

INFRASTRUCTURE DISASTER MANAGEMENT:
INSIGHT FROM SMALL BUSINESS LEADERS AFTER A MEGA DISASTER

by

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A Dissertation Presented in Partial Fulfillment

of the Requirements for the Degree

Doctor of Business Administration

UNIVERSITY OF PHOENIX

December 2010

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**INFRASTRUCTURE DISASTER MANAGEMENT:
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by

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December 2010

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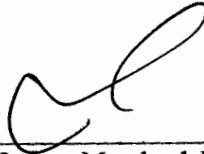
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Abstract

During the 2005 storm season, hurricanes Dennis, Katrina, and Rita significantly disrupted business infrastructure along the American Gulf Coast. In New Orleans alone, the aftermath of the mega-disaster closed 18,000 businesses and caused over 1,300 deaths. The mega-disaster also closed thousands of businesses in coastal Alabama, Florida, Louisiana, and Mississippi with damage estimated between \$40 and \$50 billion. The quantitative, correlational study investigated relationships between the availability of business infrastructure during the mega-disaster and Gulf Coast small business leaders' perceptions of disaster management. The study examined perceptions of Gulf coast small business leaders who sustained business operations during the 2005 storm season. A statistically significant correlation emerged between small business leaders' perceived pre-disaster planning and perceived severity of actual events. The correlation between the perceived severity of actual events and small business leaders' perceptions of the post-disaster response was insignificant. Findings suggested that perceptions about the severity of the actual disaster were disconnected from participants' perceptions about the post-disaster response. Although small business leaders perceived there was major damage from the hurricanes, the data did not reflect perceptions that a disaster response that was similar to the major damage along the Gulf Coast. Results from the study suggested businesses have different needs based on whether operations are traditional brick and mortar or Internet-based organizations. Study findings suggested a need for segmented disaster planning to avoid generic disaster approaches, disaster planning incorporating local community insight, and further research leading to improvement in disaster planning or disaster response.

Dedication

This work is dedicated to my wife, my mother, and my family. My wife, Imelda Griffey, preserved, encouraged me, and served as an inspiration throughout the doctoral journey. I cannot image a better partner in life. My mother, Patricia Gardner, gave me the gift of reading and the love of learning to satisfy my curiosity throughout my life. My family never begrudged the missed weddings, holidays, family reunions, and other typical life events I missed through this journey and continually supported the doctoral effort.

Acknowledgments

It is with humility and warmth that I recognize the professionals who have been a part of my doctoral journey. This work would have not been possible without the faith, wisdom, perseverance, encouragement, and guidance from my mentor, Dr. Ruby Rouse. Dr. Rouse was the energetic, integral, motivating, essential mechanism in this pursuit of research and scholarship. A sincere debt of gratitude to my committee members, Dr. John Peed, and Dr. Debbie Ritter-Williams for their commitment to excellence, adherence to scholarship standards, and patience as I pursued the doctoral journey. Very special thanks to the indefatigable Dr. Judith B. Kaplan as the essential editor-in-chief of the many manuscript revisions. I cannot imagine a better dissertation team has ever existed.

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Chapter 1: Introduction

American business depends on infrastructure such as highways, communication, public utilities, and regional distribution centers (Holliday, 2006). Phillips and Phillips (2008) noted access to groceries, gasoline, and basic consumer goods are essential for commerce with customers, suppliers, and vendors. Small businesses, representing a significant part of the American economy, rely heavily on infrastructure to succeed. In 2007, half of all Americans worked for small businesses that provided half of the American non-farm private sector workforce (United States Small Business Administration [SBA], 2009).

Unfortunately, business infrastructure is vulnerable to disasters, such as hurricanes, tornadoes, drought, tsunamis, terrorism, technological meltdowns, and other events triggered by external circumstances. Although most large businesses eventually recover from prolonged disaster situations, many small businesses do not survive. During the 2005 Hurricane disasters, Dennis, Katrina, and Rita, numerous small businesses along the Gulf Coast were adversely affected by the lack of business infrastructure to support business operations through the crisis (Ewing, Kruse, & Sutter, 2007).

Chapter 1 presents background information concerning Gulf Coast small businesses during and after the series of 2005 natural disasters, including hurricanes Dennis, Katrina, and Rita. Chapter 1 also presents the problem, purpose, significance, and nature of the quantitative study, and presented research questions.

Background of the Problem

The 2005 Gulf Coast storm season included three major Hurricanes, Dennis, Katrina, and Rita (Epstein, 2006; Holliday, 2006). The repetitive coastal pounding by the three major hurricanes along with the associated flooding, wind damage, and spin-off tornados created the conditions for a mega-disaster (Chiodi & Harrison, 2008; Epstein, 2006). Disaster planning and response for the Gulf Coast creates social concerns for the health of Gulf Coast small businesses, disruption of business revenue for community tax bases, and the influence of future disasters (Colten, Kates, & Laska, 2008; Ives & Junglas, 2006). The relationship of business infrastructure to small Gulf Coast businesses is of theoretical interest to communities, government disaster planning professionals, and business professionals.

Social concerns. The survival of Gulf Coast small businesses during crisis periods are of social concern because of the widespread economic impact of natural disasters on communities in the region. Hurricane Katrina resulted in the closing of 18,000 businesses in New Orleans (Ives & Junglas, 2006), thousands of businesses in Texas (Doyle, 2006), and interrupted business operations throughout the coastal regions of Alabama, Florida, Louisiana, and Mississippi. Occurring shortly after Katrina, hurricane Rita added to the devastation of businesses in the Gulf Coast region (Holliday, 2006). During the 2005 hurricane season, 27 floods hit New Orleans before Hurricane Katrina overcame New Orleans's levees, flooding 80% of the city, and causing more than 1,300 deaths. Flooding from Katrina disrupted infrastructure for the city's businesses, resulting in damages estimated from \$40 to \$50 billion (Colten et al., 2008).

