. Road flooded. Parked here. Am walking to check houses on 20th to 23rd. Need boots or boats.	Joe, Arrived at assigned houses. Cannot access without boat, water is 3-4 feet deep. People to be evacuated. (Subject 4)
5	Text-messages received of dispatched resources	it is still raining here, it might be dangerous for tree workers to begin right now	Thank U for the responses. Electrical & sewage seem to be bigger issues. Please provide ETA for these units.	(Task not completed due to technical problems).	Joe, I will meet Sal and Joanne to retrieve flashlites/batteries for my families. (Subject 4)

5.1.4 Quantitative Pilot Results

Recognizing that the pilot study sample was too small to conduct quantitative data analysis, the mean for each question from the survey instruments was the basis for the pilot study discussion. Tables 5.3-5.10 reflect the results from the four study participants discussed in Section 5.1.3. The survey instruments used a 5 point Likert scale. Overall, the survey results introduced complex conditions between previous ICT experience, resistance, and confidence with SMS text-messaging.

Beginning with Tables 5.3-5.5 that reflect the output from the pre-training survey instruments, the four participants were reviewed. The points of emphasis were based on the observations presented from the participant's behavior. The participants were of the 35-64 age range, three females and one male. None of the participants for the pilot study work as practitioners in emergency management or as volunteers with an emergency related focus, although three of the participants have some knowledge of emergency response from either an academic perspective or community perspective, all four participants are native English language speakers. Three of the four participants use most Internet options (maps, news, alerts, calendar). One participant is a frequent Internet user although does not utilize many options. In contrast, mobile device and feature usage diminish to phone calls, reminders and text-messaging for the primary features used.

In this study, ICT usage via email and planning display means between 3.75 and 4.25 respectively. Communication response patterns indicate the use of text-messaging as a positive step in a crisis and demonstrate favorable attitude toward the use of SMS text-messaging in a crisis with both means of 4.25. The "rereading of messages before sending to confirm accuracy" and "liking to write ideas down" also had a mean of 4.25.

Table 5.6 reflects the repeated measures survey results for the speech act training episodes which showed very little change between the three communication episodes with training. This may be due to the limited training introduced for the initial pilot study. Technological implications when progressing between audio/video recordings hindered the initial pilot study response time, causing application migration to another server.

Tables 5.7-5.9 reflect the post-training survey results for the overall training. The results overall indicate a mean of 2.75 out of 5 (strongly agree) for many question responses. Many of the questions were associated with training and again the technological implications may have hindered the responses. The level of concentration and effort for each SMS text-message response differed from some of the survey question responses, causing the need for further research and additional pilot subjects with the application run from a new server.

Two of the most interesting findings are found in the post-training survey questions when comparing the responses, such as from "for needing more practice" and "writing confidence." When reviewing these results, the study participants indicate the writing confidence with text-messaging is low, but also indicate that the need for more training is also low. There also seems to be a correlation between low confidence and "not feeling comfortable" using text-messaging, although the participants responded that they would not like more training. Confidence was reported as low (strongly disagree and disagree) for communication, retrieving and rewording information, and general ability respond with text-messaging in a crisis.

When comparing confidence responses to the repeated measures, the repeated measure responses reflected rereading both the inbound message, study participant outbound message, and composing thoughts with most values of 4 & 5 (agree & strongly

agree). The participants responded that clear and concise responses using SMS text-messaging were not difficult, but indicate the need for more plain language (speech act) training.

The survey questions from the pilot study were re-evaluated (Appendix D) to reduce the number of survey questions. The format of the survey was also adjusted. The Camtasia Studio recordings were reviewed for "ease of use" and reviewed for survey format. The following are initial changes applied to the survey instruments:

- Primary role of the study participant should be clarified.
- The years of experience in an emergency role should provide an option for "no" experience.
- Native language should be included to identify those who are not native English speakers.
- A question asking the study participant when they started using text-messaging is important.
- A question on the average volume and frequency of text-message usage would be beneficial.
- The question on Internet usage from home, (omitted in error) should be included.

To expand the potential for study participants, a login id was assigned and a MySQL database was developed. This allowed the study to reach a larger population of community responders and also allowed the participant scheduling flexibility and the use of their own computer.

One final measure that had been reviewed, presented a need for further analysis can be seen in the pre-training and post-training comparison (Table 5.10). A significant change between the use of text-messaging in a crisis prior to training and after training was presented. This prompts the following questions for further research:

1. Does awareness of text-messaging and hands-on training cause the study participant to understand the importance of clear and concise communication exchange for crisis response?

2. Does the study participant realize that the use of SMS text-messaging may be challenging for use in a crisis? Noting that the need for practice was indicated, these results could prompt the study participant to learn more and use SMS text-messaging or pursue other means for low-cost communication devices for crisis response.

Table 5.3 Pre-Training Pilot Survey Results 1 of 3

Mobile SMS Text-Message Training for Crisis Response
Pre-Training Survey Pilot Data Results December 2006

	Question	Answer Option/Type	Subject 1	Subject 2	Subject 3	Subject 4
	My User ID is:	Open-Ended Response	Subject12_11	Subject12_12	Subject12_14	Subject12_21
	My gender is:	Response	Female	Male	Female	Female
	My age is:	Response	35-59	35-59	50-65	50-65
	My primary role relating to emergency response is:	Response	Researcher	Other (please specify)	Student	Practitioner
	Role (continued from #5)	Open-Ended Response		None		
	I have been working/volunteering in my primary role in the field of emergency response for:	Response	Less than 1 year	Less than 1 year	Less than 1 year	Less than 1 year
1	On the average, how frequently do you use Internet for job-related work?	Response	Several times a day	Several times a day	Several times a day	Several times a day
2	On the average, how frequently do you use Internet at home?	*Question missing from survey*				
3	Please indicate whether you use the following on the Internet (check ALL that apply).	News Maps and driving directions Weather Phone directory Alert subscription Electronic calendar Music & movie clips Games Email Online chats Newsgroups Online shopping Travel Sports	News Maps and driving Weather Email Online chats Travel Sports	News Maps and driving Weather directory Alert subscription Electronic calendar Music & movie clips Games Email Online chats Newsgroups Online shopping Travel Sports	News Maps and driving Weather directory Electronic calendar Music & movie clips Email Online chats Online shopping Travel	Weather Email Travel Sports
4	On the average, how frequently do you use a cell-phone or blackberry for job-related work?	Response	A few times a week	About once a day	Several times a day	Several times a day
5	On the average, how frequently do you use a cell-phone for personal use?	Response	Several times a day	Several times a day	Several times a day	
6	Please indicate whether you use the following functions on your cell-phone or blackberry (check ALL that apply).	Phone-calls Text-messaging Email Reminders/alarms Chat Text alerts Phone directory Games Camera and movie recordings Music or audio recordings	Phone-calls Text- m	Phone-calls Text- Email m Chat Phone Games Camera and movie Music or audio recordings	Phone-calls m	Phone-calls Text- Phone

Pre-Training Survey page: 1 of 3

Likert Key: Strongly Disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5

Table 5.4 Pre-Training Pilot Survey Results 2 of 3

Mobile SMS Text-Message Training for Crisis Response
Pre-Training Survey Pilot Data Results December 2006

	Question	Answer Option/Type	Subject 1	Subject 2	Subject 3	Subject 4	Mean
7	**Please answer the following questions:**	7. I would like to receive email messages for important alerts.	2	3	3	4	3
8		8. I like to communicate using email.	4	4	3	4	3.75
9		9. I like to communicate using text-messaging.	4	4	3	3	3.5
10		10. I like to chat online.	4	3	3	1	2.75
11		11. I like to manage my time with online calendar reminders.	5	5	5	2	4.25
12		12. I am comfortable using new computer software.	4	5	4	3	4
13		13. I like to check email several times a day.	4	5	5	5	4.75
14		14. I know how to play movie clips on my PC.	3	5	5	2	3.75
15		15. I use plain-language.	3	2	4	3	3
16		16. I know how to receive text-messages.	5	5	4	4	4.5
17		17. I know how to send text-messages from a computer.	1	5	4	2	3
18		18. I know to send text-messages from a cell phone.	5	5	4	4	4.5
19		19. I like to plan my week in advance.	2	1	4	4	2.75
20		20. I like when team mates and coworkers acknowledge receipt of my email.	2	2	4	5	3.25
21		21. I am comfortable doing several things at the same time (multi-tasking).	4	5	4	5	4.5
22		22. What I want most in a job is the possibility of really doing something important.	4	5	4	4	4.25
23		23. I always honor high priorities.	4	5	4	4	4.25

Likert Key: Strongly Disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5

Table 5.5 Pre-Training Pilot Survey Results 3 of 3

Mobile SMS Text-Message Training for Crisis Response
Pre-Training Survey Pilot Data Results December 2006

	Question	Answer Option/Type	Subject 1	Subject 2	Subject 3	Subject 4	Mean
24	**Please answer the following questions:**	24. I reread inbound text-messages more than once before I reply.	2	2	4	5	3.25
25		25. I reread my text-messages before sending to confirm the messages are accurate.	2	4	4	5	3.75
26		26. I compose my thoughts before writing a text-message reply.	4	2	4	4	3.5
27		27. I like to write my ideas down.	4	4	5	4	4.25
28		28. I am nervous about writing.	1	1	2	2	1.5
29		29. I enjoy writing.	4	5	5	4	4.5
30		30. I don't think I write as well as most other people do.	1	1	1	2	1.25
31		31. All things considered, using text-messaging in a crisis will be a positive step.	5	4	4	4	4.25
32		32. All things considered, using text-messaging in a crisis will be a bad idea.	1	2	2	1	1.5
33		33. All things considered, using text-messaging in a crisis will be an effective step.	5	4	4	4	4.25
34		34. All things considered, I like the idea of using text-messaging in a crisis.	5	4	4	4	4.25
35		35. Using text-messaging in a crisis will improve my performance.	5	4	3	4	4
38		36. Using text-messaging in a crisis will enhance my productivity.	5	4	3	4	4
37		37. Using text-messaging in a crisis will ehance my effectiveness.	5	4	3	4	4
38		38. Using text-messaging in a crisis will be useful.	5	4	3	4	4

Pre-Training Survey page 3 of 3

Likert Key: Strongly Disagree=1, Disagree=2 Neutral=3, Agree=4, Strongly Agree=5

Table 5.6 Speech Act Training Survey Results 1 of 1 (repeated measures)

Mobile SMS Text-Message Training for Crisis Response
Speech Act Training Tasks Survey Pilot Data Results December 2006

		Speech Act Training (Episodes 1-3 for each subject)											
Question	Answer Option/Type	Subject 1 Episodes 1-3			Subject 2 Episodes 1-3			Subject 3 Episodes 1-3			Subject 4 Episodes 1-3		
Your User ID is:		Subject 12 11	Subject 12 11	Subject 12 11	Subject 12 12	Subject 12 12	Subject 12 12	Subject 12 14	Subject 12 14	Subject 12 14	Subject 12 21	Subject 12 21	Subject 12 21
I reread the inbound text-messaging more than once before I replied.		4	4		2	2	3	4		4	5	4	5
I reread my text message before sending to confirm the message is accurate.		4	4		3	3	3	4		4	5	4	5
I composed my thoughts before writing a text-message reply.		4	4		4	4	4	4		4	4	4	4
I found it difficult to be clear and concise using text-messaging.		2	2		1	1	1	2		2	2	2	3
I found plain-language helpful in shortening my text message response.		3	3		2	2	2	4		4	2	3	3

Likert Key: Strongly Disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5

Table 5.7 Post-Training Pilot Survey Results 1 of 3

Mobile SMS Text-Message Training for Crisis Response
Post-Training Survey Pilot Data Results December 2006

	Question	Answer Option/Type	Subject 1	Subject 2	Subject 3	Subject 4	Mean
	My User ID is:	Open-Ended Response	Subject12 11	Subject12 12	Subject12 14	Subject12 21	
1	**Please complete the following questions regarding overall learning:**	1. I learned a great deal about text-messaging for crisis response from the training.	2	4	3	4	3.25
2		2. Text-messaging for crisis response training improved my ability to respond in a clear, concise manner.	2	2	2	5	2.75
3		3. The learning quality of text-messaging for crisis response training materials was improved by the video-enhanced	3	2	2	5	3
4		4. The learning quality of training materials was improved by the crisis-related tasks.	2	2	2	5	2.75
5		5. Text-messaging for crisis response training was useful to my learning.	2	2	2	4	2.5
6	**Please complete the following questions regarding**	6. I feel my motivation to learn text-messaging for crisis response increased with training.	2	3	2	5	3
7		7. Text-messaging training for crisis response motivated me to do write my best response.	2	2	2	5	0
8		8. I feel my motivations to use clear, concise writing (i.e. plain-language) in a crisis increased with training.	2	2	2	4	2.5
9		9. The actual process of using text-messaging is pleasant.	2	3	3	4	3
10		10. I had fun using text-messaging during the training.	2	3	3	3	2.75
11	**Please complete the following questions regarding enjoyment:**	11. I enjoyed web-based training more than regular face-to-face training.	4	2	3	3	3
12		12. I found text-messaging for crisis response training enjoyable.	3	2	2	4	2.75
13		13. Text-messaging training for crisis response improved my written communication skills.	2	4	3	4	3.25
14		14. I found myself more interested in the subject with text-messaging for crisis response training.	2	2	2	5	2.75
15		15. Training broadened my knowledge of text-messaging options for crisis response.	2	4	2	4	3
16	(removed from questionnaire)	16. Training was useful to my learning.	2	4	2	4	3

Post-Training Survey Page 1 of 3

Likert Key: Strongly Disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5

Table 5.8 Post-Training Pilot Survey Results 2 of 3

Mobile SMS Text-Message Training for Crisis Response
Post-Training Survey Pilot Data Results December 2006

	Question	Answer Option/Type	Subject 1	Subject 2	Subject 3	Subject 4	Mean
17	**Please complete the following questions regarding intention to use:**	16. I plan to continue using clear, concise writing (i.e. plain-language) after this training to practice for crisis response	2	2	2	4	2.5
18		17. I plan to continue using text-messaging after this training to learn new ways to communicate for crisis response.	2	4	2	5	3.25
19		18. I plan to continue using text-messaging after this training to practice communicating for crisis response.	2	4	2	5	3.25
19	**Please complete the following questions regarding usefulness:**	19. All things considered, using text-messaging in a crisis will be a positive step.	2	2	3	4	2.75
20		20. All things considered, using text-messaging in a crisis will be a bad idea	5	4	3	2	3.5
21		21. All things considered, using text-messaging in a crisis will be an effective step.	2	2	3	4	2.75
22		22. All things considered, I like the idea of using text-messaging in a crisis.	2	2	2	5	2.75
23		23. Using text-messaging in a crisis will improve my performance	2	2	3	4	2.75
24		24. Using text-messaging in a crisis will increase my productivity.	2	2	3	4	2.75
25		25. Using text-messaging in a crisis will enhance my effectiveness.	2	2	3	4	2.75
26		26. Using text-messaging in a crisis will be useful.	2	2	3	4	2.75
27		27. Learning to use text-messaging for crisis response is easy for me	2	1	2	4	2.25
28		28. I find it easy to use text-messaging to say what I need to say in a crisis.	3	1	2	4	2.5
29		29. It is easy for me to become skillful at text-messaging for crisis response	3	1	2	4	2.5
30		30. I find text-messaging for crisis response easy to use.	3	1	2	4	2.5

Likert Key: Strongly Disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5

Table 5.9 Post-Training Pilot Survey Results 3 of 3

Mobile SMS Text-Message Training for Crisis Response
Post-Training Survey Pilot Data Results December 2006

	Question	Answer Option/Type	Subject 1	Subject 2	Subject 3	Subject 4	Mean
31	**Please complete the following questions regarding overall task performance:**	31. I like to reread my message before sending it.	2	4	1	5	3
32		32. I like to reread a message received before responding to it.	2	4	1	5	3
33		33. Plain-language is a new concept for me.	2	3	4	4	3.25
34		34. Text-messaging is a new concept for me.	5	5	4	2	4
35		35. I am confident I know what to write when communicating with text-messaging.	3	1	3	4	2.75
36		36. I am confident I can use text-messaging for written communication	2	1	2	4	2.25
37		37. I need time to think before using text-messaging.	2	4	3	2	2.75
38		38. I need more practice to be able to reduce my written communication when using text-messaging.	2	3	2	5	3
39		39. I need more practice to be able to quickly articulate a text-message.	2	4	2	5	3.25
40		40. I use text-messaging already when communicating with others	2	2	4	2	2.5
41		41. I was aware of all techniques presented in the training beforehand	3	3	4	2	3
42		42. I found myself learning techniques I did NOT know existed.	3	3	3	2	2.75
43		43. I found myself recognizing techniques I use already that are important.	3	2	2	4	2.75
44		44. I found myself recognizing techniques I need to improve upon.	3	4	2	5	3.5
45		45. Training increased my awareness of text-messaging techniques	3	3	2	4	3
46		46. I am confident I can use text-messaging to communicate.	2	1	2	4	2.25
47		47. I am confident I can communicate with someone using text-messaging	2	1	2	4	2.25
48		48. I am confident I can retrieve information and reword a text-message.	2	1	2	4	2.25
49		49. I need more practice to be able to reduce my written communication when using text-messaging.	2	4	2	5	3.25
50		50. I do NOT feel comfortable using text-messaging.	5	5	4	2	4
51		51. I feel I am able to respond with text-messaging in a crisis.	2	1	3	4	2.5
52		52. I would like more training on the use of for text-messaging for crisis response.	2	3	2	5	3

Post-Training Survey Page 3 of 3

Likert Key: Strongly Disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5

Table 5.10 Pre-Training – Post-Training Comparison

Mobile SMS Text-Message Training for Crisis Response
Pre-Training - Post-Training Comparison Pilot Data Results December 2006

			Question Number Mapping		Subject 1		Subject 2		Subject 3		Subject 4		
	Question	Answer Option/Type	Pre-train	Post-train	Pre-train	Post-train	Pre-train	Post-train	Pre-train	Post-train	Pre-train	Post-train	Mean
	Please answer the following questions:	I reread inbound text-messages more than once before I reply.	24	32 *	2	2	2	4	4	1	5	5	3.125
		I reread my text messages before sending to confirm the messages are accurate	25	31 *	2	2	4	4	4	1	5	5	3.375
		All things considered, using text-messaging in a crisis will be a positive step.	31	19	5	2	4	2	4	3	4	4	3.42857
		All things considered, using text-messaging in a crisis will be a bad idea.	32	20	1	5	2	4	2	3	1	2	2.57143
		All things considered, using text-messaging in a crisis will be an effective step.	33	21	5	2	4	2	4	3	4	4	3.42857
		All things considered, I like the idea of using text-messaging in a crisis.	34	22	5	2	4	2	4	2	4	5	3.28571
		Using text-messaging in a crisis will improve my performance.	35	23	5	2	4	2	3	3	4	4	3.28571
		Using text-messaging in a crisis will enhance my productivity.	36	24	5	2	4	2	3	3	4	4	3.28571
		Using text-messaging in a crisis will enhance my effectiveness.	37	25	5	2	4	2	3	3	4	4	3.28571
		Using text messaging in a crisis will be useful	38	26	5	2	1	2	3	3	1	1	3.28571

* Denotes slight wording change between the pre and post test quesitons.

Likert Key: Strongly Disagree–1, Disagree–2, Neutral–3, Agree–4, Strongly Agree–5

CHAPTER 6

DESCRIPTIVE STATISTICS AND NORMALITY

6.1 Study Participation

A total of 50 study participant's were recorded as of April 11, 2007. The descriptive statistics for this study placed emphasis on ICT frequency of use, and demographics related to crisis response, age, and gender (Table 6.1). Pre-training and post-training factor loadings and tests of normality are also discussed at this time before additional results are introduced.

The demographic information presented a balance between genders (25 male and 25 female), and a significant difference between responder roles was noted. The Responder Role categories from the study are noted and include: 1) community responders; 2) practitioner with crisis response responsibilities, 3) academic researcher; 4) student, citizen; and 5) none (please specify). The cross-tabulation (Table 6.2) between Responder Role and the Training Session Type (stimulus) is also included. It should be noted that some participants had a dual role. In the case of a dual role, the role that is ranked higher/more advanced in crisis/emergency management, which determines frequency of practice, was used for the cross-tabulation. An example is a practitioner who is also a community responder.

The role of community responders remains an open real-world discussion. The participants selected for this research were individuals who volunteer or have involvement in their community as responders, yet do not consider themselves as a community responder as reflected in the "Other" category for "My role relating to crisis response." For example, the director of a public housing development may find

themselves responding if a crisis impacts the public housing development. Another example is a worker in a public health clinic that has already been designated as a specimen collection point in a crisis.

Tests for homogeneity and pre-training profiles are presented in cross-tabulations to ensure equal variances before continuing with hypothesis results. Power users and those who enjoy writing offer a significant difference in results. In terms of crisis response practices, the demographics reflect that approximately 90% of all participants use the Internet for maps, news, weather, and email. Phone directory, travel, and online shopping are the next subsequent marker at approximately 66% of all participants. Alert subscriptions through the Internet was noted with the lowest use at 20%, followed by with the use of newsgroups at 26%, and then the use of online chats at 30%. Question 11 also noted that 74% of the study participants "would like to receive email alerts." For personal cell-phone use, 70% of study participants use their cell phone "several times a day."

Table 6.1 Descriptive Statistics for Study Participants

Question	Categories	Total N	Percentage
Gender	Female	25	50.0%
	Male	25	50.0%
Age	18-34	11	22.0%
	35-49	18	36.0%
	50-64	17	34.0%
	Over 65	4	8.0%
	I'd rather not specify	0	.0%
My role relating to crisis response is (check **ALL** that apply)	Community Volunteer	15	30.0%
	Practitioner with Crisis Response Responsibilities	16	32.0%
	Academic Researcher	2	4.0%
	Student	4	8.0%
	None	10	20.0%
	Other (please specify)	3	6.0%

Table 6.1 Descriptive Statistics for Study Participants (continued)

Question	Categories	Total N	Percentage
I have been working/volunteering in the field of crisis response for	Less than 1 year	4	8.0%
	From 1-2 years	5	10.0%
	3-5 years	5	10.0%
	6-10 years	1	2.0%
	More than 10 years	4	8.0%
	I do not work/volunteer in crisis response	31	62.0%
On the average, how frequently do you use the Internet for job-related work?	About once a day	7	14.0%
	Several times a day	33	66.0%
	A few times a week	4	8.0%
	Less than once a month	5	10.0%
	Once a month	0	0%
	A few times a month	1	2.0%
Please indicate whether you use the following on the Internet (check **ALL** that apply)	News	46	92%
	Maps and driving directions	45	90%
	Weather	42	84%
	Phone directory	33	66%
	Alert subscription	10	20%
	Electronic calendar	17	34%
	Music & movie clips	23	46%
	Games	17	34%
	Email	46	92%
	Online chats	15	30%
	Newsgroups	13	26%
	Online shopping	34	68%
	Travel	38	76%
	Sports	22	44%
On the average, how frequently do you use a cell-phone, or blackberry for job-related work?	About once a day	6	12.0%
	Several times a day	22	44.0%
	A few times a week	11	22.0%
	Less than once a month	9	18.0%
	Once a month	0	0%
	A few times a month	2	4.0%

Table 6.1 Descriptive Statistics for Study Participants (continued)

Question	Categories	Total N	Percentage
On the average, how frequently do you use a cell-phone, or blackberry for personal use?	About once a day	10	20.0%
	Several times a day	35	70.0%
	A few times a week	3	6.0%
	Less than once a month	2	4.0%
	Once a month	0	0%
	A few times a month	0	0%
Please indicate whether you use the following functions on your cell-phone or blackberry (check **ALL** that apply)	Phone calls	50	100%
	Text-messaging	23	46%
	Email	10	20%
	Reminders/alarms	20	40%
	Chat	3	6%
	Text alerts	10	20%
	Phone directory	28	56%
	Games	10	20%
	Camera and movie recordings	19	38%
	Music or audio recordings	4	8%
Q11 I would like to receive email messages for important alerts.	Strongly Disagree	4	8.0%
	Disagree	1	2.0%
	Neutral	8	16.0%
	Agree	28	56.0%
	Strongly Agree	9	18.0%

Table 6.2 Number of Study Participants by Responder Role and Stimulus

Responder Role	Independent Variable		Total
	Photo with Audio	Text with Audio	
Community Responder	5	10	15
Practitioner with Crisis Response Responsibilities	11	5	16
Academic Researcher	2	0	2
Student	1	3	4
None	4	6	10
Other (please specify)	2	1	3
Total	**25**	**25**	**50**

Study participants are organized by Responder Role and include representation from first responders, the public sector, and private sector crisis response. The number of participants by gender is represented in Table 6.3. The number of participants by age is represented in Table 6.4.