Total disruption costs for businesses in the Gulf Coast region will not be fully accounted for many years after the three hurricanes. Estimates of total losses from the 2005 storm season indicated Hurricane Katrina was the single most damaging storm in recorded history, displacing more than one million Gulf Coast residents (Chiodi & Harrison, 2008). The 2005 hurricane season produced 27 named storms and was the first time storms were given names Alpha, Beta, Gamma, Delta, Epsilon, and Zeta because of the number of named storms exhausted the prepared alphabetical list for the year (Epstein, 2006).

In the aftermath of the 2005 hurricane season, many businesses continued to struggle for financial survival. In Louisiana and Mississippi, 60% of businesses affected by Hurricane Katrina remained closed more than a year after the storm subsided (Ives & Junglas, 2006). Three years after the 2005 hurricane season, a third of the Gulf Coast population was still absent, large sections of coastal business areas were empty, essential elements of the economy had not recovered, and some local communities may be lost forever (Colten et al., 2008).

Although the American public may perceive the probability of another Katrina-like event as minor; however, Britt (2009) indicated there is significant risk of additional mega-disasters in the United States. The top 10 most likely natural disaster threats in the United States include a major Midwestern earthquake, a Yellowstone super-volcano eruption, a New York City hurricane, a Pacific Northwest mega-thrust earthquake, and tsunamis on the various coastlines, such as the Gulf Coast, east coast, or Los Angeles (Britt, 2009). Any of these listed disasters could dwarf the infrastructure damage caused during the storm season of 2005. If the disaster management evidenced during Katrina as

stated in the House of Representatives report (2006), which indicated poor management, should occur with any of the top 10 mega-disasters, the economic consequences to small businesses in these affected regions there could be devastating and potentially unrecoverable economic and financial situations.

Theoretical interests. Beyond societal concerns, understanding infrastructure's influence on the performance of small businesses after a crisis is also of theoretical interest. Insight about the process small business leader's use when responding to crises may be helpful to business leaders coordinating operations during crisis periods, community leaders responsible for economic recovery following unexpected catastrophes, and public leaders coping with future disasters. Businesses play a critical role in optimizing economic conditions to help communities recover after disasters. Jarman and Chopra (2008) suggested economic business leaders are responsible for regional metropolitan service areas should strive to attract and retain businesses to provide steady employment and promote regional economic growth. Economists throughout the world acknowledge the importance of local business in stimulating economic growth and/or recovery (Edmiston, 2007).

The role of national leaders in American disaster management became evident during the 1906 San Francisco earthquake and subsequently strengthened through legislation. Disaster management responses have foundations in two main disaster management theories: pre-scripted emergency response plans and situational disaster leadership (Arvidsson, Johansson, Ek, & Akselsson, 2007; Schneider, 1992). In the past, American emergency response leaders have relied heavily on pre-planned disaster scripts with relatively little use of situational leadership to adjust pre-planned disaster scenarios

to actual disasters. Prepared disaster plans are the primary focus for historical and current American disaster management including contemporary operations by the Federal Emergency Management Agency (FEMA) and the Department of Homeland Security (DHS). Disaster management scripts, which started in the 1950s, consisted of the traditional disaster response cycle of pre-planning, management, mitigation, response, and recovery (Herzog, 2007; NARA, 2009a; Shaluf, 2008). Critics contended scripted disaster management responses are inflexible and fail to address evolving disaster situations that often bear little resemblance to new disasters (Schneider, 1992; United States House of Representatives, 2006).

Disaster response based on direct situational leadership, using the skills of executive leaders to change response methods and resource allocation based on the evolving disaster situation, is a relatively new disaster response theory (Samuels, 2008). Situational response to crises began with the Kennedy administration when several disasters and national security threats occurred between 1961 and 1963 (Ausland & Richardson, 1966). President Kennedy directed administration officials to address each crisis as a separate, non-relatable event and to create resolution plans in a framework designed to accommodate rapid, unpredictable changes. The Kennedy administration faced several crises that occurred in quick succession, which varied in scope from existing general disaster response plans (Ausland & Richardson, 1966; May & Zelikow, 2008).

The study has theoretical interest for disaster management leaders to examine conceptual frameworks for better alignment of disaster response leadership to future crises. Information from the study was used to compare small business leaders'

perceptions of disaster responses, post-disaster economic development, and effectiveness of disaster leadership. Disaster management that uses situational leadership, combined with contemporary management strategies, could lead to improved crises response effectiveness, mitigating the damage from future natural disasters (Herzog, 2007).

The study provided additional theoretical interest to international leaders by studying several major U.S. disasters as a context for analyzing crises in other countries. The study of the affects of the 2005 Gulf Coast natural disasters on small businesses, effectiveness of disaster response, and the long-term consequences of the disasters on economic recovery may provide insight for global leaders on how to deal with a variety of future disasters. Study research questions were used as the basis to investigate infrastructure support for small business recovery and may provide information for disaster management leaders around the world.

Statement of the Problem

The general problem is small businesses are ill prepared to operate during extended crises, resulting in reduced economic opportunity, loss of regional employment, and population migration. In New Orleans alone, 18,000 businesses closed because of Hurricane Katrina and 60% remained out of business year later (Ives & Junglas, 2006). Small companies, representing a large segment of employment, were particularly disrupted by the lack of business infrastructure and many have not recovered (Colten et al., 2008; SBA, 2009). Lack of small business employment contributed to a Gulf Coast exodus with 2008 census data showing a third of the Gulf Coast population were still missing three years after the 2005 storm season (Colten et al., 2008).