Table 6.3 Number of Study Participants by Responder Role and Gender

Responder Role	Gender		Total
	Female	Male	
Community Responder	12	3	15
Practitioners	5	11	16
Academic Researcher	0	2	2
Student	3	1	4
None	5	5	10
Other (please specify)	0	3	3
Total	**25**	**25**	**50**

Table 6.4 Number of Study Participants by Responder Role and Age

Responder Role	Age				Total
	18-34 Years	35-49 Years	50-64 Years	65 & over	
Community Responder	3	6	4	2	15
Practitioners	4	4	8	0	16
Academic Researcher	0	2	0	0	2
Student	3	1	0	0	4
None	1	4	4	1	10
Other (please specify)	0	4	1	1	3
Total	**11**	**18**	**17**	**4**	**50**

6.2 Pre-Training Survey Factor Loadings and Normality

Data reduction in SPSS v13 was run for the pre-training survey to confirm both sample size adequacy (Table 6.5) for this type of analysis and also to determine which factors naturally loaded compared to predicted constructs. KMO and Bartlett's Test were run with the Data Reduction, Primary Components, selected using with a Varimax rotation and Eigenvalues set to 1. The total variance explained is 73.567 percent for six factors of Likert scale questions Q12-Q34 of the pre-training survey. Before continuing with further

analysis of the six factor loadings, the Scree Plot (Figure 6.1) was also reviewed. The constructs were similar to the constructs predicted in the pilot study of this research. The origin of the constructs was presented in chapter 4. However, existing constructs were adapted and were also discussed in Chapter 4. Promax rotation was also reviewed in lieu of Varimax rotation because two constructs were tested in the classroom and were adjusted from the existing Team-Based Learning model. The results of the Promax rotation differed very little from the Varimax rotation, which was preferred for this research.

The factor loadings (Table 6.6) are the result of all 5 point Likert scale items on the pre-training survey once Q11 "I would like to receive email messages for important alerts" was removed. Before removing Q11 from the data reduction analysis, questions Q11-Q23 related to the study participants ICT Usage Behavior all clustered as one factor some with loading values in the Rotated Component Matrix lower than anticipated. Moreover, in reviewing the clustering of Q11-Q23 as one factor, cross-loading was not feasible.

To further conclude, the removal of Q11, the context for the question was reviewed in relation to the remaining questions related to study participant usage behaviro (Q12-Q23). Q11 was related to an individual's preference to a future action "would like to receive", a question perhaps best suited to review after training. All other pre-training survey questions were related to the current perceptions of the study participant when completing the survey. It should be noted that Q17 "I know how to play movie clips on my PC" loaded rather low with both Factor 1 and Factor 2. This loading is important for future research given the amount of study participants who use pictures and

videos on their cell phones and the importance of live footage in crisis management. Moreover, the Cronbach's alpha of .854 for this construct allowed us to keep this question.

Table 6.5 Adequacy of Sample Size

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**.664**
Bartlett's Test of Sphericity	Approx. Chi-Square	702.357
	df	253
	Sig.	.000

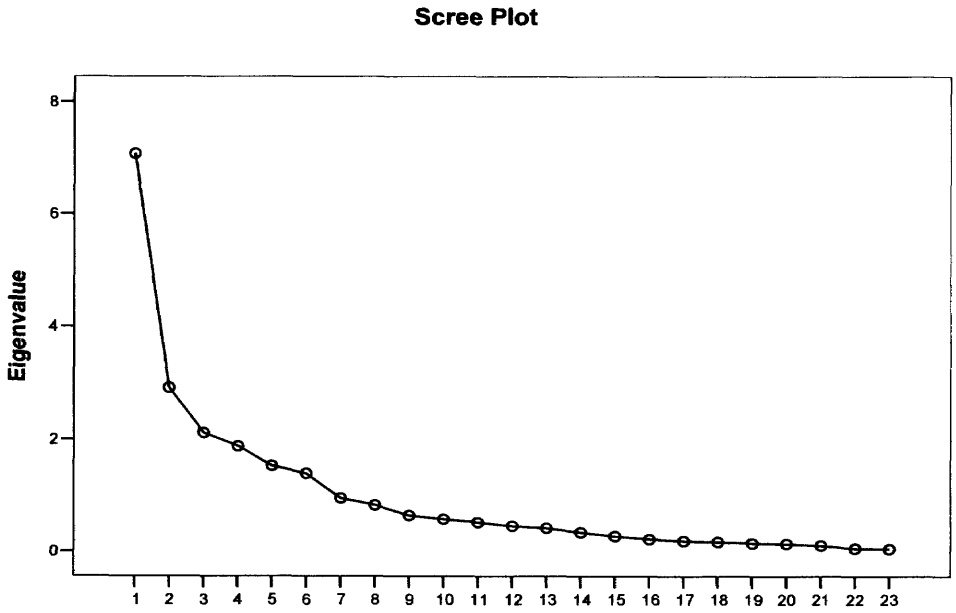


Figure 6.1 Scree Plot for pre-training survey factor analysis.

Table 6.6 Initial Factor Loadings for Pre-Training Survey

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cummulative %	Total	% of Variance	Cummulative %	Total	% of Variance	Cummulative %
1	7.082	30.789	30.789	7.082	30.789	30.789	3.759	16.344	16.344
2	2.914	12.669	43.458	2.914	12.669	43.458	3.484	15.149	31.492
3	2.120	9.219	52.677	2.120	9.219	52.677	2.983	12.969	44.461
4	1.881	8.176	60.854	1.881	8.176	60.854	2.952	12.833	57.294
5	1.532	6.660	67.513	1.532	6.660	67.513	2.120	9.215	66.510
6	1.392	6.053	73.567	1.392	6.053	73.567	1.623	7.057	73.567

Table 6.7 Rotated Component Matrix

Rotated Component Matrix [a]

	Component					
	1	2	3	4	5	6
Q21	.790	.113	.072	.250	-.044	-.007
Q22	.778	-.042	.092	.436	-.043	-.015
Q12	.662	.448	.055	.017	.359	.094
Q18	.633	.218	.028	.129	-.149	-.043
Q23	.621	.323	-.309	.008	.239	.132
Q16	.597	.339	.196	-.096	.058	.231
Q15	.551	.429	.137	-.039	-.384	.237
Q13	.170	.829	.116	.248	-.053	-.175
Q20	.174	.746	.132	.210	.198	.157
Q14	.282	.728	-.006	.173	-.019	-.233
Q19	.203	.676	.233	.140	-.121	.197
Q34	-.117	.103	.862	.083	-.210	-.123
Q31	.220	.197	.858	.143	.050	-.012
Q33	.162	.105	.839	.116	.000	-.118
Q29	-.151	-.047	.582	.057	.323	.498
Q26	.042	.132	.141	.877	-.034	-.037
Q24	.109	.282	.030	.804	-.038	.201
Q25	.203	.469	-.047	.704	-.062	.173
Q27	.231	.034	.260	.685	.143	-.142
Q30R	-.217	.127	-.011	.005	.861	-.101
Q28R	.194	-.100	-.032	-.010	.831	.047
Q32R	-.108	.099	.333	-.004	.217	-.795
Q17	.389	.414	.049	.304	.207	.569

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

In reviewing the component loadings, and also to the predicted constructs, the following factor loadings (Table 6.8) were selected. Cronbach's Apha for reliability is noted below each factor.

Table 6.8 Factor Loadings for Pre-Training Survey

ICT Desktop Behavior (F1)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**
Cronbach's Alpha: .854						
Q21 I like to plan my week in advance.	.790					
Q22 I like when team mates and coworker acknowledge receipt of my email.	.778					
Q12 I like to communicate using email.	.662					
Q18 I use plain language (clear and concise communication protocols).	.633					
Q23 I am comfortable doing several things at the same time (multi-tasking).	.621					
Q16 I am comfortable using new computer software.	.597					
Q15 I like to manage my time with online calendar reminders.	.551					
Q17 I know how to play movie-clips on my PC.	.389					
ICT SMS Behavior (F2)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**
Cronbach's Alpha: .839						
Q13 I like to communicate using text-messaging.		.829				
Q20 I know how to send text-messages from a cell-phone.		.746				
Q14 I like to chat online.		.728				
Q19 I know how to send text-messages from a computer.		.676				
Text-Message Attitudes (F3)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**
Cronbach's Alpha: .817						
Q34 Using text-messaging in a crisis will be more useful.			.862			
Q31 All things considered, using text-messaging in a crisis will be a positive step.			.858			
Q33 All things considered, using text-messaging in a crisis will be an effective step.			.839			
Q32 All things considered, using text-messaging in a crisis will be an effective step. (reversed)			.333			

Table 6.8 Factor Loadings for Pre-Training Survey (continued)

Writing Behavior (F4)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**
Cronbach's Alpha: .864						
Q26 I compose my thoughts before writing a text-message reply.				.877		
Q24 I reread inbound text-messages more than once before I reply.				.804		
Q25 I reread my text-messages before sending to confirm the messages are accurate.				.704		
Q27 I like to write my ideas down.				.685		
Writing Apprehension (F5)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**
Cronbach's Alpha: .599						
Q30 I don't think I write as well as most other people do. (reversed)					.861	
Q28 I am nervous about writing. (reversed)					.831	
Writing Enjoyment (F6)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**
Q29 I enjoy writing						.498

The bivariate correlations of the pre-training survey factors are reflected below.

Table 6.9 Bivariate Correlations for Pre-training Factor Loadings

	ICT Desktop Usage	**ICT Mobile Usage**	**Writing Behavior**	**Text-Message Attitude**	**Writing Ability**	**Writing Enjoyment**
ICT Desktop Usage Pearson Correlation	1	.615**	.450**	.124	.010	.015
ICT Mobile Usage		1	.506**	.303*	.013	.049
Writing Behavior			1	.248	-.001	.095
Text-Message Attitude				1	.004	.336*
Writing Ability					1	.245
Writing Enjoyment						1

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
a. Listwise N=49

6.3 Post-Training Survey Factor Loadings and Normality

Data reduction in SPSS v13 was run for the post-training survey to confirm both sample size adequacy (Table 6.10) for this type of analysis and also to determine which factors were naturally loading. The factor loadings were compared to predicted constructs. KMO and Bartlett's Test were run with the Data Reduction, Primary Components selected,

using with a Varimax rotation and Eigenvalues set to 1. The variance explained is 77.34 percent with eight factors for the Likert scale questions Q1-Q46 of the post-training survey with questions PQ17-21, and PQ37 having been dropped. Before continuing with further analysis of the eight factor loadings, the Scree Plot (Figure 6.2 was also reviewed. The constructs were similar to what was predicted in the pilot study of this research. The origin of the constructs was disclosed in Chapter 4. How existing constructs were adapted for this research were also discussed in Chapter 4.

The factor loadings represented below (Table 6.11) are the result of all 5 point Likert scale items on the post-training survey once Q17-Q21 and Q37 "I found myself recognizing techniques I use already are important was removed" was removed. PQ17-PQ21 were removed because they appeared as duplicates on the survey. A T-test was run to compare means before removing these questions to ensure no difference of means existed. PQ37 was removed from the data reduction analysis because it loaded separately and after carefully reviewing the question and loadings of the other factors, the question was determined to broad to keep. Future research should reevaluate PQ37 and reword as "I found myself recognizing text-messaging techniques I use already, I did not know were important for crisis response," as an example.

Table 6.10 Adequacy of Sample Size

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**.665**
Bartlett's Test of Sphericity	Approx. Chi-Square	1858.633
	df	780
	Sig.	.000

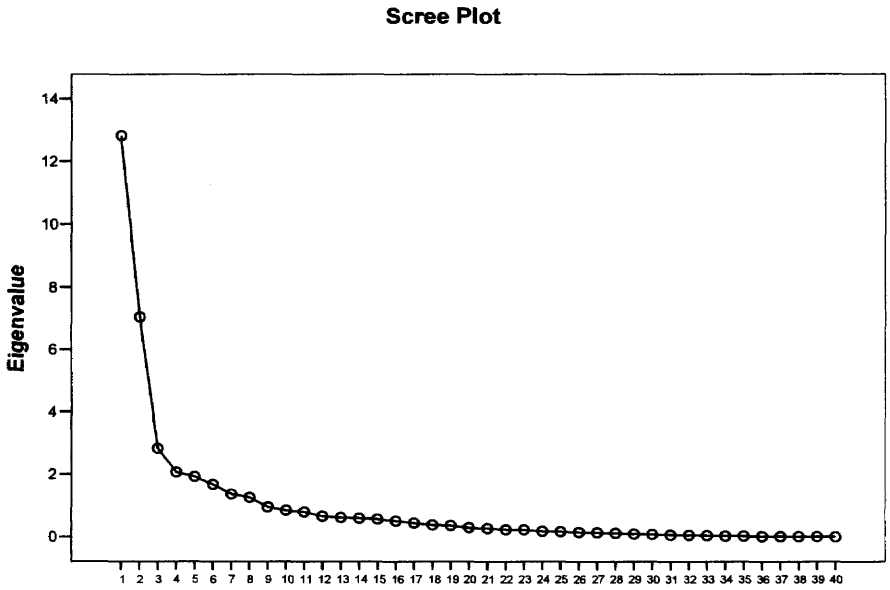


Figure 6.2 Scree plot for post-training survey factor analysis.

Table 6.11 Initial Factor Loadings for Post-Training Survey

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cummulative %	Total	% of Variance	Cummulative %	Total	% of Variance	Cummulative %
1	12.823	32.058	32.058	12.823	32.058	32.058	6.847	17.118	17.118
2	7.050	17.624	49.683	7.050	17.624	49.683	5.236	13.090	30.207
3	2.827	7.067	56.750	2.827	7.067	56.750	4.839	12.098	42.306
4	2.066	5.165	61.915	2.066	5.165	61.915	3.347	8.368	50.673
5	1.921	4.802	66.717	1.921	4.802	66.717	3.188	7.970	58.644
6	1.676	4.189	70.906	1.676	4.189	70.906	2.915	7.289	65.932
7	1.365	3.411	74.318	1.365	3.411	74.318	2.753	6.883	72.815
8	1.253	3.132	77.450	1.253	3.132	77.450	1.854	4.635	77.450

Table 6.12 Rotated Component Matrix

Rotated Component Matrix[a]

	Component							
	1	2	3	4	5	6	7	8
PQ25	.856	-.046	-.032	.114	.087	.127	-.194	-.123
PQ24	.838	.049	.001	.049	.138	.061	-.142	.077
PQ40	.761	.127	.237	.169	.233	.242	.196	.196
PQ26	.723	-.018	.317	.071	.003	.272	.190	-.038
PQ27	.717	.186	.342	.039	.035	.318	.256	-.017
PQ22	.707	.247	.113	.073	.345	-.101	-.107	-.108
PQ42	.695	.130	.247	.072	.253	.185	.199	.248
PQ41	.652	.213	.164	.155	.390	.135	.121	.294
PQ44R	.587	-.026	.502	.269	-.019	.134	.285	.041
PQ31	.558	.032	.364	.006	.382	.240	.194	.085
PQ2	.204	.812	-.150	.134	.033	.201	.013	.041
PQ11	.004	.806	-.044	.159	.141	.276	-.087	.093
PQ1	-.044	.797	-.104	-.081	.356	.114	-.074	-.120
PQ7	.049	.784	.018	.071	-.093	.273	-.043	.243
PQ39	.164	.743	-.264	.008	.066	-.048	-.396	-.076
PQ9	.018	.739	-.108	.264	.019	-.027	.036	-.155
PQ5	.242	.559	-.217	.219	.176	.517	-.046	.104
PQ4	.217	.513	.285	.371	.294	.210	-.046	.146
PQ33R	.253	-.149	.830	.066	.080	-.027	.058	-.023
PQ34R	.173	-.194	.820	.097	.156	-.117	.200	.015
PQ46R	.120	-.042	.789	-.224	.075	.024	.052	-.093
PQ43R	.186	-.225	.733	.040	.036	-.074	.310	-.018
PQ30	.483	.056	.638	.073	.022	.278	.176	.133
PQ32R	-.042	.020	.481	.473	.311	.178	-.062	-.152
PQ16	.153	.115	-.070	.937	.106	.027	.020	-.006
PQ15	.163	.190	.007	.915	.030	.083	.049	-.056
PQ14	.123	.341	.098	.722	.202	.277	.107	.273
PQ13	.295	.239	-.080	.018	.762	.258	-.069	.079
PQ12	.173	.017	.164	.191	.707	.273	.134	.085
PQ23R	.449	.227	.260	.230	.630	-.040	-.072	-.018
PQ45	.466	.111	.381	.106	.580	.090	.102	.024
PQ8	.346	.234	.090	.338	.421	.417	-.107	-.088
PQ10	.239	.331	-.072	.317	.163	.724	-.030	-.030
PQ6	.286	.218	.186	.088	.175	.692	-.102	.069
PQ3	.250	.336	-.074	-.013	.235	.658	.062	.086
PQ35	.301	-.035	.044	.111	-.105	-.090	.879	-.028
PQ36R	-.014	-.169	.308	-.011	.201	-.022	.773	-.135
PQ38R	-.136	-.149	.508	-.020	-.016	.047	.749	.075
PQ29	-.114	.142	-.032	.066	.065	.123	-.025	.817
PQ28	.361	-.153	-.068	-.077	.026	-.065	-.073	.790

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

In reviewing the component loadings, in addition to the predicted constructs, the following factor loadings were selected. Reliability for each factor was then reviewed and is noted beneath each factor. Questions 17-21 were removed because they were included twice in the survey. A T-test was run to confirm the values had an equivalent mean for consistency.

Table 6.13 Factor Loadings for Post-Training Survey

Perceived Usefulness (F1a)	F1	F2	F3	F4	F5	F6	F7	F8
Cronbach's Alpha: .885								
Q22 All things considered, using text-messaging as one communication option in a crisis will be a positive step.	.707							
Q23 All things considered, using text-messaging as one communication option in a crisis will be a bad step. (**reversed**)	.449							
Q24 All things considered, using text-messaging as one communication option in a crisis will be a effective step.	.838							
Q25 All things considered, I like the idea of using text-messaging as one communication option in a crisis.	.856							
Q26 I find it easy to use text-messaging to say what I need to say in a crisis.	.723							
Q27 It is easy for me to become skillful at text-messaging for crisis-response.	.717							
Perceived Task Performance (F1b)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
Cronbach's Alpha: .909								
Q30 I am confident I know what to write when communicating with text-messaging.	.483							
Q31 I am confident I can use text-messaging for written communication.	.558							
Q40 I am confident I can use text-messaging to communicate.	.761							
Q41 I am confident I can communicate with someone using text-messaging.	.652							
Q42 I am confident I can retrieve information and reword a text-message.	.695							
Q44 I do NOT feel comfortable using text-messaging.(**reversed**)	.587							
Q45 I feel I am able to respond with text-messaging in a crisis.	.466							

Table 6.13 Factor Loadings for Post-Training Survey (continued)

Perceived Learning (F2)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
Cronbach's Alpha: .898								
PQ1 I learned a great deal about text-messaging for crisis response from the training.		.797						
PQ2 Text-messaging for crisis response training improved my ability to respond in a clear, concise manner.		.812						
PQ4 The learning quality of training materials was improved by the crisis response tasks.		.513						
PQ7 I feel my motivations to use clear, concise writing (i.e., plain language) in a crisis increased with training.		.784						
PQ9 Text-messaging training for crisis response improved my written communication skills.		.739						
PQ11 Training broadened my knowledge of text-messaging options for crisis response.		.806						
PQ39 Training increased my awareness of text-messaging techniques.		.743						
Perceived Readiness (F3)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
Cronbach's Alpha: .860								
PQ32 I need more time to think before using text-messaging. (reversed)			.481					
PQ33 I need more practice to be able to reduce my written communication when using text-messaging. (reversed)			.830					
PQ34 I need more practice to be able to quickly articulate a text-message. (reversed)			.820					
PQ43 I need more practice to be able to reduce my written communication when using text-messaging. (reversed)			.733					
PQ46 I would like more training on the use of text-messaging for crisis response. (reversed)			.789					

Table 6.13 Factor Loadings for Post-Training Survey (continued)

Perceived Intention to Use (F4)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
Cronbach's Alpha: .927								
PQ14 I plan to continue using clear, concise writing (i.e., plain language) after this training to practice for crisis response.				.722				
PQ15 I plan to continue using text-messaging after this training to learn new ways to communicate for crisis response.				.915				
PQ16 I plan to continue using text-messaging after this training to practice communicating for crisis response.				.937				
Perceived Enjoyment (F5)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
Cronbach's Alpha: .772								
PQ8 I found text-messaging for crisis response training enjoyable.					.421			
PQ12 I found the crisis scenario easy to follow.					.762			
PQ13 I found the crisis scenario realistic.					.707			
Perceived Motivation (F6)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
Cronbach's Alpha: .862								
PQ3 The learning quality of text-messaging for crisis response training materials was improved by the video-enhanced presentations.						.658		
PQ5 I feel my motivation to learn text-messaging for crisis response increased with training.						.517		
PQ6 Text-message training for crisis response motivated me to write my best response.						.692		
PQ10 I found myself more interested in the subject with text-messaging for crisis response training.						.724		

Table 6.13 Factor Loadings for Post-Training Survey (continued)

Perceived Preparedness (F7)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
Cronbach's Alpha: .849								
PQ35 I was aware of all techniques presented in the training beforehand.							.879	
PQ36 I found myself learning techniques I did NOT know existed. (reversed)							.773	
PQ38 I found myself recognizing techniques I need to improve upon. (reversed)							.749	
Perceived Write Behavior (F8)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
Cronbach's Alpha: .655								
PQ28 I like to reread my message before sending it.								.817
PQ29 I like to reread a message received before responding to it.								.790

Table 6.14 Bivariate Correlations for Post-Training Factor Loadings

	Perc Learn	Perc Motivate	Perc Enjoy	Perc Intent	Perc Useful	Perc Task Performance	Perc Write Behave	Perc Readiness	Perc Write Ability
Perc Learn	1	.631**	.418**	.393**	.263	.207	.046	-.195	-.240
Perc Motivate		1	.658**	.444**	.492**	.480**	.140	-.019	-.089
Perc Enjoy			1	.454**	.600**	.626**	.126	.236	.014
Perc Intent				1	.324*	.356*	.066	.120	.061
Perc Useful					1	.815**	.126	.403**	.139
Perc Task Performance						1	.218	.565**	.353*
Perc Write Behave							1	-.072	-.071
Perc Readiness								1	.469**
Perc Write Ability									1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

a. Listwise N=49

CHAPTER 7

TASK RESPONSE DATA ANALYSIS

This section discusses the findings of the task response data. The data collection for this research was stored in a MySQL database. The task response measures per study participant were connected through a unique login id. The actual measures used to support the SMS Text-Message Communication Training Model as presented in this research were captured by task (six tasks per participant) and included: Word Count, Character Count, Task Performance Time, and Task Response. Task Response was the actual response to each of the six task prompts provided by the study participant. The Task Response was used to assign a Response Code (Table 7.1).