The specific problem is small businesses along the Gulf Coast were negatively influenced by lack of business infrastructure resulting from the 2005 mega-disaster (Doyle, 2006). National business indicators show a \$39.2 million spike in small business bankruptcy figures for 2005, up 14% from 2004 and significantly higher than post-disaster years (SBA, 2009). Business analysts attribute a portion of the 2005 third quarter rise to the 2005 business disruption caused by the mega-disaster (Koh, 2006). Small businesses depended on infrastructure, such as highways, communications, public utilities, and regional distribution centers to operate (Holliday, 2006). Unfortunately, infrastructure is vulnerable to disasters, such as hurricanes, tornadoes, drought, tsunamis, and terrorism. Most large businesses recover from prolonged disaster situations but many small businesses are not prepared to operate during extended crises (Ewing et al., 2007). The study used a correlational design to examine the relationship between the availability of business infrastructure and small business leaders' perceptions of disaster management on the Gulf Coast within the context of the 2005 mega-disaster. The general population for the study was Gulf Coast small business leaders who conducted continuous operations from 2004 to 2008.

Purpose of the Study

The purpose of the quantitative study was to investigate what relationship, if any, exists between the availability of business infrastructure during the 2005 natural disasters and Gulf Coast small business leader's perceptions of disaster management. In particular, the analysis examined the perceptions of Gulf coast small business leaders who successfully sustained business operations during the 2005 storm season. A quantitative research method was appropriate when examining relationships between

independent and dependent variables (Creswell, 2009; Vogt, 2007). Neuman (2007) indicated quantitative research methods are particularly useful when collecting data in geographically dispersed populations and the study analysis moves from abstract ideas to concrete conclusions. Quantitative research was appropriate for the study to investigate the relationships between the variables in a population dispersed throughout the coastal regions of three states.

A correlational research design was appropriate with the examination associated with patterns in the experiences of sampled populations in the context of specific independent events (Salkind, 2009). Study data were correlated to determine the strength of relationship (Creswell, 2009), if any, between Gulf Coast small business leaders' perceptions of disaster management and the availability of business infrastructure during the 2005 storm season. The independent variable was the availability of business support infrastructure during and after the 2005 storm season; the dependent variable was Gulf Coast small business leaders' perceptions of disaster infrastructure management. The specific population was Gulf Coast small business leaders in coastal Alabama, Louisiana, and Mississippi with continuous operation from 2004 through 2007.

Significance of the Problem

The study was significant to small business leaders, the American business community, and business leaders. Results from the study can be used to understand disaster management influence on small business demographics and Gulf Coast communities (Colten et al., 2008). The study can be of significance to business leaders to understand business continuity during disasters (Chiodi & Harrison, 2008; McLaurin, 2006).

General significance. The study has societal significance to the economic welfare and future viability of the American Gulf Coast as a business region. From 1990 to 2003, leaders of small businesses were responsible for 92.7% of new jobs in America (SBA, 2009). Within the small business designation, firms with less than 20 employees represented 79.5% of new jobs and organizations with 20 to 499 employees generated 13.2% of new jobs (Edmiston, 2007).

The storms of 2005 resulted in a 33% reduction in the size of the coastal population (Colten et al., 2008). Without the presence of viable small businesses, there was little reason for citizens to return to the Gulf Coast region (Colten et al., 2008). Governmental and business leaders may use the results of the study to improve community and regional continuity planning. Leaders may also use data from the study to analyze the specific role public infrastructure plays in promoting economic recovery after periods of disaster (Ives & Junglas, 2006).

The study was also significant for community leaders concerned about social programs for local constituencies funded through the tax base provided by small businesses and their employees (Colten et al., 2008). Disasters are crippling to local economies and future economic development (Colten et al., 2008; Ewing, et al., 2007; Ives & Junglas, 2006). The study examined the implications of 2005 natural disasters on the Gulf Coast and the study's conclusions may be applicable to other crises including tornadoes, terrorism, and other disasters.

Leadership significance. Leaders from many business disciplines may benefit from the study's investigation into the effectiveness of cyclical models for disaster administration (Herzog, 2007). The quantitative study provided insight to leaders of all

disciplines about how to respond during crisis events, manage a crisis workforce, and re-assemble business infrastructure (Ives & Junglas, 2006). The analysis may be significant to practitioner leadership in all fields concerned with strategic planning, situational leadership, business continuity, and business infrastructure requirements following disaster events (Chiodi & Harrison, 2008; Colten et al., 2008; Herzog, 2007; McLaurin, 2006). The results could provide the basis for future models for natural disaster administration, improving the availability of business infrastructure for communities and the survivability of small businesses.

Nature of the Study

The intent of the quantitative correlational study was to investigate how, if at all, natural disaster damage to business infrastructure influenced the operations of small Gulf Coast businesses after a mega-disaster. Quantitative research is appropriate when a problem requires an analytical description of the relationships between two or more variables (Vogt, 2007). Qualitative research is appropriate when research seeks descriptive exploration to provide new insight and theories to examine social and cultural problems (Neuman, 2007). Correlational designs are most appropriate in situations in which researchers are interested in determining the extent to which two variables co-vary and defining the degree that a change in one variable may be reflected in the other (Creswell, 2009).

Mixed methods are useful to understand relationships of several quantifiable variables and simultaneously seek a detailed understanding of central phenomenon (Creswell, 2009). Mixed-mode research was not appropriate for the study because there was no need to analyze qualitative information. The study used a correlational approach

to indicate how, if at all, availability of business infrastructure influences the operations of Gulf Coast small businesses; the study did not seek to understand any social elements that would require qualitative research. Correlational research is quantitative and does not incorporate qualitative elements that would require mixed-mode analysis (Salkind, 2009). The study included a minimal number of open-ended questions to allow participants to clarify, if necessary, survey responses.

Correlational study designs are capable of testing the relationship between business infrastructure and Gulf Coast small business operations allowing forecasting of future outcomes (Vogt, 2007). A correlational approach is more appropriate than other designs, such as a causal-comparative design, because a correlational design is useful to address direct quantitative relationships describing the amount of causality between two or more variables (Salkind, 2009). A correlational design was a better fit for the study than a case study design that focuses on the understanding of central, limited phenomena (Creswell, 2009). The selection of a correlational design enabled the correlation coefficient examination of the relationship, if any, between the availability of business support infrastructure and the perceptions of Gulf Coast small business leaders concerning disaster management.

Research Questions and Hypotheses

The research study analysis focused on two research questions to investigate the relationships, if any, between the availability of business infrastructure during the 2005 natural disasters and Gulf Coast small business leader's perceptions of disaster management. *Business infrastructure* is a term used to describe all necessary support structures and facilities for businesses to continue daily operations. Business

infrastructure includes roads, housing, distribution centers, communications facilities, utilities, and office space (Ewing et al., 2007; Holliday, 2006; Phillips & Phillips, 2008). *Small business* is a sizing term used by the Small Business Administration (SBA). The SBA (2009) defines small businesses as a combination of two groups with one group defined by organizations with 19 or fewer employees and the second group composed of firms with 20 to 499 employees (SBA, 2009).

Analyzed results from the two research questions focused on the correlation between business infrastructure and small business operations throughout the natural disasters of 2005. Study analysis investigated the involvement of leaders (government, business, and community) in maintaining and restoring business infrastructure during natural disasters and the corollary impact to small business operations on the American Gulf Coast. Calculated results from the research questions provided insight about how to change disaster response leadership theory and disaster management based on the perceptions of Gulf Coast small business leaders. The study's research questions, described below, provided a framework to determine the correlation between availability of business infrastructure support and small Gulf Coast business operations during the 2005 natural disasters.

Study analysis examined two research questions. Participants' answers to the first research question investigated the experience of small businesses in relation to leadership planning and mitigation for business infrastructure during 2005 natural disasters. The first research was constructed to ask, "*What influence, if any, do business infrastructure planning and mitigation have on small businesses after natural disasters?*" Some small businesses may be affected through the disaster period because no provisions are made

for the delivery of minimally acceptable business infrastructure (Colten et al., 2008). Timely and effective disaster response by leaders may lessen the impact of disasters on the affected community. Business infrastructure support tends to be particularly important during the recovery period when small businesses need connectivity to supplies, suppliers, and business partners to resume operations.

The following null and alternative hypotheses associated with the first research question were statistically tested:

H_{10} – Business infrastructure planning and mitigation do not significantly correlate with small business leaders’ perceptions after natural disasters.

H_{1A} – Business infrastructure planning and mitigation significantly correlate with small business leaders’ perceptions after natural disasters.

To investigate leadership opportunities for responding to business infrastructure problems caused by natural disasters, participants’ responses to the second research question examined small business leaders’ perceptions of disaster management response after natural disasters. The second research was constructed to ask: *“How, if at all, can natural disaster management leaders improve the response to business infrastructure problems based on perceptions from small business leaders?”* Research indicates the recovery period after major natural disasters may take three years or longer (Colten et al., 2008). Some small businesses, unable to maintain business operations without restoration of essential business infrastructure, may fail during the natural disaster recovery period because of insufficient leadership management or response.

The following null and alternative hypotheses associated with the second research question were statistically evaluated:

H2₀ – Disaster management leaders' response to business infrastructure problems do not significantly correlate with small business leaders' perceptions of actual infrastructure problems.

H2_A – Disaster management leaders' response to business infrastructure problems significantly correlates with small business leaders' perceptions of actual infrastructure problems.

Theoretical Framework

The study falls under the broad theoretical area of crisis management and leadership. Germinal research in crises management literature focuses on planning for situations created through human actions, including revolutions, civil wars, and armed conflicts between nations (Gilbert & Lauren, 1980). Historically, during periods of crisis, government officials follow blueprints set forth in contingency plans and mitigation projections, rather than developing dynamic models capable of dealing with the realities of an unfolding crisis. The federal government is not known for effective situational leadership, preferring to depend on contingency planning for quick responses to crisis management (Ausland & Richardson, 1966; Banipal, 2006; Gilbert & Lauren, 1980; Harrington, 2008; Herzog, 2007; Lyden, 1974). With situational leadership, creative thought is necessary with leaders' behavior depending on emergent variables, such as followers' relationships and abilities, time pressure, and unique characteristics of the task (McLaurin, 2006).

In 1961 and 1962, President Kennedy changed American crisis response theory by insisting on situational awareness and contingency leadership for national security crises, rather than adhering to the published planning binder for crisis situations (May &

Zelikow, 2008). Kennedy encouraged national leaders to use feedback from on-going crises, rather than relying on rote actions listed in the pre-prepared manuals, for crisis events such as the Berlin wall crisis, Cuban missile crises, fighting in Laos, and the outbreak of violence in Cyprus (Ausland & Richardson, 1966). Kennedy's intent was to foster adaptable, contingency-driven decision-making during events in which leaders' reaction time is significantly restricted.

Disaster leadership. A subset of crisis management is disaster leadership, a holistic term comprising all elements in planning and responding to disasters including events before a disaster through recovery activities (Shaluf, 2008). Crises differ from disasters because crises are unplanned events as a direct result of human intervention. Disasters are natural occurrences, not a result of human intervention, and managed as a subset of crisis management (Ausland & Richardson, 1966; Banipal, 2006; FEMA, 2008). Formalized national disaster management started early in the twentieth-century with the 1906 San Francisco earthquake (Roberts, 2006). The event registered 8.3 on the Richter scale, destroyed 28,000 buildings, killed approximately 3,000 people, and left more at least 225,000 citizens homeless (O'Rourke, 2006). The San Francisco disaster seemed to foreshadow events in 2005 because each event consisted of damage caused by the natural disaster as well as collateral problems caused by ineffective leadership planning for public infrastructure. Although the natural disaster of the earthquake was uncontrollable, the fires that destroyed the greater part of San Francisco's wooden buildings could have been prevented through active, informed leadership (O'Rourke, 2006; Roberts, 2006).