7.1 Response Code Assignment

A Response Code was assigned to all participant task responses. A sample of participant Task Responses (Appendix G) has been externally validated by two field experts currently working as practitioners in an Office of Emergency Management. Both field experts have senior positions within their organization. Moreover, the experts are part of ongoing preparedness planning, tabletop exercises, training, and actual field exercises.

The researcher compiled all responses for all six tasks (three pre-training and three post-training). After assessing the range of responses, four Response Codes were developed with one co-advisor of this research who is a writing assessment specialist. Together, the criterion of the four Response Codes (Table 7.1) was discussed in addition to the document-based interview for external validation.

Table 7.1 Initial Response Codes Assigned

Response Code	Response Code Level	Criteria Used
1	Low	Participant response did not answer both prompts for the task.
2	Low-medium	Participant response did not convey situational information. Participation response included ambiguity or uncertainty.
3	Medium-high	Participant response answered both prompts with some situational information or mixed verb tenses or content causing confusion.
4	High	Participant response answered both prompts with essential situational information.

7.2 Response Code Assessment

Table 7.1 reflects the criteria used for Response Code assessment. The Response Code criterion was adjusted based on expert opinion, keeping in mind situational awareness and goals towards the actual crisis. An important disclosure from the expert reviews is the importance of confirming the responder's current location (even though this may be redundant). Training module enhancements should provide some training or examples on situational awareness. Information regarding current weather conditions should be a push from the command and control coordinator rather than the responder advising the command and control coordinator current weather conditions in route. Today's technology and capabilities of a command and control coordinator/station should be able to compensate for some information exchange. This important disclosure needs further evaluation when volunteers with limited resources are involved in an event. For example, can a process be established for a command and control coordinator role when responders need to exchange minimal information? The other finding was the lack of importance on wordiness. The experts felt that having the essential information was more important than the focus on wordiness, however this has two implications going forward, especially on

intelligence-based or agent-based systems and collaboration where systems can intervene. Team of individuals who are unfamiliar with each other has implications.

7.3 Communication Episode Assessment

The pre-training and post-training paired episodes (Section 4.1) are presented in the order they were administered during the training application. The Speech Act Essential Rules and task complexity that corresponds to the paired communication episodes are presented in Table 7.2.

Table 7.2 Communication Episodes

Communication Episodes and Tasks		
Communication Episode	**Essential Rules**	**Task Complexity**
1 and 3	Confirm and Warn	Medium
2 and 4	Advise and Ask for	High
2b and 5	Thank and Request	Low

7.3.1 Communication Episodes 1 and 3

Beginning with communication episodes 1 & 3 (Table 7.3), with a significance of (.003 and .050 for $p<.05$) was supported for Word Count and Character Count. In terms of Task Performance Time and Response Code, the significance was just slightly over the ($p<.05$) with Task Performance Time at .051 and Response Code of .522.

Table 7.3 Episodes 1 & 3 Paired T-Test

Task Performance	Independent Sample T-Test					
Task 1 & 3	Mean		Standard Deviation			
	PreTrain	PostTrain	PreTrain	PostTrain	t	p
Word Count	22.84	17.62	12.58	7.28	3.12	.003**
Char Count	118.62	100.46	66.05	40.73	2.01	.050*
Task Performance Time	2:33	2:23	1:43	1:36	.68	.501
Task Response Code	3.02	2.94	.87	.91	.65	.522

* p< .05
** p< .01

7.3.2 Communication Episodes 2 and 4

Communication episodes 2 & 4 (Table 7.4), reflect significance of (.000, .000 for p<.001) was supported for Word Count and Task Performance Time. Significance of (.001 for p<.01) was supported for Task Response Code. Significance of (.017 for p<.05) was supported for Character Count.

Table 7.4 Episodes 2 & 4 Paired Samples

Task Performance	Independent Sample T-Test					
Task 2 & 4	Mean		Standard Deviation			
	PreTrain	PostTrain	PreTrain	PostTrain	t	p
Word Count	20.36	14.86	8.61	5.67	4.46	.000***
Char Count	109.80	94.22	44.86	32.11	2.48	.017*
Task Performance Time	2:48	1:49	1:54	1:11	3.86	.000***
Task Response Code	3.06	3.56	.94	.13	-3.63	.001**

* p< .05
** p< .01
*** p<.001

7.3.2 Communication Episodes 2b and 5

Communication episodes 2b & 5 (Table 7.5), reflect significance of (.004 for p<.01) was supported for Task Performance Time. Significance of (.000 for p <.001) was supported for Task Response Code. Word Count and Character Count did not reflect significance.

Table 7.5 Episodes 2b & 5 Paired Samples

Task Performance	Independent Sample T-Test					
Task 2b & 5	Mean		Standard Deviation			
	PreTrain	PostTrain	PreTrain	PostTrain	t	p
Word Count	10.14	8.50	6.61	3.62	1.81	.076
Char Count	60.54	51.80	40.21	21.80	1.60	.117
Task Performance Time	1:02	1:39	:55	1:20	-3.03	.004**
Task Response Code	2.36	3.32	2.36	3.32	-4.45	.000**

** p< .01

7.4 Task Response Paired Comparisons

In reviewing the progression of paired tasks, Paired Sample T-tests were run to compare the pre-training and post-training parallel task measures for the actual task response data collected in the MySQL database.

7.4.1 Word Count Paired Comparisons

The first observation when reviewing the paired pre-training and post-training tasks were the levels of significance for Word Count (Table 7.6). The highest task complexity showed the greatest significance at (.001 for p<.01) was supported. Medium task complexity showed significance at (.003 for p<.01) was supported.

Table 7.6 Word Count Significance Paired Comparisons

Task Complexity Comparisons and Word Count		
Communication Episode	**Task Complexity**	***p***
1 and 3	Medium	.003**
2 and 4	High	.001**
2b and 5	Low	.076

** p <.01

7.4.2 Character Count Paired Comparisons

Character Count (Table 7.7) parallels the findings of Word Count with the greatest significance at (.017 for p<.05) for the highest task complexity. Significance at (.050 for p<.05) was also supported for medium task complexity.

Table 7.7 Character Count Significance Paired Comparisons

Task Complexity Comparisons and Character Count		
Communication Episode	**Task Complexity**	***p***
1 and 3	Medium	.050*
2 and 4	High	.017*
2b and 5	Low	.117

* p <.05

7.4.3 Task Performance Time Paired Comparisons

Task Performance Time (Table 7.8) showed the greatest improvement for high complexity tasks with significance at (.000 for p<.001) was supported. The post-training Task Performance Time was after the study participant had received two modules of plain language training and also had previously performed 3 tasks increasing their ability to use the application more efficiently. Task 4 in particular was a task that involved a highly familiar incident (breathing difficulties of a citizen) to most participants. This was a change introduced after the pilot study and based on a recommendation from the committee and background of those who have some public health related background.

Table 7.8 Task Performance Time - Significance Paired Comparisons

Task Complexity Comparisons and Task Performance Time		
Communication Episode	**Task Complexity**	***p***
1 and 3	Medium	.501
2 and 4	High	.000***
2b and 5	Low	.004 **

** $p < .01$
*** $p<.001$

This change alone provides an indication that expert involvement for crisis scenario development can enhance the training experience leading to a finer Response Code granularity as future research. Tasks that precede Task 4 were related to situational awareness; the average community responder may not be familiar with or practice on a routine basis. It should also be noted that the two external experts who participated in the response validation also raised the importance for situational awareness when responding to a crisis. Moreover, one participant in the pre-pilot stage of this research questioned the wording of the task noting that "Describe one immediate need" was an unfamiliar instruction to him. Given the participant who questioned this instruction was testing the functionality of the application, is a student, and is also unfamiliar with crisis response of any form, the change that was applied to the final study was to "Warn about one immediate need." The experts who reviewed a sample of participant responses also questioned the use of "one immediate need" noting that in an emergency, the most important needs are associated with life safety. The appropriate terminology for community responders, especially those with no crisis response training may not readily recognize the meaning of life safety either. This is an important finding for future research and application enhancement leading us to future research that introduces some training on situational awareness and the context of the incident when responding.

7.4.4 Task Response Code Paired Comparisons

Response Code was discussed in Section 4.1 as a 4 point scale assigned for writing assessment that looks at the content of the task response. The lowest level task was the one showing the greatest significance at (.000, p<.001). The task with the highest task complexity also showed significance at (.001, p<.01). The task of medium complexity did not show significant change. The reason the improvement may be less is that Task 1 that began the scenario was a task that used email. All remaining tasks for the training application used a cell phone simulation that is not as familiar as email. Changing from email for Task 1 to Task 3 (paired task) cell phone task with one module of training may account for the lower significance. Email is recognized for fluency rather than syntactic language. It should also be noted that when reviewing a sample of responses with the field experts for validation, the field experts found it was difficult to rank (assign a Response Code) to Task 5, noting that there is really no difference for the majority of responses because the essential information contained in the task response.

Table 7.9 Response Code Paired Comparisons

Task Complexity Comparisons and Response Code		
Communication Episode	**Task Complexity**	***p***
1 and 3	Medium	.522
2 and 4	High	.001**
2b and 5	Low	.000***

** p <.001
*** p<.001

7.5 Task Response Code Linear Regression Model

Linear regression was used to generate a model with emphasis on the coded responses, and as a means to triangulate the actual task response measures with both the pre-training and post-training measures. A linear regression model associated with Perceived Learning was evaluated separately to confirm the findings in relation to the previous team-based learning constructs.

As a first step, a linear regression model was run for each of the six tasks using Response Code (Table 7.10) as the dependent variable. Each task model was produced with the same independent variables, moderating variables, and dependent variable. The dependent variable for all six task models is task response code (a 4 point scale described in Table 7.1). The independent variables were derived from the completion of each task response include: Word Count, Character Count, Task Performance time. The pre-training moderating variables are ICT Desktop Behavior, ICT SMS Usage Behavior, Writing Apprehension, and Writing Enjoyment. The post-training moderating variables are Perceived Enjoyment, Perceived Usefulness, Perceived, Readiness to Respond with SMS, and Perceived Writing Behavior.

The model (Table 7.11) overall did show significant results, however the R square is rather low (between 34% and 51% of the model explained depending on the task) for all episodes until either pre-training or post-training factors are included at which point, both dependent variables: Perceived Readiness and Perceived Task Performance were evaluated for model fit and significance. The R square with Response Code as the dependent variable from this study is approximately (r^2=.339, .425, .511, .406, .542, .403) indicating that another construct may be needed for the model of actual task performance

measures. Perceived Task Performance produced the greatest overall significance and R square including the most significance on a per construct association for the model (r^2=.84 for most tasks). The four measures of each Task Response were included (Word Count, Character Count, Task Performance Time, Response Code). Pre-training study participant measures (ICT Usage Behavior and writing characteristics) were then included to the regression model. Four pre-training moderating variables: ICT Desktop Behavior, ICT SMS Usage Behavior, Writing Apprehension, and Writing Enjoyment were predicted and show correlation with the individual task response measures. Four post-training moderating variables: Perceived Enjoyment, Perceived Usefulness, Perceived, Readiness to Respond with SMS, and Perceived Writing Behavior were predicted and show correlation with the individual task response measures.

Table 7.10 Linear Regression Model for Task Response Code

Dependent Variable	Independent Variables	Moderating Variables	
		Pre-Training Survey	Post-Training Survey
Response Code*	Word Count		
	Character Count		
	Performance Time		
		ICT Desktop Usage Behavior	
		ICT SMS Usage Behavior	
		Perceived Writing Apprehension	
		Perceived Writing Enjoyment	
			Perceived Enjoyment
			Perceived Usefulness
			Perceived Readiness to Respond with SMS
			Perceived Writing Behavior

* Response Code 1-4 based on the task response.

Beginning with the Task 1 Model (Table 7.11), which revealed results that are not significant at (r^2=.339,*df*=(11,47),F=1.678, p<.119), indicates that an alternate model may be needed to take into account writing fluency (no maximum character limit) in comparison to the other tasks that measured syntactic writing/language. The Task 1 Model accounted for 34% of the variance and was the only task that used email as the simulated device for the task response whereas tasks 2-5 all use a simulated device of a cell-phone. Task 1 is a pre-test measure and allowed the user to type freely (i.e., fluency) whereas the simulated cell-phone tasks all have a 160 character limit. This measure is important for our pre-training baseline as a way to identify the natural writing style of the study participant. Tasks 2, 3, and 5 reveal a level of significance of (p<.05). Task 2 (pre-training) was the first task that introduced the use of a simulated cell-phone and the 160 character limit. The variance explained for Task 2 is 44% (r^2=.435, *df*=(11,47), F=2.524, p<.018). Task 3, was the first training module introduced and produced a model with 41% (r^2=.406, *df*=(11,47), F=2.237, p<.034) of the variance explained. Task 3 is a post-training measure compared with Task 1 where the same two prompts are introduced (confirm and warn). Task 5, the last training task produced a model with 41% (r^2=.406, *df*=(11,47), F=2.237, p<.034) the variance explained.

Task 2b and Task 4 revealed a level of significance of p<.001. Task 2b is the last pre-training task with 51% of the variance explained with a significance of (r^2=.511, *df*=(11,47), F=3.414, p<.003). Task 4 reflected the highest variance explained for the model of all tasks at 54% (r^2=.542, *df*=(11,47), F=3.877, p<.001). Task 4 is a post-training task and was completed after two training modules had been introduced. The scenario of Task 4 also presents a more familiar response than the other tasks of this study, which

also related to situational awareness. Task 4 introduced an individual with breathing difficulties in lieu of situational components (Advise and Ask for).

Table 7.11 Linear Regression Model for Task Response Code

Task Response Code (Dependent Variable)	Speech Act	Paired Tasks		
		Task 1 & 3	Task 2 & 4	Task 2b & 5
Task 1 (word count, character count, task performance time)	Confirm and Warn	r^2=.323, *df*=(11.47), F=1.678, p<.119		
Task 2 (word count, character count, task performance time)	Advise and Ask for		r^2=.435, *df*=(11.47), F=2.524, p<.018	
Task 2b (word count, character count, task performance time)	Thank and Request			r^2=.511, *df*=(11.47), F=3.414, p<.003
Task 3 (word count, character count, task performance time)	Confirm and Warn	r^2=.406, *df*=(11.47), F=2.237, p<.034		
Task 4 (word count, character count, task performance time)	Advise and Ask for		r^2=.542, *df*=(11.47), F=3.877, p<.001	
Task 5 (word count, character count, task performance time)	Thank and Request			r^2=.403, *df*=(11.47), F=2.207, p<.036
Independent Variables: Task response word count, character count, task performance time. **Moderating Variables:** ICT Desktop Usage Behavior, ICT SMS Usage Behavior, Perceived Writing Apprehension, Perceived Writing Enjoyment, Perceived Enjoyment, Perceived Readiness to Respond, Perceived Writing Behavior, Perceived Usefulness.				

7.6 Perceived Task Performance Linear Regression Model

A linear regression model was produced for each task placing emphasis on Perceived Task Performance (Table 7.12) as the dependent variable. Each of the six tasks (three pre-training, three post-training) at present has its own model. Each Perceived Task Performance Model was produced with the same independent variables, moderating variables, and dependent variable. The dependent variable for all six task models is

Perceived Task Performance. The independent variables derived from the completion of each task response include: Word Count, Character Count, Task Performance Time, Task Response Code. The pre-training moderating variables are ICT Desktop Behavior, ICT SMS Usage Behavior, Writing Apprehension, and Writing Enjoyment. The post-training moderating variables are Perceived Enjoyment, Perceived Usefulness, Perceived, Readiness to Respond with SMS, and Perceived Writing Behavior.

Table 7.12 Linear Regression Model for Perceived Task Performance

Dependent Variable	Independent Variables	Moderating Variables	
	Task Performance	Pre-Training Survey	Post-Training Survey
Perceived Task Performance	Word Count		
	Character Count		
	Performance Time		
	Response Code		
		ICT Desktop Usage Behavior	
		ICT SMS Usage Behavior	
		Perceived Writing Apprehension	
		Perceived Writing Enjoyment	
			Perceived Enjoyment
			Perceived Usefulness
			Perceived Readiness to Respond with SMS
			Perceived Writing Behavior

The Task 1 Model (Table 7.13) which reveals significance has been met (r^2=.837,*df*=(12,47),F=14.981, p<.000) in contrast to the Task Response Code Model (Table 7.11) where the level of significance was not met. The Task 1 Model accounted for 84% of the variance even though the task uses email as the simulated device compared to tasks 2-5 that use a simulated device of a cell-phone. Tasks 2-5 also revealed a level of significance of (p<.000). Task 2 (pre-training) was the first task that introduced

the use of a simulated cell-phone and the 160 character limit. The variance explained for Task 2 was 84% (r^2=.843, *df*=(12,47), F=15.684, p<.000). Task 2b was the last pre-training task with 87% of the variance explained with a significance of (r^2=.858, *df*=(12,47), F=17.584, p<.000). Task 3, where the first training module was introduced produced a model with 86% (r^2=.867, *df*=(12,47), F=18.964, p<.000) of the variance explained. Task 3 was a post-training measure compared with Task 1 where the same two prompts were introduced (confirm and warn). Task 4 reflected the highest variance explained for the model of all tasks at 54% (r^2=.835, *df*=(12,47), F=14.767, p<.000). Task 4 was a post-training task after two training modules had been introduced. The scenario of Task 4 also presented a more familiar response than the other tasks of this study which were all related to situational awareness. Task 4 introduced an individual with breathing difficulties in lieu of situational components (Advise and Ask for). Task 5, produced a model with 84% of the variance explained (r^2=.835, *df*=(12,47), F=14.767, p<.000).

Table 7.13 Linear Regression Model for Perceived Task Performance

Perceived Task Performance (Dependent Variable)	Speech Act	Paired Tasks		
		Task 1 & 3	Task 2 & 4	Task 2b & 5
Task 1 (word count, character count, task performance time, response code)	Confirm and Warn	r^2=.837, *df*=(12,47), F=14.981, *p*<.000		
Task 2 (word count, character count, task performance time, response code)	Advise and Ask for		r^2=.843, *df*=(12.47), F=15.684, *p* <.000	
Task 2b (word count, character count, task performance time, response code)	Thank and Request			r^2=.867, *df*=(12.47), F=18.964, *p* <.0000
Task 3 (word count, character count, task performance time, response code)	Confirm and Warn	r^2=.858, *df*=(12,47), F=17.584, *p* <.000		
Task 4 (word count, character count, task performance time, response code)	Advise and Ask for		r^2=.842, *df*=(12.47), F=15.546, *p* <.000	
Task 5 (word count, character count, task performance time, response code)	Thank and Request			r^2=.835, *df*=(12.47), F=14.767, *p* <.000
Independent Variables: Task response word count, character count, task performance time, task response code. **Moderating Variables:** ICT Desktop Usage Behavior, ICT SMS Usage Behavior, Perceived Writing Apprehension, Perceived Writing Enjoyment, Perceived Enjoyment, Perceived Readiness to Respond, Perceived Writing Behavior, Perceived Usefulness.				

7.7 Task Response Data Analysis Summary

The Task Response data analysis findings presented in this section show promise for communication exchange protocols that aim to increase e-readiness for crisis response. Both actual task response measures and perceived performance measures reflect significant findings for pre-training and post-training paired comparisons depending on the tasks and associated measures.

CHAPTER 8

RESULTS FROM SURVEY HYPOTHESES

8.1 Hypotheses for Research Questions

The main hypotheses for this research are listed below and are associated with a research question listed in Section 3.1. Is there a significant difference in participant predisposition of ICT and writing before answering the research questions below? This is an important question to answer before addressing research questions because the Responder Role distribution did differ significantly between the Training Session Types (stimulus) of photo with audio and text with audio, the independent variables. .An ANOVA was run to compare means of the 6 factors for the Training Session Type. The results (Table 8.1) for all 6 constructs were above the .05 level of significance indicating there is no significant difference between groups for the two types of Training Session Type. As noted, the construct just above the .05 level of significance was ICT Usage Behavior of mobile technologies, which is an important construct for this research. All other constructs were well above the .05 level of significance.

Table 8.1 Independent Sample T-Test for Study Participant Profile

Participant Profile	Independent Sample T-Test					
	Mean		Standard Deviation			
	Photo	Text	Photo	Text	t	*p*
ICT Desktop Usage Behavior	3.67	3.87	.98	.416	-.95	.366
ICT SMS Usage Behavior	2.61	3.22	1.22	.99	-1.94	.058
Writing Behavior	3.30	3.21	1.01	.84	.34	.734
Writing Ability	3.38	3.68	.92	.99	-1.11	.271
Writing Enjoyment	3.44	3.52	.96	1.05	-.28	.779
Text-Message Attitude	3.47	3.81	.79	.70	-1.60	.116

8.1.1 Evaluating Perceived Task Performance

The research question below placed emphasis on the study participant's Perceived Task Performance once speech act with plain language training was introduced. To address the research question, the Training Session Type of the crisis scenario that is introduced to the study participant was reviewed to see if there was a significant difference between the photo with audio and text with audio Training Session Type of the crisis scenario. The results of the photo with audio Training Session Type were compared to the results of the text with audio Training Session Type and reflect a significant difference for Perceived Task Performance between photo with audio and text with audio (t= -2.858**, p=.006). However, the results reflect that study participants had significantly higher Perceived Task Performance codes for text with audio than photo with audio Training Session Type for each task scenario.

Perceived Task Performance Research Question

RQ1: How does Training Session Type affect responder's perception of Task Performance of speech act with plain language training?

Table 8.2 Independent Sample T-Test for Task Improvement Measures

Participant Profile	Independent Sample T-Test					
	Mean		Standard Deviation			
	Photo	Text	Photo	Text	t	*p*
Perceived Task Performance	3.76	4.26	.70	.52	-2.858	.006**
Pre-Training Response Code	2.91	2.72	.74	.65	.950	.347
Post-Training Response Code	3.23	3.32	.77	.61	-.475	.637

** p<.001

H1: Responders completing a scenario employing photo with audio SMS text-message training will have increased SMS text-message Perceived Task Performance after plain language training. That is, those responders receiving this scenario will have a greater sense of Perceived Task Performance than those responders completing a text with audio Training Session Type for plain language training.