Government leaders who are active in emergency planning and prepared for effective disaster response tend to be dependent on the current body of knowledge for disaster administration management. Herzog (2007) suggested additional research should create frameworks to close the gap between actual events and theoretical models for disaster mitigation, planning, response, leadership, and economic recovery. Local communities, state authorities, the United States FEMA, DHS, and other organizations have checklists, guidelines, and planning elements to create plans for disaster management; however, little research has been conducted to create holistic theories for natural disaster administration addressing the event's entire life cycle (Roberts, 2006; Shaluf, 2008; Sylves, 2008).

Contemporary disaster management. The study's results built on current disaster management literature by testing the correlation between availability of business infrastructure during disasters and perceived consequences to small businesses. Herzog (2007) extensively discussed a commonly used contemporary model for disaster management. The framework illustrates the disaster management flow by connecting disaster theories, disaster planning, projected destruction, actual damages, disaster response, and the feedback from past disasters to influence the body of theory for future disasters.

Information from the study extended the body of knowledge for modeling disaster administration theory in the context of infrastructure and small businesses. Herzog's model (2007) is an example of contemporary disaster administration theory containing the common elements of disaster theory for planning, projecting crisis scenarios with prepared disaster plans, and pre-planned disaster response based on projections. The

preparation of pre-scripted disaster response templates evolved from the approach taken by the Federal Civil Defense Act of 1950 preparing America for nuclear attack based on the emergency response elements of planning, management, mitigation, response, and recovery (Herzog, 2007; NARA, 2009a; Shaluf, 2008). Herzog's (2007) model extended the commonly used disaster response model of planning, management, mitigation, response, and recovery to include a comparison of disaster management results after the disaster. Herzog's model also used the information from after-disaster reports as feedback to influence the body of knowledge to change future disaster theory.

Contemporary holistic theories for disaster management are sparse and the research investigates Herzog's (2007) cycles of business planning, mitigation, management, and response. The study of Gulf Coast small business leader perceptions of business infrastructure leadership through the disaster management cycle added to the body of literature for disaster management. The Herzog disaster administration model is a useful tool providing contextual framework for the study of Gulf Coast small business operations in relation to the availability of business infrastructure in natural disasters.

Controversy. In the field of crisis management, considerable controversy exists between experts who suggest a stronger situational leadership style, with minimal pre-determined scripting, and those leaders who assert a systematic pre-planned approach minimizing uncertainty and maximizing decision time. President Kennedy was a charismatic leader who contributed to changes in the traditional manner of crisis management from a pre-planned rote model to a situational contingent style (May & Zelikow, 2008). Kennedy used contingency management methods for national responses to a variety of national emergencies occurring in 1961 and 1962. Prior to Kennedy's use

of situational leadership for crisis situations, federal responses were mandated based on pre-planned scenarios created by government, civilian, and military experts (Ausland & Richardson, 1966). According to Ausland and Richardson (1966), Kennedy led his cabinet and advisors using a Socratic approach during several national emergencies in 1961 to 1962. Kennedy's approach changed American disaster management theory for the future.

In contemporary business, successful leaders must adapt relevant styles and methods to the realities of emerging crises. Situational factors are often present in emergencies, including variables such as time pressure, follower capability, and fast-shifting task priorities (McLaurin, 2006). Disaster management leaders will be better prepared to respond to crises with more scholarly information about how to use situational awareness to cope with as disasters as they unfold.

Adherents to pre-preplanned crisis response argued that prepared scripts save considerable time in addressing crises events and remove emotional influences from disaster management (Takeda & Helms, 2006; United States House of Representatives, 2006). Supporters of pre-planned scripts believe pre-planned disaster scripts can save valuable time and help disaster leaders quickly and effectively respond to developing crises. Pre-planned disaster scripts have been the preferred government response for several decades (Ausland & Richardson, 1966; Banipal, 2006; FEMA, 2008).

FEMA's actions and decisions on the Gulf Coast during the 2005 storm season illustrated the controversy between adherence to scripted, pre-planned actions and situational leadership that uses pre-planned procedures as guidelines (Sylves, 2008). FEMA relied on hurricane plans developed prior to 2005 in Washington, D.C. by

acknowledged disaster management experts. Nevertheless, several FEMA strategies failed during the Katrina disaster because the hurricane planning did not adjust to cover the magnitude of a larger storm.

Definition of Terms

Research study results were used to conduct correlational analysis between small business, business infrastructure, and disasters on the Gulf Coast (Creswell, 2009).

Definition of business terms within the study is important to place the quantitative analysis in business context. The following paragraphs provide significant definitions.

Business failure. Business failure is the end state for any organization that becomes deficient or inadequate to the point of closure (Liao, Welsch, & Moutray, 2009). Business failure is a result of a wide range of market and non-market influences. In particular, small businesses are susceptible to business failure due to relatively low capitalization resources (Colten et al., 2008; Doyle, 2006). The study discussed business failure in the context of small business failures on the Gulf Coast in relation to disasters.

Business infrastructure. Business infrastructure describes support facilities necessary for continuing business operations including regional material distribution centers, communications facilities, passable roadways, public utilities, security, and housing (Ewing et al., 2007; Holliday, 2006; Phillips & Phillips, 2008). In this study, business infrastructure was discussed in the context of business support facilities necessary to sustain profitable operations for small businesses on the Gulf Coast. The study investigated the relationship, if any, between small business and business infrastructure during disasters.

Business operations. Business operations are defined as activities that prevent any organization from becoming deficient or inadequate to the point of closure through bankruptcy, organizational mortality, business discontinuance of ownership (ownership changes), business discontinuance (the business entity ceases to exist), dissolution of the business charter, or entrepreneurial exit (Carter & Van Auken, 2006; Liao et al., 2009). Business operations encompass all activities for individual organizations to remain relevant and vibrant in their chosen markets. The study examined business operations in the context of small businesses on the American Gulf Coast.

Just-in-time. Just-In-Time (JIT) systems require components or finished products delivery to the manufacturer or vendor at the appropriate place in the manufacturing or sales process at the exact time needed (Bayo-Moriones, Bello-Pintado, & Merino-Díaz-de-Cerio, 2008). Small businesses often operate on limited operations budgets and depend on JIT arrangements with suppliers, partners, and customers to remain solvent. JIT operations require effective, coordinated communications infrastructure and were discussed in the study as a dependent on business infrastructure.

Situational leadership. Situational leadership is a term identifying leaders who base decisions and actions on the situational variables and perceived organizational outcomes in a given situation (Arvidsson et al., 2007; Vroom & Jago, 2007). Some of the contributing situational variables are time pressure, follower capability, and fast-shifting task priorities (McLaurin, 2006; Roberts, 2006; Sylves, 2008). The study cited situational leadership as one of the main categories of disaster management theory.

Small businesses. Small businesses represent two segments of American organizations, one comprised of less than 20 employees and the other encompassing

enterprises of 20 to 499 employees (SBA, 2009). In 2007, small businesses encompassed more than 99% of all American-based businesses and employed more than 57 million workers (Edmiston, 2007; SBA, 2009). The relationship, if any, between small business operations and disaster management was one of the main themes of the research study.

Small business leaders. Small business leaders are people who lead small businesses filling unique, innovative niches not occupied by large corporations (Bhattacharyya, 2006). The term was used in the study to identify Gulf Coast leaders of companies that consist of one through 499 employees (SBA, 2009). Perceptions of small business leaders in relation to disaster management were one of the main themes of the study.

Assumptions

The quantitative study investigated the influence, if any, of business infrastructure availability on the operations of small Gulf Coast businesses during the 2005 mega disaster. An essential assumption was small business leaders would be willing to respond to the survey and reflect a representative sample. One of the primary problems in social science research is the lack of response from the targeted study population (Neuman, 2007). Poor response rates can jeopardize the quality of analysis and weaken research study conclusions. Several questionnaire techniques improve study response rates including wording the questions clearly, maximizing readability, and making the survey interesting to participants (Colker, 2009; Zalles, 2009).

The study assumed small business leaders related disaster events honestly with accurate recollection of significant events. Accurate witness responses to past events can vary with time and are influenced by the context of how the survey was presented to the

participant (Wikman, 2007). Brewer, Caon, Todd, and Weber's (2006) results suggested time lag from original events to research conducted later influences the quality of participant's recollection. The time lag from the 2005 storm season to the 2010 study survey might influenced the quality of small business leader's responses for 2005 disaster perceptions. Participants may also have difficulty accurately recalling events from 2005; however, given the magnitude of the 2005 Gulf Coast storm season, it was likely small business leaders were able to recall and relate the influence of business infrastructure on the small business operations accurately.

A third assumption for the study was selected participants comprehended the focus and intent of the survey instruments. When individuals cannot comprehend the intent of the survey questions, participants may answer inquiries from a different perspective or may skip questions. The survey instruments were specifically constructed to target the small business audience using concise, easily understood language to convey survey purpose, value, intent, and completion instructions (Colker, 2009; Creswell, 2009; Zalles, 2009). Subject matter experts reviewed the survey questions for validity and then the questions were pilot tested for reliability ensuring participants comprehended the survey's intent.

The last assumption for the research study was Gulf Coast small business leaders would return the questionnaire responses in a timely manner. Creswell (2009), Fincham (2008), and Salkind (2008) suggested strategies to remind participants for timely submissions including e-mails, postcards, and phone calls. As discussed in chapter 3, online survey returns were increased through e-mail reminders.

Scope

The study's scope included small businesses in continuous operation from 2004 through 2007 in the coastal regions of Alabama, Louisiana, and Mississippi. The quantitative, correlational study was conducted in 2010 to test the relationship between small business operations and the availability of business infrastructure in relation to natural disasters. Results from the quantitative research study were intended for generalization to the Gulf Coast small business population with continuous business operations from 2004 through 2007.

Generalization is the extrapolation of research study findings from a sample to the entire population through inferential statistics (Creswell, 2009). Sound generalization depends on sufficient sample size to model the population at large and is most appropriate in quantitative research designs (List, 2008). As discussed in chapter 3, Creative Research Systems' (2009) sample size calculator was used to determine a target sample size sufficient for generalization to the estimated American Gulf Coast small business population.

Limitations

Quantitative studies based on related experiences of participants have several inherent limitations. One limitation was the potential lack of honesty, resulting in self-reported bias that could raise significant questions regarding the study's validity (Creswell, 2009; Wikman, 2007). Another limitation was the accuracy of participants' recollection when describing disaster experiences that occurred two or more years in the past (Brewer et al., 2006). Inaccurate memory could create skewed responses changing the baseline events and influencing study conclusions.

Study limitations included the lack of study control over the participants to ensure a representative population sample with an acceptable response rate (Fincham, 2008; Hurd, 2006; Porter & Whitcomb, 2007). The researcher did not have direct control or influence over participants to influence the response rate, although a set of reminders was sent to individuals in the sample. Another important research limitation was participant comprehension of the survey instrument, which may result in uneven primary response information (Colker, 2009; Creswell, 2009; Zalles, 2009). If participants cannot understand the intent of the survey, then answers could come from participant perspectives that are not relevant to the study's topic. Recognizing externally imposed limitations identifies potential research study weaknesses and supports establishment of study parameters (Creswell, 2009). Understanding the limitations before a study is conducted allows researchers to plan strategies to mitigate the limitations.