H1 Not supported. The independent sample T-test shown in table 8.2 demonstrates that study participants reported significantly higher Perceived Task Performance for the text with audio (mean=3.76, 4.26) Training Session Type than study participants who received the photo with audio Training Session Type. Significance was found between the two groups ($p < .006$).

8.1.2 Evaluating Task Performance Response Codes

The research question below places emphasis on the study participant's task performance once speech act with plain language training was introduced. To address the research question, the Training Session Type of the crisis scenario that was introduced to the study participant was reviewed to see if there was a significant difference between the photo with audio and text with audio Training Session Type of the crisis scenario. The results (Table 8.2) of the photo with audio Training Session Type were compared to the results of the text with audio Training Session Type for both the pre-training responses and post-training responses and reflect no significant difference for the pre-training responses between photo with audio and text with audio ($t = .950$, $p = .347$). There was also no significant difference for the post-training response code between photo with audio and text with audio ($t = -.475$, $p = .637$). Task performance results for study participants pre-training response code reflected a higher mean for photo with audio (mean=2.90, 2.72) than text with audio. However, study participants post-training responses reflected a higher mean for text with audio (mean=3.23, 3.32) than photo with audio Training Session Type for each task scenario.

Task Performance Response Code Research Question

RQ2: How does Training Session Type affect responder's Task Performance?

H2: Responders completing a scenario employing photo with audio SMS text-message training will have decreased SMS text-message content uncertainty than responders taking the text with audio SMS text-message training (photo with audio or text with audio). That is, those responders receiving this scenario will have a greater sense of content certainty than those responders completing a text with audio Training Session Type for plain language training.

H2 Not supported. The independent sample T-test shown in Table 8.2 demonstrates that there was not a significant difference in pre-training response code between the photo with audio and text with audio (t=.95, *p*=.35), although task response code was higher for study participants who received the photo with audio scenario delivery (mean=2.91, 2.72) than study participants who received text with audio.

The independent sample T-test shown in table 8.3 demonstrates that there was not a significant difference in post-training response code between the photo with audio and text with audio (t= -.48, *p*=.64), task response code was also lower for study participants who received the photo with audio scenario delivery (mean=3.23, 3.32) than study participants who received text with audio.

8.1.3 Evaluating ICT Usage Behavior and Perceived Task Performance

The research question below, placed emphasis on the study participant's information communication technology (ICT) usage behavior and the effect on Perceived Task Performance once speech act with plain language training had been introduced. To address the research question, the Training Session Type introduced to the study participant was reviewed to see if there was a significant difference between the photo with audio and text with audio Training Session Type of the crisis scenario in relation to ICT Usage Behavior skills for Perceived Task Performance. The results (Table 8.3) of the photo with audio Training Session Type indicated no significant correlation between ICT Desktop Usage Behavior and Perceived Task Performance (.377) compared to the results of the text with audio (Table 8.4) Training Session Type and Perceived Task Performance (.275). The results (Table 8.3) of the phone with audio Training Session Type indicate a

significant correlation between ICT SMS Usage Behavior and Perceived Task Performance (.475*). The results of the text with audio (Table 8.4) Training Session Type and Perceived Task Performance (.280) were not significant.

ICT Usage Behavior and Perceived Task Performance Research Question

RQ3: Do responder's with higher ICT Usage Behavior perceive higher Task Performance, after plain language training, for photo with audio than text with audio Training Session Type?

Table 8.3 Photo with Audio ICT Usage Behavior Skills and Perceived Task Performance

	Photo with Audio Correlations		
Task Improvement	**ICT Desktop Usage Behavior**	**ICT SMS Usage Behavior**	**Perceived Task Performance**
ICT Desktop Usage Behavior	_	.700**	.377
ICT SMS Usage Behavior	.700**	-	.475*
Perceived Task Performance	.377	.475*	_

*p<.05
**p<.01

H3a: Responders completing a scenario employing photo with audio SMS text-message training and demonstrating higher ICT Desktop Usage Behavior will have increased Perceived Task Performance than those responders with lower ICT Desktop Usage Behavior.

H3a Not Supported. The bivariate correlations shown in Table 8.3 demonstrate that there was not a significant correlation between ICT Desktop Usage Behavior and Perceived Task Performance for photo with audio. The results were not significant at .377, p<.05.

H3b: Responders completing a scenario employing text with audio SMS text-message training and demonstrating higher ICT Desktop Usage Behavior will have increased SMS text-message Perceived Task Performance than those responders with lower ICT Desktop Usage Behavior.

H3b Not Supported. The bivariate correlations shown in Table 8.4 demonstrate that there was not a significant correlation between ICT Desktop Usage Behavior and Perceived Task Performance for photo with audio. The results were not significant at .275, p<.05.

Table 8.4 Text with Audio ICT Usage Behavior and Perceived Task Performance Correlations

	Text with Audio Correlations		
Task Improvement	**ICT Desktop Usage Behavior**	**ICT SMS Usage Behavior**	**Perceived Task Performance**
ICT Desktop Usage Behavior	–	.424*	.275
ICT SMS Usage Behavior	.424*	–	.280
Perceived Task Performance	.275	.280	–

*p<.05

H4a: Responders taking photo with audio SMS text-message training and have higher ICT SMS Usage Behavior will have increased Perceived Task Performance than responders taking the text with audio SMS text-message training with lower ICT SMS Usage Behavior.

H4a Supported. The bivariate correlations shown in Table 8.3 demonstrate that there was a significant correlation between ICT SMS Usage Behavior and Perceived Task Performance for photo with audio. The results were significant at .424, p<.05 for ICT SMS Usage Behavior and Perceived Task Performance for photo with audio.

H4b: Responders taking text with audio SMS text-message training and have higher ICT SMS Usage Behavior will have increased Perceived Task Performance than responders taking the text with audio SMS text-message training with lower ICT SMS Usage Behavior.

H4b Supported. The bivariate correlations shown in Table 8.4 demonstrate that there was not a significant correlation between ICT SMS Usage Behavior and Perceived Task Performance for photo with audio. The results were significant at .280, p<.05 for ICT SMS Usage Behavior and Perceived Task Performance for photo with audio.

Discussion: A significant correlation is shown (Table 8.3) for ICT Desktop Usage Behavior and ICT SMS Usage Behavior at .700, p<.01 for photo with audio Training Session Type. A significant correlation is also shown (Table 8.4) for ICT Desktop Usage Behavior and ICT SMS Usage Behavior at .424, p<.05 for text with audio Training Session Type.

8.1.4 Evaluating Pre-Training Writing Behavior and Perceived Task Performance

The research question below placed emphasis on the study participant's pre-training Writing Behavior in relation to task performance once speech act with plain language training was introduced. To address the research question, the Training Session Type introduced to the study participant was reviewed to see if there was a significant difference between the pre-training Writing Behaviors within the photo with audio Training Session Type in relation to Perceived Task Performance. The results (Table 8.5) of the photo with audio Training Session Type indicate no significant correlation between Writing Behavior and Perceived Task Performance (.375) compared to the results of the text with audio (Table 8.6) Training Session Type and Perceived Task Performance (.310). The results (Table 8.5) of the phone with audio Training Session Type indicate no significant correlation between writing apprehension and Perceived Task Performance (.253). The results of the text with audio (Table 8.6) Training Session Type and Perceived Task Performance (.103) were not significant.

Pre-Training Writing Behavior and Perceived Task Performance Research Question

RQ4: Do responder's with stronger Writing Behavior perceive higher Task Performance, after plain language training, for photo with audio than text with audio Training Session Type?

Table 8.5 Photo with Audio Writing Behavior and Perceived Task Performance

	Photo with Audio Correlations			
Task Improvement	**Writing Behavior**	**Writing Apprehension**	**Writing Enjoyment**	**Perceived Task Performance**
Writing Behavior	–	.148	.531**	.375
Writing Apprehension	.148	-	.070	.253
Writing Enjoyment	.531**	.070	–	.327
Perceived Task Performance	.375	.253	.327	–

**p<.01

H5: Responders taking photo with audio SMS text-message training and have improved Writing Behavior will have increased SMS text-message Perceived Task Performance than responders taking the text with audio SMS text-message training with increased Writing Behavior.

H5 Not Supported. The results were not significant at .375 for photo with audio in comparison to text with audio at .310 respectively.

Table 8.6 Text with Audio Writing Behavior and Perceived Task Performance

	Text with Audio Correlations			
Task Improvement	**Writing Behavior**	**Writing Apprehension**	**Writing Enjoyment**	**Perceived Task Performance**
Writing Behavior	–	-.141	-.426*	.310
Writing Apprehension	-.141	–	.329	.103
Writing Enjoyment	.426*	.329	–	-.079
Perceived Task Performance	.310	.103	-.079	–

*p<.05

H6: Responders taking photo with audio SMS text-message training and have decreased writing apprehension will have increased SMS text-message Perceived Task Performance than responders taking the text with audio SMS text-message training with decreased writing apprehension.

H6 Not Supported. The results were not significant at .253 for photo with audio in comparison to text with audio at .103 respectively.

H7: Responders taking photo with audio SMS text-message training and have increased Writing Enjoyment will have increased SMS text-message Perceived Task Performance than responders taking the text with audio SMS text-message training with increased Writing Enjoyment.

H7 Not Supported. The results were not significant at .327 for photo with audio in comparison to text with audio at -.079 respectively.

Discussion: A significant correlation is shown (Table 8.5) for Writing Behavior and Writing Enjoyment at .531, p<.01 for photo with audio Training Session Type. A significant correlation is also shown (Table 8.6) for Writing Behavior and Writing Enjoyment at -.426, p<.05 for text with audio Training Session Type.

8.1.5 Evaluating ICT Usage Behavior and Perceived Intention to Use

The research question below placed emphasis on the study participant's ICT Usage Behavior in relation to Perceived Intention to Use once speech act with plain language training was introduced. To address the research question, the Training Session Type introduced to the study participant is reviewed to see if there was a significant difference between the ICT Usage Behavior within the photo with audio Training Session Type in relation to Perceived Intention to Use. The results (Table 8.7) of the photo with audio Training Session Type indicate no significant correlation between ICT Desktop Usage Behavior and Perceived Intention to Use (-.028) compared to the results of the text with audio (Table 8.8) Training Session Type and Perceived Intention to Use (.285). The results (Table 8.7) of the phone with audio Training Session Type indicate a significant correlation between ICT SMS Usage Behavior and Perceived Intention to Use (.451*). The results of the text with audio (Table 8.8) Training Session Type and Perceived Task Performance (.193) were not significant.

ICT Usage Behavior and Perceived Intention to Use Research Question

RQ5: Do responder's with higher ICT Usage Behavior perceive higher Intention to Use SMS Text-Messaging, after plain language training, for photo with audio than text with audio Training Session Type?

Table 8.7 Photo with Audio and Perceived Intention to Use

	Photo with Audio Correlations		
Task Improvement	**ICT Desktop Usage Behavior**	**ICT SMS Usage Behavior**	**Perceived Intention to Use**
ICT Desktop Usage Behavior	–	.700**	-.028
ICT SMS Usage Behavior	.700**	–	.451*
Perceived Intention to Use	-.028	.451*	–

*p<.05
**p<.01

H8: Higher ICT Desktop Usage Behavior will increase responder's Perceived Intention to Use from SMS text-messaging training in preparation for crisis response once SMS text-message training has been completed.

H8 Not Supported. The results were not significant at -.028.

Table 8.8 Text with Audio and Perceived Intention to Use

	Text with Audio Correlations		
Task Improvement	**ICT Desktop Usage Behavior**	**ICT SMS Usage Behavior**	**Perceived Intention to Use**
ICT Desktop Usage Behavior	–	.424*	.285
ICT SMS Usage Behavior	.424*	–	.193
Perceived Intention to Use	.285	.193	–

*p<.05

H9: Higher ICT Mobile Device Usage Behavior will increase responders' Perceived Intention to Use SMS text-messaging in preparation for crisis response.

H9 Not Supported. The results were not significant at .193.

8.1.6 Evaluating Perceived Usefulness, Perceived Task Performance and Perceived Readiness

The research question below placed emphasis on the study participant's Perceived Task Performance in relation to Perceived Readiness to Respond once speech act with plain language training was introduced. To address the research question, the Training Session Type introduced to the study participant was reviewed to see if there was a significant difference between the Perceived Task Performance within the photo with audio Training Session Type in relation to Perceived Readiness. The results (Table 8.9) of the photo with audio Training Session Type indicate no significant correlation between Perceived Task Performance and Perceived Readiness to Respond (.122) compared to the results of the text with audio (Table 8.10) Training Session Type and Perceived Readiness to Respond (.285). The results (Table 8.9) of the phone with audio Training Session Type indicate a significant correlation between Perceived Task Performance and Perceived Readiness to

Respond (.451*). The results of the text with audio (Table 8.10) Training Session Type for Perceived Task Performance and Perceived Readiness (.361) were not significant.

Perceived Readiness Research Question

RQ6: Do responder's with higher Perceived Task Performance perceive higher Perceived SMS Text-Message Response Readiness, after plain language training, for photo with audio than text with audio Training Session Type?

Table 8.9 Photo with Audio Perceived Readiness

	Photo with Audio Correlations		
Task Improvement	**Perceived Usefulness**	**Perceived Task Performance**	**Perceived Readiness**
Perceived Usefulness	–	.854**	.122
Perceived Task Performance	.854**	–	.361
Perceived Readiness	.122	.361	–

**p<.01

H10a: Responders completing a scenario employing photo with audio SMS text-message training and increased Perceived Task Performance will have increased responder perceived readiness than responders with decreased task performance. That is, those responders receiving this scenario who have increased task performance will have a greater sense of perceived readiness than those responders completing plain language training with decreased task performance.

H10a Not supported. The bivariate correlations shown in Table 8.8 demonstrate that there was not a significant correlation between Perceived Task Performance and Perceived Readiness for photo with audio. The results were not significant at .361for Perceived Task Performance and Perceived Readiness for photo with audio.

H10b: Responders completing a scenario employing text with audio SMS text-message training and increased Perceived Task Performance will have increased responder perceived readiness than responders with decreased task performance. That is, those responders receiving this scenario who have increased task performance will have a greater sense of perceived readiness than those responders completing plain language training with decreased task performance.

H10b Not supported. The bivariate correlations shown in Table 8.9 demonstrate that there was not a significant correlation between Perceived Usefulness and Perceived Readiness for photo with audio. The results were not significant at .361for Perceived Task Performance and Perceived Readiness for text with audio.

Table 8.10 Text with Audio Perceived Readiness

	Text with Audio Correlations		
Task Improvement	**Perceived Usefulness**	**Perceived Task Performance**	**Perceived Readiness**
Perceived Usefulness	–	.688**	.530**
Perceived Task Performance	.688**	–	.361
Perceived Readiness	.530**	.676**	–

**p<.01

H11a: Responders completing a scenario employing photo with audio SMS text-message training and increased Perceived Usefulness will have increased responder perceived readiness than responders with decreased task performance. That is, those responders receiving this scenario who have increased task performance will have a greater sense of perceived readiness than those responders completing plain language training with decreased Perceived Usefulness.

H11a Not supported. The bivariate correlations shown in Table 8.9 demonstrate that there was not a significant correlation between Perceived Usefulness and Perceived Readiness for photo with audio. The results were not significant at .361for Perceived Task Performance and Perceived Readiness for photo with audio.

H11b: Responders completing a scenario employing text with audio SMS text-message training and increased Perceived Usefulness will have increased responder perceived readiness than responders with decreased task performance. That is, those responders receiving this scenario who have increased task performance will have a greater sense of perceived readiness than those responders completing plain language training with decreased Perceived Usefulness.

H11b Supported. The bivariate correlations shown in Table 8.10 demonstrate that there was a significant correlation between Perceived Usefulness and Perceived Readiness for photo with audio. The results were significant at .530, $p<.01$for Perceived Usefulness and Perceived Readiness for text with audio.

8.1.7 Evaluating Perceived Motivation, Perceived Enjoyment, and Perceived Learning

The research question below placed emphasis on the study participant's Perceived Motivation and Enjoyment in relation to Perceived Learning once speech act with plain language training was introduced. To address the research question, the Training Session Type introduced to the study participant was reviewed to see if there was a significant

difference between the Perceived Motivation and Enjoyment within the photo with audio Training Session Type in relation to Perceived Learning. The results (Table 8.11) of the photo with audio Training Session Type indicate no significant correlation between Perceived Motivation, Enjoyment and Perceived Learning (.122) compared to the results of the text with audio (Table 8.12) Training Session Type and Perceived Readiness to Respond (.285). The results (Table 8.11) of the photo with audio Training Session Type indicated a significant correlation between Perceived Motivation, Enjoyment, and Perceived Learning (.451*).

Perceived Motivation and Enjoyment Research Question

RQ7: Do responder's with higher ICT Usage Behavior perceive higher Motivation, Enjoyment and Learning, after plain language training, for photo with audio than text with audio Training Session Type?

Table 8.11 Photo with Audio Perceived Learning

	Correlations			
Task Improvement	**ICT Desktop Usage Behavior**	**ICT SMS Usage Behavior**	**Perceived Motivation**	**Perceived Enjoyment**
ICT Desktop Usage Behavior	–	.700**	.429*	.262
ICT SMS Usage Behavior	.700**	–	.352	.315
Perceived Motivation	.429*	.352	–	.677**
Perceived Enjoyment	.262	.315	.677**	–

*p<.05
** p<.01

H12a: Responders completing a scenario employing photo with audio SMS text-message training and increased perceived ICT Desktop Usage Behavior will have increased Perceived Motivation than responders with decreased ICT Desktop Usage Behavior. That is, those responders receiving this scenario who have increased ICT Desktop Usage Behavior will have a greater sense of Perceived Motivation than those responders completing plain language training with decreased ICT Desktop Usage Behavior.

H12a Supported. The results were significant at .429, p<.05.

H12b: Responders completing a scenario employing text with audio SMS text-message training and increased perceived ICT Desktop Usage Behavior will have increased Perceived Enjoyment than responders with decreased ICT Desktop Usage Behavior. That is, those responders receiving this scenario who have increased ICT Desktop Usage Behavior will have a greater sense of Perceived Enjoyment than those responders completing plain language training with decreased ICT Desktop Usage Behavior.

H12b Not Supported. The results were not significant at .262.

H13a: Responders completing a scenario employing photo with audio SMS text-message training and increased perceived ICT SMS Usage Behavior will have increased Perceived Motivation than responders with decreased ICT Desktop Usage Behavior. That is, those responders receiving this scenario who have increased ICT SMS Usage Behavior will have a greater sense of Perceived Motivation than those responders completing plain language training with decreased ICT SMS Usage Behavior.

H13a Not supported. The results were not significant at .352.

H13b: Responders completing a scenario employing text with audio SMS text-message training and increased perceived ICT SMS Usage Behavior will have increased Perceived Enjoyment than responders with decreased ICT Desktop Usage Behavior. That is, those responders receiving this scenario who have increased ICT SMS Usage Behavior will have a greater sense of Perceived Enjoyment than those responders completing plain language training with decreased ICT SMS Usage Behavior.

H13b Not supported. The results were significant at .315.

Table 8.12 Text with Audio Perceived Learning

	Correlations			
Task Improvement	**ICT Desktop Usage Behavior**	**ICT SMS Usage Behavior**	**Perceived Motivation**	**Perceived Enjoyment**
ICT Desktop Usage Behavior	–	.424*	.264	.290
ICT SMS Usage Behavior	.424*	–	-.146	.085
Perceived Motivation	.264	-.146	–	.663**
Perceived Enjoyment	.290	.085	.663**	–

*p<.05
** p<.01

Table 8.13 Photo with Audio Perceived Learning

	Correlations		
Task Improvement	**Perceived Motivation**	**Perceived Enjoyment**	**Perceived Learning**
Perceived Motivation	–	.677**	.779**
Perceived Enjoyment	.677**	–	.557**
Perceived Learning	.779**	.557**	–

**p<.01

Table 8.14 Text with Audio Perceived Learning

	Correlations		
Task Improvement	**Perceived Motivation**	**Perceived Enjoyment**	**Perceived Learning**
Perceived Motivation	–	.641**	.494*
Perceived Enjoyment	.641**	–	.302
Perceived Learning	.494*	.302	–

*p<.05
**p<.01

H14a: Responders completing a scenario employing photo with audio SMS text-message training and increased Perceived Motivation will have increased Perceived Learning than responders with decreased Perceived Motivation. That is, those responders receiving this scenario who have increased Perceived Motivation will have a greater sense of Perceived Learning than those responders completing plain language training with decreased Perceived Motivation.

H14a Supported. The results were significant at .779 for p<.01.

H14b: Responders completing a scenario employing text with audio SMS text-message training and increased Perceived Motivation will have increased Perceived Learning than responders with decreased Perceived Motivation. That is, those responders receiving this scenario who have increased Perceived Motivation will have a greater sense of Perceived Learning than those responders completing plain language training with decreased Perceived Motivation.

H14b Supported. The results were significant at .494 for p<.05.

H15a: Responders completing a scenario employing photo with audio SMS text-message training and increased Perceived Enjoyment will have increased Perceived Learning than responders with decreased Perceived Enjoyment. That is, those responders receiving this scenario who have increased Perceived Enjoyment will have a greater sense of Perceived Learning than those responders completing plain language training with decreased Perceived Enjoyment.

H15a Supported. The results were significant at .557 for p<.01.

H15b: Responders completing a scenario employing text with audio SMS text-message training and increased Perceived Enjoyment will have increased Perceived Learning than responders with decreased Perceived Enjoyment. That is, those responders receiving this scenario who have increased Perceived Enjoyment will have a greater sense of Perceived Learning than those responders completing plain language training with decreased Perceived Enjoyment.

H15b Supported. The results were not significant at .302.

8.2 Summarized Hypotheses

Table 8.15 provides a summary of all hypotheses for this study and also the findings of each hypotheses.

Table 8.15 Summarized Hypotheses

Question	Categories
H1: Responders completing a scenario employing photo with audio SMS text-message training will have increased SMS text-message Perceived Task Performance after plain language training. That is, those responders receiving this scenario will have a greater sense of Perceived Task Performance than those responders completing a text with audio Training Session Type for plain language training.	**H1 Not supported.** The independent sample T-test shown in table 8.2 demonstrates that study participants reported significantly higher Perceived Task Performance for the text with audio (mean=3.76, 4.26) Training Session Type than study participants who received the photo with audio Training Session Type. Significance was found between the two groups (p< .006).
H2: Responders completing a scenario employing photo with audio SMS text-message training will have decreased SMS text-message content uncertainty than responders taking the text with audio SMS text-message training. That is, those responders receiving this scenario will have a greater sense of content certainty than those responders completing a text with audio Training Session Type for plain language training.	**H2 Not supported.** The independent sample T-test shown in Table 8.2 demonstrates that there was not a significant difference in pre-training response code between the photo with audio and text with audio (t=.95, *p*=.357), although task response code was higher for study participants who received the photo with audio scenario delivery (mean=2.91, 2.72) than study participants who received text with audio.
H3a: Responders completing a scenario employing photo with audio SMS text-message training and demonstrating higher ICT Desktop Usage Behavior will have increased SMS text-message Perceived Task Performance than those responders with lower ICT Desktop Usage Behavior. **H3b**: Responders completing a scenario employing text with audio SMS text-message training and demonstrating higher ICT Desktop Usage Behavior will have increased SMS text-message Perceived Task Performance than those responders with lower ICT Desktop Usage Behavior.	**H3a Not Supported.** The bivariate correlations shown in Table 8.3 demonstrate that there was not a significant correlation between ICT Desktop Usage Behavior and Perceived Task Performance for photo with audio. The results were not significant at .387, p<.05. **H3b Not Supported.** The bivariate correlations shown in Table 8.4 demonstrate that there was not a significant correlation between ICT Desktop Usage Behavior and Perceived Task Performance for photo with audio. The results were not significant at .28, p<.05.