Delimitations

Several researcher-imposed delimitations will restrict the target audience, research area, and influence results of the study. The population was delimited to leaders of Gulf Coast small businesses in three states (Louisiana, Alabama, and Mississippi) in continuous operation from 2004 through 2007. Study results were delimited to analysis of a survey instrument, developed through a pilot study, gathering perceptions of Gulf Coast small business leaders concerning infrastructure management during natural disasters. The survey instrument used for the main study also delimited the set of participants. The last delimitation was the use of Herzog's (2007) model to frame the study's results. Given wide acceptance of the conceptualization, the model was selected as an appropriate instrument to test what relationship, if any, exists between Gulf Coast

small business operations and availability of business infrastructure during natural disasters (Doyle, 2006; Ewing et al., 2007).

Summary

Business infrastructure, including regional distribution centers, communications facilities, housing, production facilities, roadways, and public utilities, are essential for small business operations during crisis events (Ewing et al., 2007; Holliday, 2006; Phillips & Phillips, 2008). The failure of small businesses causes significant economic consequences to communities through loss of tax revenue, reduced employment opportunities, and reduction of potential economic development (Colten et al., 2008; Ives & Junglas, 2006). The study used a quantitative method with a correlational design to build upon current disaster theory research. A pilot survey was used to validate a new instrument for business infrastructure using a sample of business and industry experts. Once the pilot survey was validated, the pilot survey was used as the basis for the main study. The analysis applied Herzog's (2007) model for natural disaster administration to small business operations along the Gulf Coast after the 2005 natural disasters. The sample consisted of small business leaders in Alabama, Louisiana, and Mississippi that continuously operated on the American Gulf Coast from 2004 through 2007. Information in Chapter 2 reviews germinal research, provides a historical overview, and explores contemporary research regarding infrastructure's influence on small business operations during periods of natural disaster.

Chapter 2: Review of the Literature

Analysis from the correlational study investigated how business support infrastructure influenced Gulf Coast small business operations throughout the natural disasters of 2005. Renski (2009) indicated little scholarly research has examined small business operations relative to geography or the influence of business infrastructure. The purpose of the quantitative research study was to examine what relationship, if any, exists between business infrastructure availability and small business operations during natural disaster events. Chapter 2 provides a historical overview and analysis of the current literature studying small businesses as well as natural disaster management and recovery. Chapter 2 also explores literature relating to the research questions, history, theoretical gaps, and conclusions of American disaster management literature.

Documents Strategy

Several sources of information were examined to provide context for the study. Emphasis was placed on locating peer-reviewed journals with keyword searches conducted in University of Phoenix Business Source Complete, Dissertations & Theses @ University of Phoenix, EBSCOhost, Gale PowerSearch, ProQuest, and ProQuest Dissertations and Theses - Full Text databases. Keyword searches included the terms *2005 storm season, contemporary disaster models, disaster administration, disaster administration theory, disaster leadership, disaster management, disaster models, entrepreneurial business management, executive orders, historic hurricanes, natural disaster administration, public infrastructure, small business leadership, small business operations, situational leadership, small business economic development, and small businesses*. Multiple Google online searches were conducted providing contributing

information from seven government websites including the American Presidency Project, the Federal Emergency Management Agency (FEMA), the Ohio Historical Society, the United States National Archives and Records Administration (NARA), the United States National Oceanic and Atmosphere Administration (NOAA), and the United States Small Business Administration (SBA). As shown in Table 1, 91.4% of references used in the proposal came from sources published within the last five years. Table 2 illustrates 82 references were used, including information from 8 peer-reviewed books, 46 peer-reviewed journal articles, 7 government websites, and 2 dissertations.

Table 1

Recency of References Analyzed

Date of References	Frequency	Percentage
Prior to 1999	4	4.9%
1999 – 2005	3	3.6%
2006 – 2010	75	91.5
Total	82	100%

Table 2
Type of References Analyzed

Type of References	Frequency	Percentage
Founding theorists	4	4.9%
Empirical research	10	12.2%
Peer reviewed articles	10	12.2%
Books	8	9.8%
Dissertations	2	2.4%
Journals	46	56.1%
Other	2	2.4%
Total	82	100%

Note. Only 2.4% of sources were not in one of the preferred scholarly categories; 97.6% of sources were founding theorists, empirical research, peer reviewed articles, books, or journals.

Historical Background

Historically, American disaster management grew from federal intervention into local and regional disasters (Ausland & Richardson, 1966; Roberts 2006). Presidents have shaped the history of American disaster management through legislation (FEMA 2008; NARA, 2009a). Disaster management in the United States is embroiled in controversy concerning management and response methodology (Herzog 2007; Shaluf, 2008).

American disaster management. The quantitative study falls under the broad theoretical areas of crisis management and disaster leadership (Ausland & Richardson, 1966; Gilbert & Lauren, 1980; Herzog, 2007; Roberts, 2006; Shaluf, 2008; Sylves, 2008).

Controversy in the disaster management field stems from scholarly debates about the merits of strictly adhering to pre-crisis plans, heavy reliance on contingency planning, or use of situational awareness during the crisis life cycle (McLaurin, 2006; Roberts, 2006; Sylves, 2008). Some experts advocate using pre-developed crisis management plans without significant deviation, to address disasters. Other disaster management experts assert pre-crisis planning should cover expected common problems and leaders should emphasize situational management to address the unique conditions of each disaster.