Table 8.15 Summarized Findings (continued)

Question	Categories
H4a: Responders taking photo with audio SMS text-message training and have higher ICT SMS Usage Behavior will have increased SMS text-message Perceived Task Performance than responders taking the text with audio SMS text-message training with lower ICT SMS Usage Behavior.	**H4a Supported.** The bivariate correlations shown in Table 8.3 demonstrate that there was a significant correlation between ICT SMS Usage Behavior and Perceived Task Performance for photo with audio. The results were significant at .424, $p<.05$ for ICT SMS Usage Behavior and Perceived Task Performance for photo with audio.
H4b: Responders taking text with audio SMS text-message training and have higher ICT SMS Usage Behavior will have increased SMS text-message Perceived Task Performance than responders taking the photo with audio SMS text-message training with lower ICT SMS Usage Behavior.	**H4b Supported.** The bivariate correlations shown in Table 8.4 demonstrate that there was not a significant correlation between ICT SMS Usage Behavior and Perceived Task Performance for photo with audio. The results were significant at .28, $p<.05$ for ICT SMS Usage Behavior and Perceived Task Performance for photo with audio.
H5: Responders taking photo with audio SMS text-message training and have improved Writing Behavior will have increased SMS text-message Perceived Task Performance than responders taking the text with audio SMS text-message training with increased Writing Behavior.	**H5 Not Supported.** The results were not significant at .375 for photo with audio in comparison to text with audio at .310 respectively.
H6: Responders taking photo with audio SMS text-message training and have decreased writing apprehension will have increased SMS text-message Perceived Task Performance than responders taking the text with audio SMS text-message training with decreased writing apprehension.	**H6 Not Supported.** The results were not significant at .253 for photo with audio in comparison to text with audio at .103 respectively.
H7: Responders taking photo with audio SMS text-message training and have increased Writing Enjoyment will have increased SMS text-message Perceived Task Performance than responders taking the text with audio SMS text-message training with increased Writing Enjoyment.	**H7 Not Supported.** The results were not significant at .327 for photo with audio in comparison to text with audio at -.079 respectively.
H8: Higher ICT Desktop Usage Behavior will increase responder's Perceived Intention to Use from SMS text-messaging training in preparation for crisis response once SMS text-message training has been completed.	**H8 Not Supported.** The results were not significant at -.028.
H9: Higher ICT Mobile Device Usage Behavior will increase responders' Perceived Intention to Use SMS text-messaging in preparation for crisis response.	**H9 Not Supported.** The results were not significant at .193.

Table 8.15 Summarized Findings (continued)

Question	Categories
H10a: Responders completing a scenario employing photo with audio SMS text-message training and increased Perceived Task Performance will have increased responder perceived readiness than responders with decreased task performance. That is, those responders receiving this scenario who have increased task performance will have a greater sense of perceived readiness than those responders completing plain language training with decreased task performance.	**H10a Not supported.** The bivariate correlations shown in Table 8.8 demonstrate that there was not a significant correlation between Perceived Task Performance and Perceived Readiness for photo with audio. The results were not significant at .361for Perceived Task Performance and Perceived Readiness for photo with audio.
H10b: Responders completing a scenario employing text with audio SMS text-message training and increased Perceived Task Performance will have increased responder perceived readiness than responders with decreased task performance. That is, those responders receiving this scenario who have increased task performance will have a greater sense of perceived readiness than those responders completing plain language training with decreased task performance.	**H10b Not supported.** The bivariate correlations shown in Table 8.9 demonstrate that there was not a significant correlation between Perceived Usefulness and Perceived Readiness for photo with audio. The results were not significant at .361for Perceived Task Performance and Perceived Readiness for text with audio.
H11a: Responders completing a scenario employing photo with audio SMS text-message training and increased Perceived Usefulness will have increased responder perceived readiness than responders with decreased task performance. That is, those responders receiving this scenario who have increased task performance will have a greater sense of perceived readiness than those responders completing plain language training with decreased Perceived Usefulness.	**H11a Not supported.** The bivariate correlations shown in Table 8.9 demonstrate that there was not a significant correlation between Perceived Usefulness and Perceived Readiness for photo with audio. The results were not significant at .361for Perceived Task Performance and Perceived Readiness for photo with audio.
H11b: Responders completing a scenario employing text with audio SMS text-message training and increased Perceived Usefulness will have increased responder perceived readiness than responders with decreased task performance. That is, those responders receiving this scenario who have increased task performance will have a greater sense of perceived readiness than those responders completing plain language training with decreased Perceived Usefulness.	**H11b Supported.** The bivariate correlations shown in Table 8.10 demonstrate that there was a significant correlation between Perceived Usefulness and Perceived Readiness for photo with audio. The results were significant at .530, $p<.01$for Perceived Usefulness and Perceived Readiness for text with audio.

Table 8.15 Summarized Findings (continued)

Question	Categories
H12a: Responders completing a scenario employing photo with audio SMS text-message training and increased perceived ICT Desktop Usage Behavior will have increased Perceived Motivation than responders with decreased ICT Desktop Usage Behavior. That is, those responders receiving this scenario who have increased ICT Desktop Usage Behavior will have a greater sense of Perceived Motivation than those responders completing plain language training with decreased ICT Desktop Usage Behavior.	**H12a Supported.** The results were significant at .429, $p<.05$.
H12b: Responders completing a scenario employing text with audio SMS text-message training and increased perceived ICT Desktop Usage Behavior will have increased Perceived Enjoyment than responders with decreased ICT Desktop Usage Behavior. That is, those responders receiving this scenario who have increased ICT Desktop Usage Behavior will have a greater sense of Perceived Enjoyment than those responders completing plain language training with decreased ICT Desktop Usage Behavior.	**H12b Not Supported.** The results were not significant at .262.
H13a: Responders completing a scenario employing photo with audio SMS text-message training and increased perceived ICT SMS Usage Behavior will have increased Perceived Motivation than responders with decreased ICT Desktop Usage Behavior. That is, those responders receiving this scenario who have increased ICT SMS Usage Behavior will have a greater sense of Perceived Motivation than those responders completing plain language training with decreased ICT SMS Usage Behavior.	**H13a Not supported.** The results were not significant at .352.
H13b: Responders completing a scenario employing text with audio SMS text-message training and increased perceived ICT SMS Usage Behavior will have increased Perceived Enjoyment than responders with decreased ICT Desktop Usage Behavior. That is, those responders receiving this scenario who have increased ICT SMS Usage Behavior will have a greater sense of Perceived Enjoyment than those responders completing plain language training with decreased ICT SMS Usage Behavior.	**H13b Not supported.** The results were significant at .315.

Table 8.15 Summarized Findings (continued)

Question	Categories
H14a: Responders completing a scenario employing photo with audio SMS text-message training and increased Perceived Motivation will have increased Perceived Learning than responders with decreased Perceived Motivation. That is, those responders receiving this scenario who have increased Perceived Motivation will have a greater sense of Perceived Learning than those responders completing plain language training with decreased Perceived Motivation.	**H14a** **Supported.** The results were significant at .779 for $p<.01$.
H14b: Responders completing a scenario employing text with audio SMS text-message training and increased Perceived Motivation will have increased Perceived Learning than responders with decreased Perceived Motivation. That is, those responders receiving this scenario who have increased Perceived Motivation will have a greater sense of Perceived Learning than those responders completing plain language training with decreased Perceived Motivation.	**H14b** **Supported.** The results were significant at .494 for $p<.05$.
H15a: Responders completing a scenario employing photo with audio SMS text-message training and increased Perceived Enjoyment will have increased Perceived Learning than responders with decreased Perceived Enjoyment. That is, those responders receiving this scenario who have increased Perceived Enjoyment will have a greater sense of Perceived Learning than those responders completing plain language training with decreased Perceived Enjoyment.	**H15a** **Supported.** The results were significant at .557 for $p<.01$.
H15b: Responders completing a scenario employing text with audio SMS text-message training and increased Perceived Enjoyment will have increased Perceived Learning than responders with decreased Perceived Enjoyment. That is, those responders receiving this scenario who have increased Perceived Enjoyment will have a greater sense of Perceived Learning than those responders completing plain language training with decreased Perceived Enjoyment.	**H15b** **Supported.** The results were not significant at .302.

Table 8.16 Correlations for Factor Loadings of Post-Training Survey

Correlations [a]

		Perc_learn	Perc_motivate	Perc_enjoy	Perc_intent	Perc_useful	Perc_taskperf	Perc_write_behave	Perc_readiness	Perc_wability
Perc_learn	Pearson Correlation	1	.631**	.418**	.393**	.263	.207	.046	-.195	-.240
	Sig. (2-tailed)		.000	.003	.005	.068	.153	.755	.178	.097
	Sum of Squares and Cross-products	18.005	11.286	7.747	10.005	4.507	4.304	.934	-5.064	-6.414
	Covariance	.375	.235	.161	.208	.094	.090	.019	-.106	-.134
Perc_motivate	Pearson Correlation	.631**	1	.658**	.444**	.492**	.480**	.140	-.019	-.089
	Sig. (2-tailed)	.000		.000	.001	.000	.000	.338	.894	.545
	Sum of Squares and Cross-products	11.286	17.745	12.102	11.216	8.369	9.875	2.834	-.501	-2.352
	Covariance	.235	.370	.252	.234	.174	.206	.059	-.010	-.049
Perc_enjoy	Pearson Correlation	.418**	.658**	1	.454**	.600**	.626**	.126	.236	.014
	Sig. (2-tailed)	.003	.000		.001	.000	.000	.388	.103	.926
	Sum of Squares and Cross-products	7.747	12.102	19.070	11.902	10.563	13.364	2.650	6.287	.374
	Covariance	.161	.252	.397	.248	.220	.278	.055	.131	.008
Perc_intent	Pearson Correlation	.393**	.444**	.454**	1	.324*	.356*	.066	.120	.061
	Sig. (2-tailed)	.005	.001	.001		.023	.012	.654	.412	.675
	Sum of Squares and Cross-products	10.005	11.216	11.902	35.995	7.849	10.450	1.895	4.393	2.320
	Covariance	.208	.234	.248	.750	.164	.218	.039	.092	.048
Perc_useful	Pearson Correlation	.263	.492**	.600**	.324*	1	.815**	.126	.403**	.139
	Sig. (2-tailed)	.068	.000	.000	.023		.000	.387	.004	.339
	Sum of Squares and Cross-products	4.507	8.369	10.563	7.849	16.278	16.068	2.452	9.924	3.548
	Covariance	.094	.174	.220	.164	.339	.335	.051	.207	.074
Perc_taskperf	Pearson Correlation	.207	.480**	.626**	.356*	.815**	1	.218	.565**	.353*
	Sig. (2-tailed)	.153	.000	.000	.012	.000		.132	.000	.013
	Sum of Squares and Cross-products	4.304	9.875	13.364	10.450	16.068	23.899	5.140	16.861	10.874
	Covariance	.090	.206	.278	.218	.335	.498	.107	.351	.227
Perc_write_behave	Pearson Correlation	.046	.140	.126	.066	.126	.218	1	-.072	-.071
	Sig. (2-tailed)	.755	.338	.388	.654	.387	.132		.624	.629
	Sum of Squares and Cross-products	.934	2.834	2.650	1.895	2.452	5.140	23.173	-2.108	-2.150
	Covariance	.019	.059	.055	.039	.051	.107	.483	-.044	-.045
Perc_readiness	Pearson Correlation	-.195	-.019	.236	.120	.403**	.565**	-.072	1	.469**
	Sig. (2-tailed)	.178	.894	.103	.412	.004	.000	.624		.001
	Sum of Squares and Cross-products	-5.064	-.501	6.287	4.393	9.924	16.861	-2.108	37.290	18.046
	Covariance	-.106	-.010	.131	.092	.207	.351	-.044	.777	.376
Perc_wability	Pearson Correlation	-.240	-.089	.014	.061	.139	.353*	-.071	.469**	1
	Sig. (2-tailed)	.097	.545	.926	.675	.339	.013	.629	.001	
	Sum of Squares and Cross-products	-6.414	-2.352	.374	2.320	3.548	10.874	-2.150	18.046	39.737
	Covariance	-.134	-.049	.008	.048	.074	.227	-.045	.376	.828

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

a. Listwise N=49

CHAPTER 9

CONTRIBUTIONS AND CONCLUSIONS

The timeliness and need to communicate accurate information in a crisis leverages different dimensions presented in the information systems literature. The fast-paced changes of mobile technology offer scant findings in the literature making it difficult to leverage for training and improved communication readiness across mobile devices. The use of writing assessment measures to carefully measure SMS text-message task responses for crisis management has not been studied before.

The rapid increase of alert notifications and inbound text-messages are indicators that adoption may cause people to revisit SMS text-message use. Moreover, the use of SMS text-messaging for this research is recognized as one communication option. The questions that remain open after this study are: "How well are users able to interpret an SMS text- message and effectively reply to the message in a crisis when using an actual mobile device?" or "How well are users able to initiate a request for assistance in a crisis via SMS text-messaging on an actual mobile device?" Our initial findings are promising for future research aimed at answering these questions.

This research proposed the use of web-based application for training with repeated measures to observe how users currently respond to text-messages and also established a pre-training baseline measure. Plain language training was then introduced followed by post-training measures. How quickly study participants can learn and apply a few basic commands that would be useful in a crisis is measured. Findings revealed that increasing Individual Usage Behavior of SMS text-messaging with plain language that

leverages task prompts (Speech Act Essential Rules) for effective written communication can increase the user's ability to respond during a crisis.

The findings generated between the Training Session Type (stimulus) of photo with audio and text with audio was measured for equality of variance given more practitioners did participate in the photo with audio. More community responders participated in the text with audio than in photo with audio. The ICT Usage Behavior background both for desktop use and ICT mobile device use was deemed equal with Levene's test of equal variances. The actual responses for each participant were also noted. The hypotheses of the survey instruments predicted higher learning and higher task performance for photo with audio. However, the results indicated that text with audio demonstrated significant improvement over photo with audio participants. This may be due to the parallel between the deliveries of a text-based scenario to text-message responses of each task.

This research proposed to 1) develop a mobile device communication training model, beginning with SMS text-messaging, to measure user behavior, response, and training; 2) identify techniques to increase mobile communication readiness; 3) advance the role of mobile ICT for community responders in the emergency management domain; and 4) extend the use of multimedia training applications in the information systems domain for crises response exercises. The results to support the initial model with actual task response measures was discussed and presented in Section 8.

Overall, the training did show significant results to complement and extend the learning instruments of this research. The learning instruments have been used dating back to Fall 2004 and findings were consistent with those from the team-based learning

research model. Moreover, Perceived SMS Text-Message Readiness and Perceived Task Performance were introduced along with a pre-training survey that captures the study participant's profile. The profile of the study participant places emphasis on their role in crisis response and also captures some ICT Desktop Usage Behavior and ICT SMS Usage Behavior measures. Significant correlations between the pre-training and post-training instruments were discussed in Section 7.

This real-world domain initiative was able to reach out to participants in six states and two countries. The web-based application metrics demonstrated less than 5 participants who did not complete the training. No attempts to access the system or decline to participate were recorded. Based on the MySQL database measures, the application ran from start to finish without external (researcher) intervention and without the need to restart due to system crashes. The integration of the IRB, training instructions, survey instruments, multimedia scenarios, and active learning tasks provided a seamless transition for the application delivery from start to finish.

Expert field validation by emergency management experts supported the coding of the task responses. The Response Code 4 point scale was discussed in Section 8 and used for the document-based interview with the two field experts. The review accounted for approximately 20% of the total participant responses. The document-based interview transcript was recorded and will be used for future research. The most important finding in the document-based interview was the importance of situational awareness (context), a control that was presented as a limitation to this study. The reason context was not included for the first iteration of this research is to reduce confounding results between the plain language assessment and the assessment of context (situational awareness). To

effectively introduce and measure context, expert input should be included and at present is being reviewed in the private sector. The initial premise of this research was to establish a baseline for future scenarios that target specific responder roles to maximize the learning process and personal relevance. This was observed with over 20% of the participants ranging in age, gender and role. For example, individuals who are slower readers took longer to complete the survey. The context and background to governmental initiatives was observed as a bit advanced for untrained community responders although deemed interesting. Future research should introduce/alter the first module for a softer transition to untrained community volunteers or second language learners. An algorithm to support this effort would be needed.

9.1 Study Findings

The overall findings of the study place emphasis on two real-world needs: 1) training and practice of communication protocols; and 2) the need recognition and awareness both of responders in a community (trained and untrained) for community responders and their role in a crisis that extends beyond the 911 or 112 emergency. The findings from this study in terms of demographic data captured reflect than many study participants who are responders in a community do not recognize their role in crisis response also impacting the number of years they have been working or volunteering in the field of crisis response. The study participants overall covered a range from each crisis response category identified and covered a mix of geographic regions (six states with a mix of urban, suburban, rural).

In terms of identifying a profile for future training scenarios and fit between the crisis scenario and study participant, a strong correlation between ICT SMS Usage Behavior and Writing Behavior was identified. These constructs should be revisited for future research to assess if other questions should be introduced in these constructs to better identify the study participant to crisis scenario fit.

Findings also reflected significance in Perceived Learning (Table 8.15) with ICT Desktop/Internet Usage Behavior and should be revisited when recruiting study participants. At present, there are many individuals who own and use a cell-phone and do not use or have access to a desktop computer on a regular basis. The use of a mouse for example could affect study participants with a low ICT Desktop Usage Behavior profile. Touch screens, tablet computers and other attachments should be considered for future research if the targeted population shows a tendency toward low ICT Desktop Usage Behavior. Moreover, the crisis scenario segments and training content should be evaluated for second language learners. This study had several participants with low command of the English language. These participants were able to engage in the study and did successfully complete all tasks, but in completing the surveys, a longer than average completion time was noticed. This raises the question on the overall content absorption for these participants.

Findings related to Perceived Task Performance and Perceived Intention to Use reflects significant correlations between Writing Behavior, Writing Apprehension, and Writing Enjoyment. Significance with motivation does vary and can perhaps be attributed to this web-based training application having a "needs based" objective rather than an application associated with enjoyment. Disasters by nature are considered motivational

but for many responders, especially volunteer's motivation towards saving lives is important.

Overall a strong correlation between pre-training and post-training measures discussed with paired T-tests reflects task response improvement. Significance with Perceived Learning measures also reflect that the participant also felt learning did take place and more importantly that practice was need to improve communication protocols. Observed participants reflect an interest to try or increase use of text-messaging once leaving the application also reflecting a need for future research. To conclude, an initial regression model reflects that Perceived Task Performance is the dependent variable encompassing pre-training profile, actual task performance, perceived readiness and writing related measures.

An additional finding/limitation of this research was the random assignment of login ids to the photo with audio or text with audio randomization. The login ids were assigned randomly as requested by participants. However, the limitation was that not all participants who requested an id were able to participate in the study within a few weeks of the date when a login id was requested. The site remains active with little activity since the last login ids were provided. An automated login process is recommended for future research to better balance the distribution of login ids. At present, the web-based application is available and can be used at request in the interim.

9.2 Limitations

The primary limitation of this study was the sample size combined with the different crisis response roles of the study participants. Because this was exploratory

research on written responses for short message services, the need for participants in different crisis response roles was needed. Moreover, the emphasis of this research is on the community responder. This is a real-world need and at present, the community responder does not have a clearly defined role and why this study could not be conducted with only community responders. First responder (i.e., fire, police, EMS/medical) and emergency management practitioners were needed in this study to establish a baseline.

Two additional limitations of this study were gender and age. This is also a real-world limitation. At present, there is a very small percentage of women who work in emergency response and most responders overall are between the ages of 35-64 because emergency management is a newly established domain.

The web-based application was designed with five episodes (six tasks). Only one response per task was permissible due to the use of the Ruth and Murphy writing assessment model and use of pre-training and post-training measures. This however detracts from the element of realism when a participant would like to ask a question before responding to the prompt. If we assume that the study participant who is responding to a crisis receiving instructions or information that is not clear to them, the study participant would ideally want to ask for additional information or clarification. This feature would have to be dynamic rather than static causing either a sophisticated agent-based database design or would require a human in the role of the command and control coordinator rather than a simulated command and control coordinator. Another limitation of the application was the design for only one level of user. Findings of the study show the need for scenarios to better match the study participant role. The three

speech act/SMS text-message training modules at present were beneficial to all study participants and will be discussed further in Section 9.4 (future research).

Within the web-based application, the distribution of participants from each responder role in relation to the independent variable (photo with audio and text with audio) was a limitation for some data analysis. The study participants were assigned randomly by crisis response role to either the photo with audio or text with audio. However, not all individuals who requested a login id were participants in the study. Many participants scheduled left them without time to participate at the present time.

Survey data collected was also a limitation of this study. The study used three survey instruments (pre-training, interim-training and post-training) and therefore survey length was a concern. The pre-training instrument would benefit from additional profile information regarding information communication technology usage in addition to Writing Behavior and crisis response role. Study participation was voluntary with study participation from a remote location (i.e., home or work). Increasing the survey length had the potential to reduce participation. Additional questions need to be carefully identified based on the findings of this study to determine if existing questions can be replaced or adjusted before increase the survey length.

The last limitation discussed is the need for expert input on the crisis scenario creation. The scenario used was for the community responder where flexibility in scenario creation was permissible especially due to the ongoing real-world assessment of the community responder role. For subsequent crisis scenarios, expert input would increase the richness of the context and assist with the element of realism. Context

training was also a limitation of this study and was not included to carefully assess the writing element and establish an initial writing assessment rubric (see Section 9.4).

9.3 Contributions

As mobility penetrates the globe and people communicate more frequently across broader geographic distances and recognize the immediacy of mobile technologies, the potential for use in crisis management is ever present. The role of text-messaging and its value as a highly reliable communication protocol made its presence several years ago. Examples include the indoor track of Drew University and many public school structures, where there is little cell-phone signal. The low-signal strength does not permit the use of VOIP. Parents and children who need to communicate under these circumstances present a regular need where practice could be introduced for many community responders.

Transitioning to text-messaging with a Numeric keypad can be an initial cumbersome interface; AOL's instant messenger for example is one way to text-message to cellular phone users of text-messaging, where in turn the reply to a text message is to a desktop computer. The desktop to cell-phone communication exchange servers as an important transition to the full adoption of text-messaging and was the premise of this research. Through desktop interfaces such as AOL, people can adapt their writing style over time to become shorter and concise while increasing practice of SMS. Today cell-phone technology extends too many citizens as their primary phone service, and is increasing in use among low income areas, making a cell-phone number more permanent than a home address with the cell-phone becoming the lowest common denominator as an interoperable communication device. At present, the literature does not provide baseline

measures taking an individual from no text-messaging to becoming a fluent and accurate text-message communicator. This research provides a preliminary baseline with a variety of responder roles and also takes an initial look at the study participant's ability to respond when a crisis incident is presented.

This research also provides an active learning application with learning measures. The application can be adapted for other purposes that extend beyond the emergency management domain or adapted for other crisis scenarios. The ability to simulate a collaborative relationship (responder to command and control coordinator) within the application as a way to increase readiness can become a pre-cursor to collaborative learning and team-based learning activities.

In conclusion, the findings reflect high Perceived Learning and high Perceived Task Performance. The differences between actual task performance and Perceived Task Performance for the linear regression models bring forth the importance of both measures and two distinct objectives: increasing awareness and the need for practice and actual task performance measures. The profile identified for this training scenario is best reflected in the community responder who has confidence in their writing and has good command over both desktop and SMS mobile text communication.

Future research resulting from the data collection of this research will provide a means to develop a communication assessment rubric and also enhance the model for use by new mobile technologies as they are introduced. This research recognizes the need for a communication assessment rubric that can be enhanced by using a finer level of granularity and criteria for task response codes. The results of this research support a preliminary baseline for web-based application enhancements and future research that

enables community responders, especially those who work with communities of needs and underrepresented populations by promoting awareness and the importance of practice for communication protocols in preparation for crisis response. The extreme change in weather pattern and flooding in New Jersey on the weekend of April 14th, demonstrated the middle of night evacuations of neighborhoods with citizens knocking door to door to help people evacuate. The tragic Virginia Tech massacre taking place on April 16th and the time lapse between the first incident's location and the second incident's location are one place where mobile text messaging could have perhaps played a role in reaching students, faculty, and administrators. What do you say and how to deliver an alert to affected communities yet not create panic rests on the communication protocol and practice, it is technology independent. A technology, such as SMS text-messaging is the delivery vehicle that carries the message. In closing can effective communication protocols and practice help incidents such as the NJ Flooding and the Virginia Tech massacre where telecommunications were not affected?

The importance of a refined task performance model based on additional situation-based scenarios and mixed-modes of communication are an important next step for the right fit of training and participant profile. Advancing the fit of this application to responder role, level of writing and technology usage behavior level are essential. During this next research phase, the objective is to incorporate the model into mobile device usage and operationalize the model in authentic crisis management contexts. If successful in extended field simulation, the model may have the potential to ensure effective mobile information communication within the context of crisis.

9.4 Future Research

The overall findings demonstrate the need for a morphology (matrix) for community responders and their role in a crisis that extends beyond the 911 or 112 emergency. Future research should identify a responder role and crisis scenario fit. Assessment on the responder role and crisis scenario fit should be assessed when seeking expert input for scenario creation. Context training for each responder role should be assessed at that time. Findings demonstrated that context richness was visible in the six task responses based on the study participant's experience/role in crisis response. A sampling plan for each responder role should be identified at that time and include demographic characteristics, such as gender and age.

Each writing prompt (six tasks) of the web-based application should be evaluated for complexity, additional training, and speech act rules. The introduction of a dynamic command and control interface as discussed in the Section 9.2 (limitations) would require a separate assessment to the writing prompt emphasis.

Within the web-based application, the distribution of participants from each responder role in relation to the independent variable (photo with audio and text with audio) was a limitation for some data analysis. The study participants were assigned randomly by crisis response role to either the photo with audio or text with audio. However, not all individuals who requested a login id were participants in the study. Many participants scheduled left them without time to participate at the present time.

The pre-training survey instrument offers promise for participant profile creation and training-responder role fit. The improvement of the survey instrument requires

additional research and qualitative analysis. Follow-up semi-structured interviews with study participants of this study should be conducted prior to survey adjustment.

9.5 Dissertation Summary

Overall the results of this dissertation reflect positive findings that encourage next steps both with longitudinal field studies with actual mobile devices and additional training focusing on one specific responder role at a time with either the same or new crises scenenarios.

APPENDIX A

ILLOCUTIONARY SPEECH ACTS

Illocutionary speech acts place emphasis on the active voice (Searle, 1964).

Types of illocutionary act

		Request	*Assert, state (that), affirm*	*Question*[1]
Types of rule	Propositional content	Future act A of H.	Any proposition p.	Any proposition or propositional function.
	Preparatory	1. H is able to do A. S believes H is able to do A. 2. It is not obvious to both S and H that H will do A in the normal course of events of his own accord.	1. S has evidence (reasons, etc.) for the truth of p. 2. It is not obvious to both S and H that H knows (does not need to be reminded of, etc.) p.	1. S does not know 'the answer', i.e., does not know if the proposition is true, or, in the case of the propositional function, does not know the information needed to complete the proposition truly (but see comment below). 2. It is not obvious to both S and H that H will provide the information at that time without being asked.
	Sincerity	S wants H to do A.	S believes p.	S wants this information.
	Essential	Counts as an attempt to get H to do A.	Counts as an undertaking to the effect that p represents an actual state of affairs.	Counts as an attempt to elicit this information from H.
	Comment:	*Order* and *command* have the additional preparatory rule that S must be in a position of authority over H. *Command* probably does not have the 'pragmatic' condition requiring non-obviousness. Furthermore in both, the authority relationship infects the essential condition because the utterance counts as an attempt to get H to do A *in virtue of the authority of S over H*.	Unlike *argue* these do not seem to be essentially tied to attempting to convince. Thus "I am simply stating that p and not attempting to convince you" is acceptable, but "I am arguing that p and not attempting to convince you" sounds inconsistent.	There are two kinds of questions, (*a*) real questions, (*b*) exam questions. In real questions S wants to know (find out) the answer; in exam questions, S wants to know if H knows.

		Thank (for)	*Advise*	*Warn*
Types of rule	Propositional content	Past act A done by H.	Future act A of H.	Future event or state, etc., E.
	Preparatory	A benefits S and S believes A benefits S.	1. S has some reason to believe A will benefit H. 2. It is not obvious to both S and H that H will do A in the normal course of events.	1. H has reason to believe E will occur and is not in H's interest. 2. It is not obvious to both S and H that E will occur.
	Sincerity	S feels grateful or appreciative for A.	S believes A will benefit H.	S believes E is not in H's best interest.
	Essential	Counts as an expression of gratitude or appreciation.	Counts as an undertaking to the effect that A is in H's best interest.	Counts as an undertaking to the effect that E is not in H's best interest.
	Comment:	Sincerity and essential rules overlap. Thanking is just expressing gratitude in a way that, e.g., promising is not just expressing an intention.	Contrary to what one might suppose advice is not a species of requesting. It is interesting to compare "advise" with "urge", "advocate" and "recommend". Advising you is not trying to get you to do something in the sense that requesting is. Advising is more like telling you what is best for you.	Warning is like advising, rather than requesting. It is not, I think, necessarily an attempt to get you to take evasive action. Notice that the above account is of categorical not hypothetical warnings. Most warnings are probably hypothetical: "If you do not do X then Y will occur."

		Greet	*Congratulate*
Types of rule	Propositional content	None.	Some event, act, etc., E related to H.
	Preparatory	S has just encountered (or been introduced to, etc.) H.	E is in H's interest and S believes E is in H's interest.
	Sincerity	None.	S is pleased at E.
	Essential	Counts as courteous recognition of H by S.	Counts as an expression of pleasure at E.
	Comment:		"Congratulate" is similar to "thank" in that it is an expression of its sincerity condition.

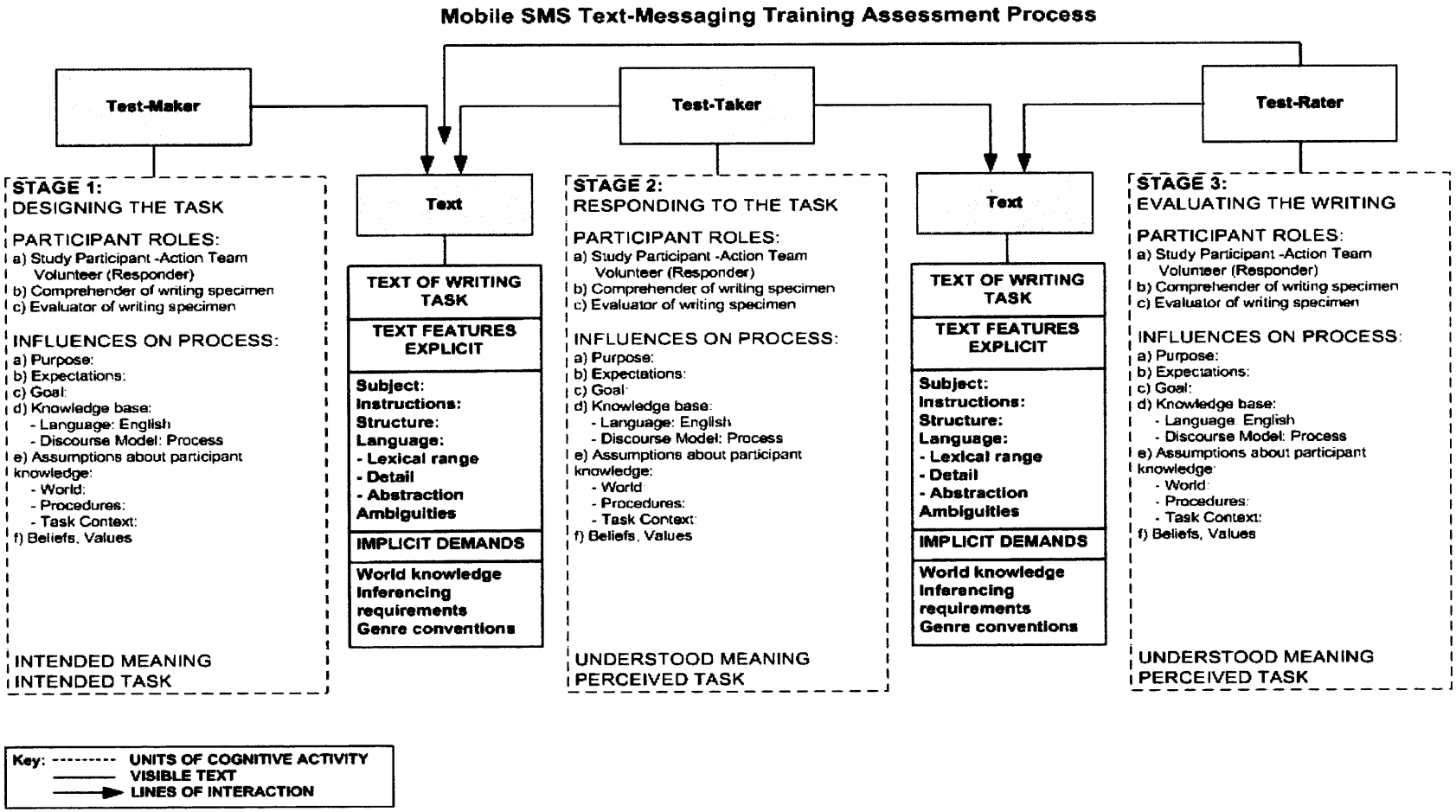
[1] In the sense of "ask a question" not in the sense of "doubt".

Figure A.1 Illocutionary Speech Acts.
Source: Searle (1964).

APPENDIX B

MOBILE SMS TEXT-MESSAGE TRAINING ASSESSMENT PROCESS

Figure B.1 presents the adapted Ruth and Murphy Writing Assessment model as used in this study.



Adapted from Ruth & Murphy, 1985, p.414

Figure B.1 SMS text-message training assessment process.

APPENDIX C

IRB CONSENT FORMS

PLEASE PRINT OR TYPE

Date:____12/1/06_____

HUMAN SUBJECT RESEARCH REVIEW FORM
NEW JERSEY INSTITUTE OF TECHNOLOGY
INSTITUTIONAL REVIEW BOARD

Name of Principal Investigator(s):_____Elizabeth Avery Gomez_____

(research being conducted under the supervision of Dr. Murray Turoff and Dr. Norbert Elliot)

NJIT Address:_____ITC 5500_____

_____

Department::_____IS
Department_____

E-mail
Address:___eag4@njit.edu_____

NJIT Affiliation (Check):
☐ Faculty X Student ☐ Other (Describe: _____)

*Note students and doctoral candidate applying for IRB approval must submit written documentation from their faculty advisors (via e-mail) stating that research is being conducted under their supervision.

Project Title:_____ **Mobile SMS Text-Messaging for Crisis Response: Plain language Training for Information Communication Technology (ICT)**

This project will be conducted:

☐ On Campus ☐ Off Campus X Both

Is this research funded by outside source(s)? ☐ Yes X No

If yes, indicate name(s) and type of funding source(s):

Name of Funding Source(s): ___None_____

Type: ☐ Government (County, State or Federal) ☐ Foundation ☐ Corporation
☐ Other (Describe: _____)

Anticipated Starting Date of Project: 12/18/2006

Anticipated Closing Date of Project: 5/1/2007

Number of Subjects: 130

NOTE: All principal investigators, faculty, and students who will be interfacing with human subjects in this study must complete an online training course in the protection of human subjects. This course can be accessed by going to the US Department of Health and Human Services' Office for Human Research Protection website (http://www.hhs.gov/ohrp/) and clicking on "Education." At the bottom of this page, you will see the tutorial for the training module for assurances. All certificates indicating course completion must be submitted with this application.

To Principal Investigator: In addition to the questions below, please furnish copies of any surveys interview formats, testing instruments or other documents necessary to carry out the research.

The completed forms should be sent to: Dawn Hall Apgar, PhD
dawn.apgar@njit.edu
Chair, IRB
DD Planning Institute – CABSR
Campbell 330
New Jersey Institute of Technology
University Heights
Newark, NJ 07102-1982

---

1. Project Title: **Mobile SMS Text-Messaging for Crisis Response: Plain language Training for Information Communication Technology (ICT)**

2. List the names and status (faculty, student, etc.) of the persons conducting the research:

   a. Principal Investigator(s): *Elizabeth Avery Gomez*

   b. Other Members of Research Team:

   c. NJIT Faculty Advisor(s) if Student Project: Dr. Murray Turoff

3. Describe the objectives, methods and procedures of the research project. This summary will used to describe your project to the IRB. Use up to 2 pages, if necessary. You may also attach a copy of an abstract or full research proposal describing this work.

   Objective: To find out if plain language training for SMS text-messaging can improve the participant's ability to reply with an effective written communication message as a means to increase readiness to respond in a crisis.

   Methods: Survey and screen capture computer recordings of keyboard and mouse movements (only for some participants).

Procedure: Participants are completely voluntary and can be a student, faculty, NJIT staff members, or from the general public. The study will take between 30 minutes to 1 hour. The participant will perform a series of training-related tasks associated with the use of email and text-messaging.

4. List name and institutional affiliation of any research assistants, workers student that will be working on this project.

5. If research assistants, workers, students will be working on the project describe their qualifications, special training and how they will be supervised.

6. What is the age of the subjects and how will they be recruited?

NJIT affiliated participants will be over the age of 18. Recruitment will be voluntary based on their interest in crisis response and the use of mobile technology as an aid.

7. Attendant risks: Indicate any physical, psychological, social or privacy risk or pain, which may be incurred by human subjects, or any drugs medical procedures that will be used. (This includes any request for the subjects to reveal any embarrassing, sensitive, or confidential information about themselves or others.) Also, indicate if any deception will be used, and if so, describe it in detail. Include your plans for debriefing.

There are no risks involved. Five tasks will be performed on a computer that simulates the use of a cell-phone. The tasks request short responses to a short scenario. The surveys and recordings will be kept confidential.

The results of the survey will be used to assess opportunities where effective communication when using SMS text-messaging should be introduced.

8. Evaluate the risks presented in 7.
   a. Is it more that would normally be encountered in daily life?

   no

   b. Do your procedures follow established and accepted methods in your field?

   yes

9. How will the risk be kept at a minimum? (e.g., describe how the procedures reflect respect for privacy, feeling, and dignity of subject and avoid unwarranted invasion of privacy or disregard anonymity in any way.) Also, if subjects will be asked to reveal any embarrassing, sensitive, or confidential information, how will confidentiality of the data be insured? Also include your pans for debriefing. If subjects will be placed under any physical risk, describe the appropriate medical support procedures.

The simulated training focuses on five tasks that ask for a response that is directed at a given scenario. Participants will provide a check point status of their simulated location based on photos.

10. Describe the benefits to be derived from this research, both by the subject and by the scientific community (this is especially important if research involves children).

SMS text-messaging use has increased and is being used for alert notifications and to assist those in a crisis. Knowing what to say when you have to use text-messaging in a crisis takes practice. The training strategy being studied seeks to determine the needs associated with training to improve effective written communication.

11. Describe the means through which human subjects will be informed of their right to participate, not to participate, or withdraw at any time. Indicate whether subjects will be adequately informed about the procedures of the experiment so that they can make an informed decision on whether or not to participate.

The following message will appear at the beginning of the simulation. The participant will have to complete the consent form and click to select they consent to the training before continuing. It clearly states that the survey is optional:

Dear Participant:

I am conducting research for my dissertation that involves using SMS text-messaging as a form of written communication when you are in a crisis situation. Knowing what to say so your message is clear and concise is important when communicating with others and the use of telecommunications is limited. This study asks you to respond to 5 tasks on a computer through training that simulates the use of text-messaging on a cell-phone. You will be asked to complete a pre-training assessment survey, an interim-training survey, and a post-training survey as part of the process. I would appreciate your participation in this study and in sharing your current experiences with SMS text-messaging. This training simulates the use of text-messaging on a cell-phone. Prior experience with text-messaging on a cell-phone is not necessary.

Please complete both the attached consent form and the survey. Note that your name will not appear on the survey. We will keep the consent form and the survey separate, so that your answers remain entirely anonymous. Note that participation in this study is completely voluntary.

Thank you in advance,

Elizabeth Avery Gomez
Ph.D. Candidate

12. Complete the attached copy of the Consent Form and the Institutional Review Board will make a determination if your subjects will be at risk. This Consent Form must include the

following five pieces of information: (1) The purpose of the research, (2) the procedures involved in the work, (3) the potential risk of participating, (4) the benefits of the research, (5) that the subjects are free to withdraw from the research at any time with no adverse consequences.

13. Furnish copies of surveys, interview formats, testing instruments or other documents to carry out the research. If surveys are not complete please submit an outline of the questions to be used. You will have to submit the completed survey to the Committee before the research can begin.

14. If the subjects will be minor children, complete Consent Form as prescribed in paragraph 12 for signature by parent or guardian. If the project is approved (regardless of the Board's determination concerning risk), it will be necessary that a Consent Form be secured for every minor child.

15. Attach copy of permission of facility to conduct the proposed research (if other that NJIT).

Complete a Consent Form Using the Model Below:

NEW JERSEY INSTITUTE OF TECHNOLOGY
323 MARTIN LUTHER KING BLVD.
NEWARK, NJ 07102

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE OF STUDY: **Mobile SMS Text-Messaging for Crisis Response: Plain language Training for Information Communication Technology (ICT)**

RESEARCH STUDY:

I,_____, have been asked to participate in a research study under the direction of Elizabeth Avery Gomez.
Other professional persons who work with them as study staff may assist to act for them.

PURPOSE:

The purpose of the study is to find out to find out if plain language training for SMS text-messaging can improve the participant's ability to reply with an effective written communication message as a means to increase readiness to respond in a crisis.

DURATION:

My participation in this study is to complete five computer-based tasks that simulate the use of a cell-phone with SMS Text-Messaging. I will be asked to complete a pre-training survey, an interim training survey, and a post-training survey. The training including survey completion is expected to take between 30 minutes to one hour.

PROCEDURES:

I have been told that, during the course of this study, I will have to complete the survey and this consent form. I may also be recorded through a video recorder and through the use of screen capture software.

PARTICIPANTS:

I will be one of about 130 participants to participate in this trial.

EXCLUSIONS:

I will inform the researcher if any of the following apply to me:

I do not wish to fill out the survey.
I do not wish to be video recorded.
I do not wish to be recorded through screen capture software.

RISKS/DISCOMFORTS:

I have been told that the study described above may involve the following risks and/or discomforts:

There are no known risks to participating.

There also may be risks and discomforts that are not yet known.

I fully recognize that there are risks that I may be exposed to by volunteering in this study which are inherent in participating in any study; I understand that I am not covered by NJIT's insurance policy for any injury or loss I might sustain in the course of participating in the study.

CONFIDENTIALITY:

I understand confidential is not the same as anonymous. Confidential means that my name will not be disclosed if there exists a documented linkage between my identity and my responses as recorded in the research records. Every effort will be made to maintain the confidentiality of my study records. If the findings from the study are published, I will not be identified by name. My identity will remain confidential unless disclosure is required by law.

However every student's name will be kept separate from the actual answers given so the answers will be kept anonymously.

PAYMENT FOR PARTICIPATION:

I have been told that I will not receive extra credit points as compensation for my participation in this study.

RIGHT TO REFUSE OR WITHDRAW:

I understand that my participation is voluntary and I may refuse to participate, or may discontinue my participation at any time with no adverse consequence. I also understand that the investigator has the right to withdraw me from the study at any time.

INDIVIDUAL TO CONTACT:

If I have any questions about my treatment or research procedures, I understand that I should contact the principal investigator at:

IS Department, ITC 5500, NJIT
Elizabeth Avery Gomez (leave message with IS department administrator) (973) 596-3368 eag4(@njit.edu
Dr. Murray Turoff (973) 596-3366 turoff(@.njit.edu
Dr. Norbert Elliot (973) 596-6457elliot(@njit.edu

If I have any addition questions about my rights as a research subject, I may contact:

Dawn Hall Apgar, PhD, IRB Chair
New Jersey Institute of Technology
323 Martin Luther King Boulevard
Newark, NJ 07102
(973) 642-7616
dawn.apgar(@njit.edu

SIGNATURE OF PARTICIPANT

I have read this entire form, or it has been read to me, and I understand it completely. All of my questions regarding this form or this study have been answered to my complete satisfaction. I agree to participate in this research study.

Subject Name:_____ Signature:_____

Date:_____

SIGNATURE OF READER/TRANSLATOR IF THE PARTICIPANT DOES NOT READ ENGLISH WELL

The person who has signed above, _____, does not read English well, I read English well and am fluent in (name of the language) _____, a language the subject understands well. I have translated for the subject the entire content of this form. To the best of my knowledge, the participant understands the content of this form and has had an opportunity to ask questions regarding the consent form and the study, and these questions have been answered to the complete satisfaction of the participant (his/her parent/legal guardian).

Reader/Translator Name:_____
Signature:_____
Date:_____

SIGNATURE OF INVESTIGATOR OR RESPONSIBLE INDIVIDUAL

To the best of my knowledge, the participant, _____, has understood the entire content of the above consent form, and comprehends the study. The participants and those of his/her parent/legal guardian have been accurately answered to his/her/their complete satisfaction.

Investigator's Name:_____ Signature:_____

Date:_____

APPENDIX D

ASSESSMENT INSTRUMENTS

Pre-Training Survey

Name: _____

My gender is: __ **Female** ___ **Male** _____ **I'd rather not specify**

My age is: ___ **20-34** ___ **35-49** _____ **50-64** _____ **over 65** ____ **I'd rather not specify**

Internet Usage (adapted from Igbaria et al. MISQ 9/97)

1. On the average, how frequently do you use the Internet for job-related work? (Please check **ONE** number only).
   a. Less than once a month
   b. Once a month
   c. A few times a month
   d. A few times a week
   e. About once a day
   f. Several times a day

2. On the average, how frequently do you use the Internet at home? (Please check **ONE** number only).
   a. Less than once a month
   b. Once a month
   c. A few times a month
   d. A few times a week
   e. About once a day
   f. Several times a day

3. Please indicate whether you use the following functions on the Internet. (Check **ALL** that apply).
   a. News
   b. Maps and driving directions
   c. Weather
   d. Phone directory
   e. Alert subscription
   f. Electronic calendar
   g. Music & movie clips
   h. Games
   i. Email
   j. Online Chats
   k. Newsgroups
   l. Online Shopping
   m. Travel
   n. Sports

Cell-Phone, Blackberry, & PDA Usage (adapted from Igbaria et al. MISQ 9/97)

4. On the average, how frequently do you use a cell-phone or blackberry for job-related work? (Please check **ONE** number only).
   a. About once a day
   b. Several times a day
   c. A few times a week
   d. Less than once a month
   e. Once a month
   f. A few times a month

5. On the average, how frequently do you use a cell-phone or blackberry for personal use? (Please check **ONE** number only).
   a. About once a day
   b. Several times a day
   c. A few times a week
   d. Less than once a month
   e. Once a month
   f. A few times a month

6. Please indicate whether you use the following functions on your cell-phone or blackberry. (Check **ALL** that apply).
   a. Phone-calls
   b. Text-messaging
   c. Email
   d. Reminders/alarms
   e. Chat
   f. Text alerts
   g. Phone directory
   h. Games
   i. Camera & movie recordings
   j. Music or audio recordings

Please complete the following questions regarding your current usage of information communication technologies:

Pre-Training Assessment					
ICT Usage Behavior (new construct-pilot tested in classrooms, 2005-06)	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
7. I would like to receive email messages for important alerts.	SD	D	N	A	SA
8. I like to communicate using email.	SD	D	N	A	SA
9. I like to communicate using text-messaging.	SD	D	N	A	SA
10. I like to chat online.	SD	D	N	A	SA
11. I like to manage my time with online calendar reminders.	SD	D	N	A	SA
12. I am comfortable using new computer software.	SD	D	N	A	SA
13. I like to check email several times a day.	SD	D	N	A	SA
14. I know how to play movie clips on my PC.	SD	D	N	A	SA
15. I use plain language (i.e., communication your audience can understand the first time they hear it or read it).	SD	D	N	A	SA
16. I know how to receive text-messages.	SD	D	N	A	SA
17. I know how to send text-messages from a computer.	SD	D	N	A	SA
18. I know how to send text-messages from a cell-phone.	SD	D	N	A	SA

Pre-Training Assessment Survey (continued)

ICT Planning (new construct-pilot tested in the class, 2005-06)	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
19. I like to plan my week in advance.	SD	D	N	A	SA
20. I like when team mates and coworkers acknowledge receipt of my email.	SD	D	N	A	SA
21. I am comfortable doing several things at the same time (multi-tasking).	SD	D	N	A	SA
22. What I want most in a job is the possibility of really doing something important.	SD	D	N	A	SA
23. I always honor high priorities.	SD	D	N	A	SA
ICT Communication (#1-4 adapted from TBL research 2006; #5-11 from Daly & Miller, 1975)	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
24. I reread inbound text-messages more than once before I reply.	SD	D	N	A	SA
25. I reread my text-messages before sending to confirm the messages are accurate.	SD	D	N	A	SA
26. I compose my thoughts before writing a text-message reply.	SD	D	N	A	SA
27. I like to write my ideas down.	SD	D	N	A	SA
28. I am nervous about writing.	SD	D	N	A	SA
29. I enjoy writing.	SD	D	N	A	SA
30. I don't think I write as well as most other people do.	SD	D	N	A	SA
Perceived Attitude Toward Behavior (adapted from Taylor & Todd, Davis, Bhattacherjee et al. 2001)	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
31. All things considered, using text-messaging in a crisis will be a positive step.	SD	D	N	A	SA
32. All things considered, using text-messaging in a crisis will be a bad idea.	SD	D	N	A	SA
33. All things considered, using text-messaging in a crisis will be an effective step.	SD	D	N	A	SA
34. All things considered, I like the idea of using text-messaging in a crisis.	SD	D	N	A	SA

Pre-Training Assessment Survey (continued)

Perceived Beliefs (adapted from Bhattacherjee et al. 2001)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
35. Using text-messaging in a crisis will improve my performance.	SD	D	N	A	SA
36. Using text-messaging in a crisis will increase my productivity.	SD	D	N	A	SA
37. Using text-messaging in a crisis will enhance my effectiveness.	SD	D	N	A	SA
38. Using text-messaging in a crisis will be useful.	SD	D	N	A	SA

Interim Training Assessment					
Perceived Response Behavior (adapted from TBL research 2006)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I reread the inbound text-message more than once before I replied.	SD	D	N	A	SA
2. I reread my text-message before sending to confirm the message is accurate.	SD	D	N	A	SA
3. I composed my thoughts before writing the text-message reply.	SD	D	N	A	SA
4. I found it difficult to be clear and concise using text-messaging.	SD	D	N	A	SA
5. I found plain language helpful in shortening my text-message response.	SD	D	N	A	SA

Post-Training Assessment					
Perceived Learning (adapted from Wu & Hiltz, 2004)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I learned a great deal about text-messaging for crisis response from the training.	SD	D	N	A	SA
2. Text-messaging for crisis response training improved my ability to respond in a clear, concise manner.	SD	D	N	A	SA
3. The learning quality of the text-messaging for crisis response training materials was improved by the video-enhanced presentations.	SD	D	N	A	SA
4. The learning quality of training materials was improved by the crisis related tasks.	SD	D	N	A	SA

Post-Training Assessment Survey (continued)

Perceived Motivation (adapted from Venkatesh, 2003, Wu & Hiltz, 2004)	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
5. Text-messaging training was useful to my learning for crisis response.	SD	D	N	A	SA
6. I feel my motivation to learn text-messaging for crisis response increased with training.	SD	D	N	A	SA
7. Text-messaging training for crisis response motivated me to write my best response.	SD	D	N	A	SA
8. I feel my motivation to use clear, concise writing (i.e., plain language) in a crisis increased with training.	SD	D	N	A	SA
9. The actual process of using text-messaging is pleasant.	SD	D	N	A	SA
10. I had fun using text-messaging.	SD	D	N	A	SA
Perceived Enjoyment 11. (adapted from Wu & Hiltz, 2004)	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
I enjoyed web-based training more than regular face-to-face training.	SD	D	N	A	SA
I found text-messaging for crisis response training enjoyable.	SD	D	N	A	SA
Text-messaging training for crisis response improved my written communication skills.	SD	D	N	A	SA
I found myself more interested in text-messaging for crisis response with training.	SD	D	N	A	SA
Training broadened my knowledge of text-messaging options for crisis response.	SD	D	N	A	SA
Perceived Intention to Use (adapted from Bhattacherjee et al. 2001)	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
I plan to continue using clear, concise text-messaging to improve my readiness for crisis response.	SD	D	N	A	SA
I plan to continue using text-messaging to learn new ways to communicate to improve my readiness for crisis response.	SD	D	N	A	SA
I plan to continue using text-messaging after this training to practice communicating to improve my readiness for crisis response.	SD	D	N	A	SA

Post-Training Assessment Survey (continued)

Perceived Attitude Toward Behavior (adapted from Bhattacherjee et al. 2001)	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
12. All things considered, using text-messaging in a crisis will be a positive step.	SD	D	N	A	SA
13. All things considered, using text-messaging in a crisis will be a bad idea.	SD	D	N	A	SA
14. All things considered, using text-messaging in a crisis will be an effective step.	SD	D	N	A	SA
15. All things considered, I like the idea of using text-messaging in a crisis.	SD	D	N	A	SA
Perceived Beliefs (adapted from Bhattacherjee et al. 2001)	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
16. Using text-messaging in a crisis will improve my performance.	SD	D	N	A	SA
17. Using text-messaging in a crisis will increase my productivity.	SD	D	N	A	SA
18. Using text-messaging in a crisis will enhance my effectiveness.	SD	D	N	A	SA
19. Using text-messaging in a crisis will be useful.	SD	D	N	A	SA
20. Learning to use text-messaging for crisis response is easy for me.	SD	D	N	A	SA
21. I find it easy to use text-messaging to say what I need to say.	SD	D	N	A	SA
22. It is easy for me to become skillful at text-messaging for crisis response.	SD	D	N	A	SA
23. I find text-messaging for crisis response easy to use.	SD	D	N	A	SA
Perceived Communication (adapted from Daly & Miller, 1975)	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
24. I like to reread my text message before sending it.	SD	D	N	A	SA
25. I like to reread a message received before responding to it.	SD	D	N	A	SA
26. Plain language is a new concept for me.	SD	D	N	A	SA
27. Text-messaging is a new concept for me.	SD	D	N	A	SA
28. I am confident I know what to write when communicating with text-messaging.	SD	D	N	A	SA
29. I am confident I can use text-messaging for written communication.	SD	D	N	A	SA

Post-Training Assessment Survey (continued)

30. I need time to think before using text-messaging.	SD	D	N	A	SA
31. I need more practice to be able to reduce my written communication when using text-messaging.	SD	D	N	A	SA
32. I need more practice to be able to quickly articulate a text-message.	SD	D	N	A	SA

Perceived Readiness (adapted from TBL research 2006)	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
33. I use text-messaging already when communicating with others.	SD	D	N	A	SA
34. I was aware of all techniques presented in the training beforehand.	SD	D	N	A	SA
35. I found myself learning techniques I did NOT know existed.	SD	D	N	A	SA
36. I found myself recognizing techniques I use already that are important.	SD	D	N	A	SA
37. I found myself recognizing techniques I need to improve upon.	SD	D	N	A	SA
38. Training increased my awareness of text-messaging techniques.	SD	D	N	A	SA
39. Training increased my awareness of text-messaging options (i.e., desktop to cell)	SD	D	N	A	SA
40. I am confident I can communicate with someone using text-messaging.	SD	D	N	A	SA
41. I am confident I can communicate with someone using text-messaging.	SD	D	N	A	SA
42. I am confident I can retrieve information and reword a text-message.	SD	D	N	A	SA
43. I do NOT feel comfortable using text-messaging.	SD	D	N	A	SA
44. I feel I am able to respond with text-messaging in a crisis.	SD	D	N	A	SA
45. I would like more training on the use of text-messaging for crisis response.	SD	D	N	A	SA

APPENDIX E

EXCERPT FROM PREVIOUS RESEARCH

The excerpt below supports the learning components of the proposed SMS Text-Message for Crisis Response Training Model presented in this research.

Team-Based Learning Model – Fall 2004-Spring 2005

Research Conducted by: Gomez, E., Wu, D., Passerini, K., and Bieber, M. (2005-2006)

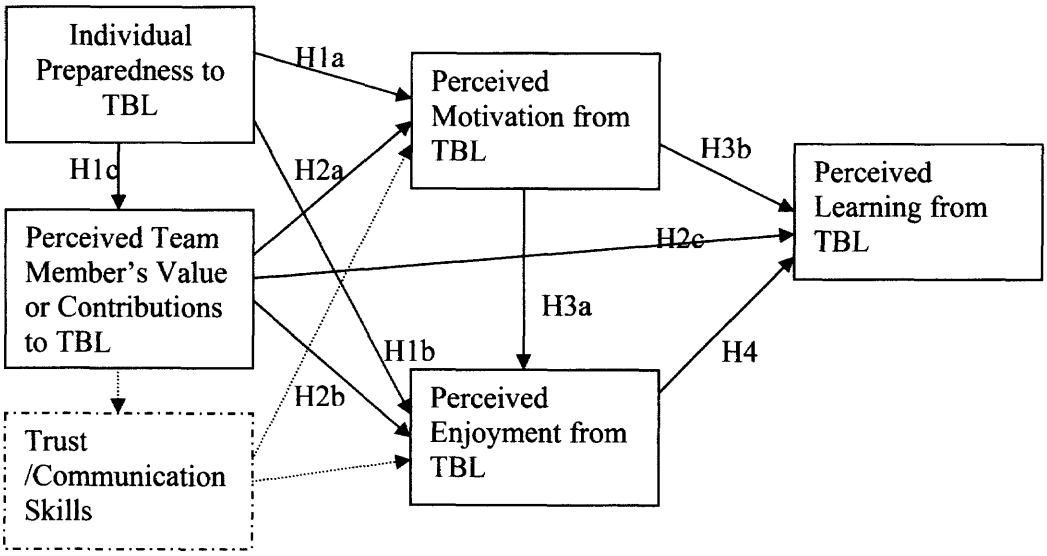


Figure E.1 Team-based learning model.
Source: Gomez, Wu, Passerini, Bieber, 2006.

The model constructs proposed for this study include individual preparedness, Perceived Motivation, Perceived Enjoyment, and Perceived Learning. Perceived team member's value or contribution, and trust/communication skills are team-related measures and are not recommended for this research, but will be needed for future research based on the findings of this study. The corresponding hypotheses identify the team focus (hypothesis H1c, H2a&b).

Tested Hypotheses

Hypothesis 1a&b: Higher individual preparedness will increase students' Perceived Motivation and Enjoyment from computer-supported team-based learning process.

Hypothesis 1c: Higher individual preparedness will increase the perception of team members' value and contribution to the computer-supported team-based learning process.

Hypothesis 2a&b: Higher perceived team members' contributions to computer-supported team-based learning will increase Perceived Motivation and enjoyment from this process.

Hypothesis 2c: Higher perceived team members' contributions to computer-supported team-based learning will enhance Perceived Learning in this process.

Hypothesis 3a&b: Higher Perceived Motivation will lead to higher enjoyment and learning from the computer-supported team-based learning.

Hypothesis 4: Higher Perceived Enjoyment from the computer-supported team-based learning will lead to higher learning.

Factor loadings for the constructs proposed in this research are listed below.

Principal Component Analysis Results

Table E.1 Team-Based Learning Components Extraction Matrix

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.612	37.442	37.442	8.612	37.442	37.442	4.753	20.665	20.665
2	2.482	10.790	48.232	2.482	10.790	48.232	3.660	15.912	36.577
3	1.721	7.484	55.716	1.721	7.484	55.716	2.454	10.669	47.246
4	1.518	6.602	62.319	1.518	6.602	62.319	2.278	9.905	57.151
5	1.122	4.879	67.197	1.122	4.879	67.197	1.775	7.719	64.870
6	1.034	4.497	71.694	1.034	4.497	71.694	1.570	6.824	71.694
7	.883	3.841	75.535						
8	.826	3.591	79.126						
9	.711	3.089	82.216						
10	.628	2.732	84.947						
11	.524	2.278	87.225						
[...]									
23	8.357E-02	.363	100.000						

Extraction Method: Principal Component Analysis.

The reliability of each construct is assessed through Cronbach's alpha analysis. The Perceived Learning construct has a Cronbach's Alpha = 0.88.

Extraction Method: Principal Component Analysis: 1 component extracted, 81.7% cumulative variance explained.

Table E.2 Perceived Motivation from CS-TBL

Question Items Strongly Agree= 1 -> Strongly Disagree = 5	**Component Loading***	**SA (%)**	**A (%)**	**N (%)**	**D (%)**	**SD (%)**	**N**	**Mean**	**SD**
CS-TBL motivated me to do my best work (PM1).	.904	29.2	43.1	18.1	6.9	2.8	72	2.11	1.00
I feel my motivation to learn increased with CS-TBL (PM2).	.904	26.0	45.2	21.9	5.5	1.4	73	2.11	0.91

Table E.3 Perceived Enjoyment from CS-TBL

Question Items Strongly Agree= 1 -> Strongly Disagree = 5	**Component Loading***	**SA (%)**	**A (%)**	**N (%)**	**D (%)**	**SD (%)**	**N**	**Mean**	**SD**
I enjoyed sharing my knowledge of course related materials with my team through CS-TBL (PE1).	.628	48.6	37.5	9.7	2.8	1.4	72	1.71	0.86
I enjoyed CS-TBL more than regular classes with lectures (PE2).	.759	38.4	27.4	23.3	6.8	4.1	73	2.11	1.13
I like CS-TBL (PE3).	.701	36.1	29.2	23.6	6.9	4.2	72	2.14	1.12
CS-TBL improved my communication skills (PE4).	.459	30.1	45.2	17.8	4.1	2.7	73	2.04	0.95
I found myself more interested in the subject with CS-TBL (PE5)	.648	23.3	43.8	21.9	11.0	0	73	2.21	0.93

EXTRACTION METHOD: PRINCIPAL COMPONENT ANALYSIS: 1 COMPONENT EXTRACTED, 75.6.% CUMULATIVE VARIANCE EXPLAINED.
TABLE 5. PERCEIVED TEAM MEMBER'S VALUE TO CS-TBL

Table E.3 Perceived Enjoyment from CS-TBL (continued)

Question Items Strongly Agree= 1 -> Strongly Disagree = 5	Component Loading*	SA (%)	A (%)	N (%)	D (%)	SD (%)	N	Mean	SD
Most classmates' comments are very valuable (PTMV1).	.906	24.7	42.5	19.2	8.2	5.5	73	2.27	1.10
Most of my teammates' comments are very useful (PTMV2).	.867	33.3	38.9	15.3	11.1	1.4	72	2.08	1.03
CS-TBL (activities) worth my time (PTMV3).	.836	30.6	45.8	13.9	8.3	1.4	72	2.04	0.96

EXTRACTION METHOD: PRINCIPAL COMPONENT ANALYSIS: 1 COMPONENT EXTRACTED, 63.3 .% CUMULATIVE VARIANCE EXPLAINED.

Table E.4 Individual Preparedness to CS-TBL

Question Items Strongly Agree= 1 -> Strongly Disagree = 5	Component Loading*	SA (%)	A (%)	N (%)	D (%)	SD (%)	N	Mean	SD
When preparing for the RAT, I read the materials and tried not to study by memorizing the information (IP1).	-.796	4.1	32.9	26.0	32.9	4.1	73	3.00	1.00
When preparing for the RAT, I read the materials and did study (IP2)	.796	9.7	30.6	16.7	36.1	6.9	72	3.00	1.16

Table E.5 Perceived Learning from CS-TBL

Question Items Strongly Agree= 1 -> Strongly Disagree = 5	**Component Loading***	**SA (%)**	**A (%)**	**N (%)**	**D (%)**	**SD (%)**	**N**	**Mean**	**SD**
The learning quality of course materials was improved by the team activities(PL1).	.816	34.2	52.1	9.6	2.7	1.4	73	1.85	0.81
CS-TBL has broadened my knowledge of course related materials (PL2).	.851	32.9	46.6	15.1	5.5	0	73	1.93	0.84
CS-TBL improved my ability to integrate concepts from different parts of the semester's materials (PL3).	.830	33.3	50.0	12.5	2.8	1.4	72	1.89	0.83
CS-TBL was useful to my learning (PL4).	.867	36.1	43.1	15.3	2.8	2.8	72	1.93	0.94
The learning quality of course materials was improved by the team tRAT (PL5).	.623	31.5	54.8	8.2	4.1	1.4	73	1.89	0.83
I learned a great deal from my team (PL6).	.750	47.9	39.7	9.6	1.4	1.4	73	1.68	0.83

Table E.6 Bivariate Correlation Analysis

Perceived Learning from TBL (1)	1				
Perceived Enjoyment from TBL (2)	0.635**	1			
Perceived Motivation from TBL (3)	0.637**	0.708**	1		
Perceived Team Member's Value/ Contribution to TBL (4)	0.437**	0.518**	0.288*	1	
Individual Preparedness to TBL (5)	-0.171	-0.174	-0.188	-0.026	1

** Correlation is significant at 0.01 level (two-tailed)

* Correlation is significant at 0.05 level (two-tailed)

Note: Michael Bieber was the instructor for both semesters. Liz Avery Gomez was the teaching assistant. The authors of the resulting publications and contributors of this research were: Liz Avery Gomez, Dezhi Wu, Katia Passerini, and Michael Bieber. Publications are listed at the back of this document.

APPENDIX F

PRE-TRAINING AND POST-TRAINING CORRELATIONS

Table F.1 Pre-Training Correlations

Correlations [a]

		ICT_usgdesk	ICT_usgmob	Writing_ behavior	Textmsg_ attitude	Writing_ability	Write_enjoy
ICT_usgdesk	Pearson Correlation	1	.615**	.450**	.124	.010	.015
	Sig. (2-tailed)		.000	.001	.395	.945	.920
	Sum of Squares and Cross-products	27.682	25.731	15.274	3.410	.355	.526
	Covariance	.577	.536	.318	.071	.007	.011
ICT_usgmob	Pearson Correlation	.615**	1	.506**	.303*	.013	.049
	Sig. (2-tailed)	.000		.000	.035	.931	.737
	Sum of Squares and Cross-products	25.731	63.194	25.940	12.561	.673	2.658
	Covariance	.536	1.317	.540	.262	.014	.055
Writing_behavior	Pearson Correlation	.450**	.506**	1	.248	-.001	.095
	Sig. (2-tailed)	.001	.000		.086	.996	.516
	Sum of Squares and Cross-products	15.274	25.940	41.551	8.349	-.031	4.163
	Covariance	.318	.540	.866	.174	-.001	.087
Textmsg_attitude	Pearson Correlation	.124	.303*	.248	1	.004	.336*
	Sig. (2-tailed)	.395	.035	.086		.978	.018
	Sum of Squares and Cross-products	3.410	12.561	8.349	27.263	.140	11.918
	Covariance	.071	.262	.174	.568	.003	.248
Writing_ability	Pearson Correlation	.010	.013	-.001	.004	1	.245
	Sig. (2-tailed)	.945	.931	.996	.978		.089
	Sum of Squares and Cross-products	.355	.673	-.031	.140	44.418	11.102
	Covariance	.007	.014	-.001	.003	.925	.231
Write_enjoy	Pearson Correlation	.015	.049	.095	.336*	.245	1
	Sig. (2-tailed)	.920	.737	.516	.018	.089	
	Sum of Squares and Cross-products	.526	2.658	4.163	11.918	11.102	46.122
	Covariance	.011	.055	.087	.248	.231	.961

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

a. Listwise N=49

Table F.2 Post-Training Correlations

Correlations [a]

		Perc_learn	Perc_motivate	Perc_enjoy	Perc_intent	Perc_useful	Perc_taskperf	Perc_write_behave	Perc_readiness	Perc_wability
Perc_learn	Pearson Correlation	1	.631**	.418**	.393**	.263	.207	.046	-.195	-.240
	Sig. (2-tailed)		.000	.003	.005	.068	.153	.755	.178	.097
	Sum of Squares and Cross-products	18.005	11.286	7.747	10.005	4.507	4.304	.934	-5.064	-6.414
	Covariance	.375	.235	.161	.208	.094	.090	.019	-.106	-.134
Perc_motivate	Pearson Correlation	.631**	1	.658**	.444**	.492**	.480**	.140	-.019	-.089
	Sig. (2-tailed)	.000		.000	.001	.000	.000	.338	.894	.545
	Sum of Squares and Cross-products	11.286	17.745	12.102	11.216	8.369	9.875	2.834	-.501	-2.352
	Covariance	.235	.370	.252	.234	.174	.206	.059	-.010	-.049
Perc_enjoy	Pearson Correlation	.418**	.658**	1	.454**	.600**	.626**	.126	.236	.014
	Sig. (2-tailed)	.003	.000		.001	.000	.000	.388	.103	.926
	Sum of Squares and Cross-products	7.747	12.102	19.070	11.902	10.563	13.364	2.650	6.287	.374
	Covariance	.161	.252	.397	.248	.220	.278	.055	.131	.008
Perc_intent	Pearson Correlation	.393**	.444**	.454**	1	.324*	.356*	.066	.120	.061
	Sig. (2-tailed)	.005	.001	.001		.023	.012	.654	.412	.675
	Sum of Squares and Cross-products	10.005	11.216	11.902	35.995	7.849	10.450	1.895	4.393	2.320
	Covariance	.208	.234	.248	.750	.164	.218	.039	.092	.048
Perc_useful	Pearson Correlation	.263	.492**	.600**	.324*	1	.815**	.126	.403**	.139
	Sig. (2-tailed)	.068	.000	.000	.023		.000	.387	.004	.339
	Sum of Squares and Cross-products	4.507	8.369	10.563	7.849	16.278	16.068	2.452	9.924	3.548
	Covariance	.094	.174	.220	.164	.339	.335	.051	.207	.074
Perc_taskperf	Pearson Correlation	.207	.480**	.626**	.356*	.815**	1	.218	.565**	.353*
	Sig. (2-tailed)	.153	.000	.000	.012	.000		.132	.000	.013
	Sum of Squares and Cross-products	4.304	9.875	13.364	10.450	16.068	23.899	5.140	16.861	10.874
	Covariance	.090	.206	.278	.218	.335	.498	.107	.351	.227
Perc_write_behave	Pearson Correlation	.046	.140	.126	.066	.126	.218	1	-.072	-.071
	Sig. (2-tailed)	.755	.338	.388	.654	.387	.132		.624	.629
	Sum of Squares and Cross-products	.934	2.834	2.650	1.895	2.452	5.140	23.173	-2.108	-2.150
	Covariance	.019	.059	.055	.039	.051	.107	.483	-.044	-.045
Perc_readiness	Pearson Correlation	-.195	-.019	.236	.120	.403**	.565**	-.072	1	.469**
	Sig. (2-tailed)	.178	.894	.103	.412	.004	.000	.624		.001
	Sum of Squares and Cross-products	-5.064	-.501	6.287	4.393	9.924	16.861	-2.108	37.290	18.046
	Covariance	-.106	-.010	.131	.092	.207	.351	-.044	.777	.376
Perc_wability	Pearson Correlation	-.240	-.089	.014	.061	.139	.353*	-.071	.469**	1
	Sig. (2-tailed)	.097	.545	.926	.675	.339	.013	.629	.001	
	Sum of Squares and Cross-products	-6.414	-2.352	.374	2.320	3.548	10.874	-2.150	18.046	39.737
	Covariance	-.134	-.049	.008	.048	.074	.227	-.045	.376	.828

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

a. Listwise N=49

APPENDIX G

SUPPLEMENTAL FINDINGS (ANOVA)

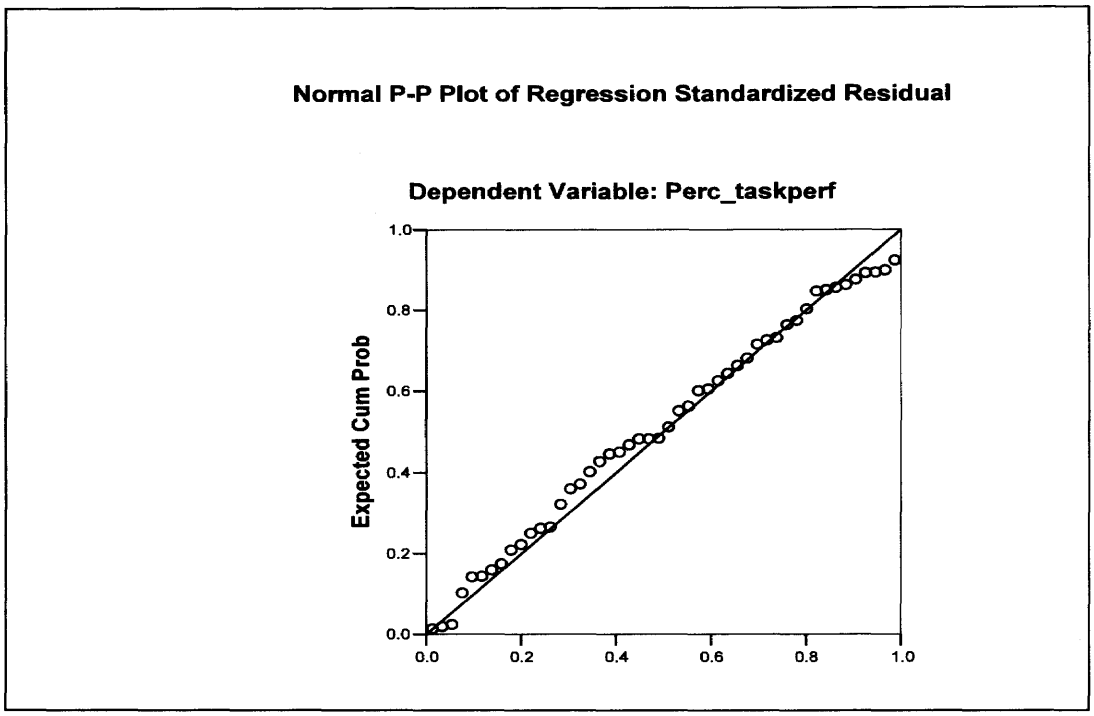


Figure G.1 Perceived Task Performance Regression Plot.

Table G.1 Episode 1 Linear Regression Model

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.903[a]	.816	.772	.33828	.816	18.697	9	38	.000

a. Predictors: (Constant), E1TimeTask, Perc_useful, E1RespCode, Writing_behavior, Perc_wability, E1WordCt, ICT_usgmob, Perc_readiness, E1CharCt

b. Dependent Variable: Perc_taskperf

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.565	.397		-1.422	.163	-1.369	.239
	ICT_usgmob	.131	.054	.213	2.406	.021	.021	.240
	Writing_behavior	.049	.066	.065	.742	.463	-.085	.183
	Perc_wability	.078	.066	.101	1.174	.248	-.057	.212
	Perc_useful	.806	.097	.651	8.273	.000	.609	1.004
	Perc_readiness	.173	.077	.214	2.230	.032	.016	.330
	E1WordCt	-.009	.025	-.161	-.361	.720	-.060	.042
	E1RespCode	-.018	.069	-.023	-.266	.792	-.159	.122
	E1CharCt	.002	.005	.227	.506	.616	-.007	.012
	E1TimeTask	3.16E-005	.001	.005	.060	.952	-.001	.001

a. Dependent Variable: Perc_taskperf

Table G.2 Episode 2 Linear Regression Model

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.908[a]	.824	.782	.33066	.824	19.766	9	38	.000

a. Predictors: (Constant), E2TimeTask, Perc_readiness, E2RespCode, Writing_behavior, Perc_useful, Perc_wability, ICT_usgmob, E2WordCt, E2CharCt

b. Dependent Variable: Perc_taskperf

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.739	.403		-1.833	.075	-1.555	.077
	ICT_usgmob	.124	.052	.203	2.384	.022	.019	.230
	Writing_behavior	.038	.065	.051	.585	.562	-.094	.171
	Perc_wability	.075	.068	.098	1.115	.272	-.061	.212
	Perc_useful	.799	.097	.646	8.206	.000	.602	.997
	Perc_readiness	.177	.074	.218	2.398	.022	.028	.326
	E2WordCt	.007	.025	.089	.289	.774	-.044	.059
	E2RespCode	.077	.063	.104	1.227	.227	-.050	.205
	E2CharCt	-.001	.005	-.074	-.232	.818	-.012	.009
	E2TimeTask	.000	.001	.026	.339	.737	-.001	.001

a. Dependent Variable: Perc_taskperf

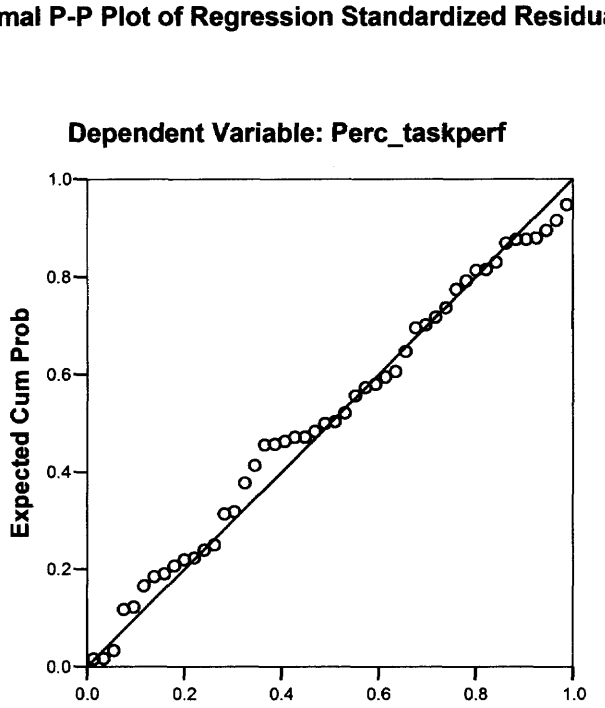


Figure G.2 Perceived task performance episode 2.

Table G.3 Episode 2b Linear Regression Model

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.926[a]	.857	.823	.29822	.857	25.269	9	38	.000

a. Predictors: (Constant), E2bTimeTask, E2bCharCt, Perc_useful, Perc_wability, ICT_usgmob, Writing_behavior, E2bRespCode, Perc_readiness, E2bWordCt

b. Dependent Variable: Perc_taskperf

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.753	.372		-2.024	.050	-1.507	.000
	ICT_usgmob	.123	.048	.201	2.549	.015	.025	.221
	Writing_behavior	.084	.061	.112	1.371	.178	-.040	.209
	Perc_wability	.072	.060	.093	1.201	.237	-.049	.193
	Perc_useful	.846	.093	.683	9.120	.000	.658	1.033
	Perc_readiness	.179	.067	.222	2.688	.011	.044	.314
	E2bWordCt	.059	.035	.552	1.696	.098	-.011	.129
	E2bRespCode	.068	.045	.121	1.490	.144	-.024	.159
	E2bCharCt	-.013	.006	-.720	-2.118	.041	-.025	-.001
	E2bTimeTask	-8.0E-005	.000	-.129	-1.864	.070	.000	.000

a. Dependent Variable: Perc_taskperf

Normal P-P Plot of Regression Standardized Residual

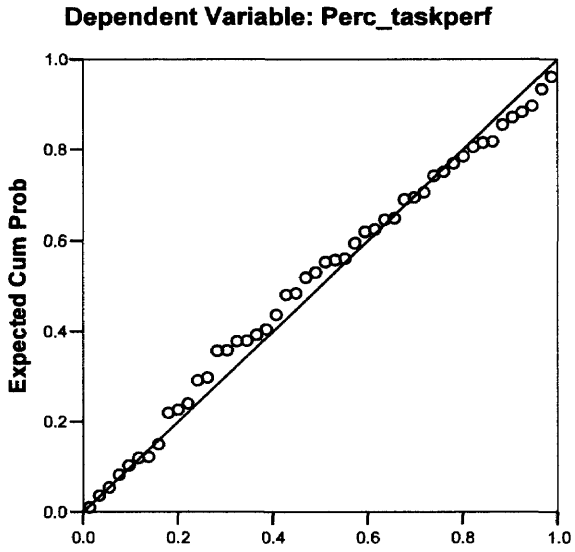


Figure G.3 Perceived task performance episode 2b.

Table G.4 Episode 3 Post-Training Linear Regression Model

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.917[a]	.841	.803	.31440	.841	22.312	9	38	.000

a. Predictors: (Constant), E3TimeTask, ICT_usgmob, Perc_readiness, E3RespCode, Perc_useful, Perc_wability, Writing_behavior, E3WordCt, E3CharCt

b. Dependent Variable: Perc_taskperf

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	-.772	.392		-1.968	.056	-1.566	.022
	ICT_usgmob	.162	.053	.264	3.076	.004	.055	.268
	Writing_behavior	.067	.063	.089	1.057	.297	-.061	.195
	Perc_wability	.023	.063	.030	.370	.714	-.105	.151
	Perc_useful	.845	.096	.683	8.821	.000	.651	1.039
	Perc_readiness	.217	.073	.268	2.977	.005	.069	.364
	E3WordCt	-.034	.028	-.352	-1.203	.236	-.091	.023
	E3RespCode	.101	.063	.131	1.593	.119	-.027	.229
	E3CharCt	.003	.005	.167	.550	.586	-.008	.013
	E3TimeTask	.000	.001	-.027	-.368	.715	-.001	.001

a. Dependent Variable: Perc_taskperf

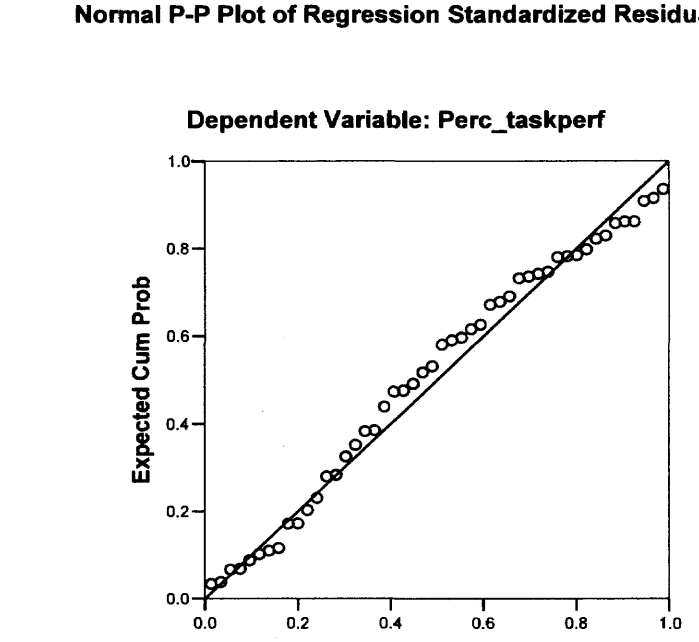


Figure G.4 Perceived task performance episode 3.

Table G.5 Episode 4 Post-Training Linear Regression Model

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.913[a]	.834	.795	.32080	.834	21.264	9	38	.000

a. Predictors: (Constant), E4TimeTask, ICT_usgmob, Perc_wability, E4RespCode, Perc_useful, Writing_behavior, E4WordCt, Perc_readiness, E4CharCt

b. Dependent Variable: Perc_taskperf

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.465	.432		-1.077	.288	-1.339	.409
	ICT_usgmob	.137	.049	.223	2.797	.008	.038	.236
	Writing_behavior	.022	.064	.029	.337	.738	-.108	.152
	Perc_wability	.092	.063	.120	1.459	.153	-.036	.220
	Perc_useful	.756	.125	.610	6.030	.000	.502	1.010
	Perc_readiness	.130	.074	.160	1.755	.087	-.020	.280
	E4WordCt	-.008	.027	-.066	-.297	.768	-.064	.047
	E4RespCode	.091	.070	.112	1.308	.199	-.050	.232
	E4CharCt	.003	.006	.116	.436	.665	-.009	.014
	E4TimeTask	-.001	.001	-.131	-1.764	.086	-.003	.000

a. Dependent Variable: Perc_taskperf

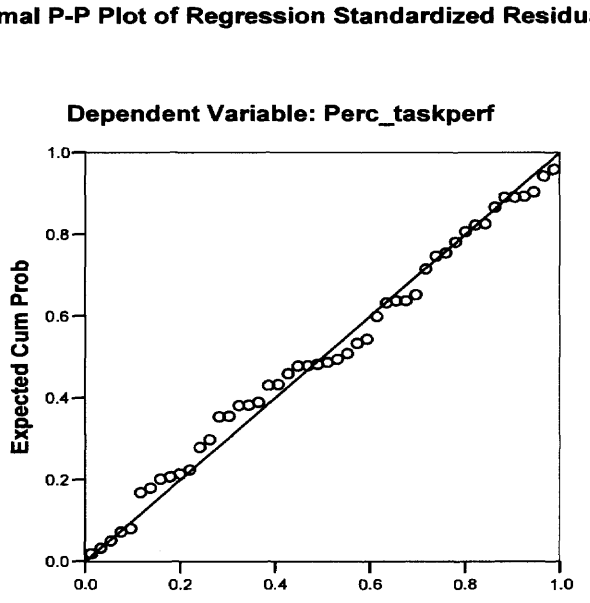


Figure G.5 Perceived task performance episode 4.

Table G.6 Episode 5 Post-Training Linear Regression Model

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.911[a]	.831	.790	.32448	.831	20.688	9	38	.000

a. Predictors: (Constant), E5TimeTask, E5RespCode, ICT_usgmob, Perc_wability, Perc_useful, E5WordCt, Writing_behavior, Perc_readiness, E5CharCt

b. Dependent Variable: Perc_taskperf

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.634	.389		-1.630	.111	-1.422	.153
	ICT_usgmob	.145	.050	.237	2.908	.006	.044	.246
	Writing_behavior	.027	.066	.036	.413	.682	-.106	.160
	Perc_wability	.077	.063	.100	1.225	.228	-.050	.205
	Perc_useful	.793	.101	.640	7.864	.000	.589	.997
	Perc_readiness	.137	.073	.170	1.884	.067	-.010	.285
	E5WordCt	-.035	.035	-.179	-.996	.325	-.107	.036
	E5RespCode	.109	.066	.124	1.638	.110	-.026	.243
	E5CharCt	.006	.006	.188	.986	.331	-.006	.019
	E5TimeTask	-.001	.001	-.098	-1.201	.237	-.002	.001

a. Dependent Variable: Perc_taskperf

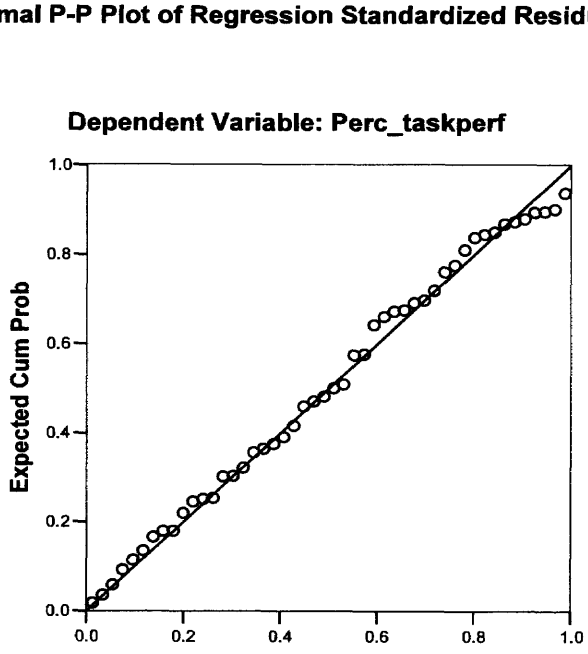


Figure G.6 Perceived task performance episode 5.

APPENDIX H

PUBLICATIONS RESULTING FROM THIS DISSERTATION RESEARCH

Note: the contents of this dissertation have resulted in the following publications and are not individually cited.

1. Gomez, Elizabeth, and Murray Turoff, "Community Crisis Response Teams: Leveraging Local Resources through ICT E-Readiness", HICSS Big Island, Hawaii, January 2007.

2. Gomez, Elizabeth, Linda Plotnick, Eli Rohn, Jon Morgan, and Murray Turoff, "Towards a Unified Public Safety Scale", HICSS Big Island, Hawaii, January 2007.

3. Gomez, Elizabeth, "Establishing Technical Writer's Readiness for Technological Change," Council on Programs in Technical and Scientific Communication (CPTSC), San Francisco California, October 2006.

4. Gomez, Elizabeth and Katia Passerini, "Improving Crisis Response through ICT-based Tools for Alert Notifications International", Conference on Telecommunication Systems – Modeling and Analysis (ICTSM), Penn State Berks, October 2006.

5. Gomez, Elizabeth, and Kathleen Higginbotham, "Building a Connection towards E-Public Healthcare: Individual Preparedness within a Local Community," AMCIS, August 2006.

6. Gomez, Elizabeth Avery, Dezhi Wu, Katia Passerini, and Michael Bieber "Introducing Computer Supported Team-Based Learning: Preliminary Outcomes and Learning Impacts," Information Resources Management Association (IRMA), May 2006.

7. Gomez, Elizabeth Avery, Katia Passerini, and Karen Hare, "Public Health Crisis Management: Community Level Roles and Communication Options", Information Systems for Crisis Response Management (ISCRAM) 2006, Newark, NJ, May 2006.

8. Gomez, Elizabeth Avery, and Karen Patten, "E-Public Health: Individual Preparedness for Collaborative Communication in Information Delivery," ISOneWorld, April 2006.

9. Gomez, Elizabeth Avery, Dezhi Wu, Katia Passerini, and Michael Bieber, "Computer-Supported Learning Strategies: An Implementation and Assessment Framework for Team-Based Learning," ISOneWorld, April 2006.

10. Gomez, Elizabeth Avery and Julian Scher, "Design Strategies for Pedagogical Use of Crossword Puzzle Generation Software, In Individual and Collaborative Design Modes," Information Systems Education Conference (ISECON) 2005, Columbus, Ohio, October 2005.

11. Gomez, Elizabeth Avery, and Michael Bieber, "Towards Active Team-Based Learning: An Instructional Strategy," America's Conference in Information Systems (AMCIS) 2005, Omaha, Nebraska, August 2005.

12. Gomez, Elizabeth, and Katia Passerini, "Community Responders in a Public Health Emergency: Leveraging Their Role in the Crisis Response Teams with ICT Readiness," International Association of Emergency Managers (IAEM) Special Issue, May 2006.

13. Gomez, Elizabeth Avery, Dezhi Wu, Katia Passerini, and Michael Bieber, "Utilizing Web Tools for Computer-Mediated Communication to Enhance Team-Based Learning" International Journal of Web-Based Applications of Learning and Teaching Technologies (IJWLTT), 2(2), April-June 2007.

14. Gomez, Elizabeth Avery and Katia Passerini, "Information and Communication Technologies (ICT) Options for Local and Global Communities in Health-Related Crisis Management" (journal; in submission).

15. Gomez, Elizabeth Avery and Katia Passerini, "Service-Based Crisis Management: Local and Global Community Roles and Communication Options" (journal; in submission).

16. Gomez, Elizabeth Avery, Dezhi Wu, Katia Passerini, and Michael Bieber, "Implementing Computer-Supported Team-Based Learning (CS-TBL): Preliminary Impact Assessment" (journal; working paper).

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