Various degrees of disaster management have existed for as long as there have been catastrophic events. The earliest national disaster management planning emerged after the 1906 San Francisco earthquake when President Theodore Roosevelt sent federal troops to help the stricken California community (Roberts, 2006). Roosevelt was the first president outwardly cognizant of the important role of public infrastructure during and after natural disasters. In many respects, the San Francisco disaster foreshadowed the events of Hurricane Katrina approximately 100 years later. Both disasters consisted of damage caused by the disaster and damage created through insufficient planning for public infrastructure (Harrington, 2008; Roberts, 2006; Takeda & Helms, 2006; United States House of Representatives, 2006). Although the natural disaster of the 1906 earthquake was uncontrollable, the subsequent fires that destroyed the greater part of San Francisco's wooden buildings could have been prevented through proper management of public resources (Harrington, 2008; Roberts, 2006). After the 1906 earthquake, fire departments used dynamite during disaster response efforts in mistaken attempts to stop the spreading fire (Harrington, 2008). The dynamite failed to stop fires from spreading, instead exacerbating the problem by causing new fires. The San Francisco earthquake,

coupled with the subsequent fires, was a harbinger of the need for sustainable public infrastructure to support businesses through crisis periods.

America's first legislation for permanent federal involvement in natural disasters was a by-product of the Federal Civil Defense Act (FCDA) of 1950. The primary purpose of the legislation created a centralized program to prepare the United States to defend against potential nuclear attack but the Federal Civil Defense Act also contained provisions for natural disaster emergency management. In conjunction with the FCDA, President Truman signed Executive Order 10186 on December 1, 1950, creating the Federal Civil Defense Administration in the Office for Emergency Management (The United States National Archives and Records Administration [NARA], 2009a). The FCDA was created predominantly as a precautionary measure based on Chinese nuclear capabilities and China's involvement in the Korean conflict (NARA, 2009a).

The FCDA was chartered to create evacuation, shelter, and education programs for state and local government implementation. Although the FCDA created the framework for programs, the Agency did not provide any funding for emergency management. State and local efforts were inconsistent across the United States, with some states creating elaborate plans, shelters, and others simply designating shelter areas in existing structures. Most of the early FCDA effort focused on major metropolitan areas, largely ignoring rural regions. In the 1950s the FCDA, USDA, and state services incorporated sophisticated fallout models and began programs to educate farmers about potential nuclear attacks, farmers as food providers, and farms as hosts for city evacuees (Barker-Devine, 2006).

The FCDA was designed as a preventive, pre-planned national response for potential nuclear attacks and inadvertently became the basis for future administration's response to natural disasters. Future presidents modified the FCDA to link administration responsibility to national emergency response for various national crises (American Presidency Project, 2009; University of Michigan, 2009). Key disaster management legislation including the 1969 Disaster Relief Act, 1970 National Council on Federal Disaster Assistance, Disaster Relief Act amendments of 1974, and Federal Emergency Management Agency (FEMA) were all examples of legislation evolving from the precedence of the FCDA (NARA, 2009a, 2009b).

The next major disaster management initiative occurred during President Kennedy's administration. Kennedy's 39th Executive Order (10952), signed July 20, 1961, substantially revised the Federal Civil Defense Act and assigned civil defense responsibilities to the Secretary of Defense and other government leaders (University of Michigan, 2009). The new FCDA strengthened government involvement and responsibility in civil emergencies by establishing the Secretary of Defense as an important cabinet member responsible for emergency management. Kennedy signed the civil defense Executive Order to prepare Americans for threats such as the Berlin wall crisis, Cuban missile crisis, Cyprus conflict, and the communist threat in Laos (Ausland & Richardson, 1966).

Kennedy changed the face of national crisis management through his desire to react immediately and effectively to national security crises (May & Zelikow, 2008). The President encouraged cabinet members and advisors to collaborate with industry analysts, business leaders, and other sources to prepare briefs for potential situational

management actions. The national leaders working for President Kennedy applied a situational, hands-on method to deal with several national emergencies from 1961 through 1964. Before the Kennedy administration, federal crises efforts were based on pre-planned lists of options for the President to choose from in a given national crisis (Ausland & Richardson, 1966).

The resultant Kennedy administration situational style employed critical thinking and formal reasoning to sort through information regarding a national crisis and select a course of action promising the best results for the nation. The President led his cabinet and advisors using a Socratic approach during several national emergencies in 1961-1962 including the Berlin wall crisis and the Cyprus conflict (Ausland & Richardson, 1966). Kennedy's approach to national crises changed American disaster management theory and transitioned American national crisis management to a situational model. Kennedy's administration stopped short of addressing natural disaster management in the United States.

Although Kennedy's decision-making changed crisis management, little progress was made regarding U.S. natural disaster management. The gap between national security crises management and natural disaster management was tested, and found lacking during the 1964 Alaskan earthquake, Hurricane Betsy in 1965, Hurricane Camille in 1969, 1971 San Fernando earthquake, and Hurricane Agnes in 1972 (Roberts, 2006). The gap between national security and disaster management narrowed through the efforts of following administrations.

Richard Nixon was the first United States president to address national crisis management for natural disasters. Nixon led the nation's response to category 5

Hurricane Camille in 1969, the Ohio Independence Day flood of 1969, category 3 Hurricane Debbie in 1969, category 3 Hurricane Celia in 1970, category 5 Hurricane Edith in 1971, and the 1972 Pennsylvania flooding prompted by Hurricane Agnes (National Oceanic and Atmosphere Administration [NOAA], 2008; Ohio Historical Society, 2006). From 1969 to 1974, Nixon was forced to declare more than 180 national disasters for the relief of American citizens in 42 states. Nixon faced so many natural disasters during his term he became the most active president in disaster management legislation. During Nixon's administration he signed the Disaster Relief Act of 1969 (Executive Order 11495), the Disaster Relief Act of 1970 (Executive Order 11526) establishing the National Council on Federal Disaster Assistance, and creating the Disaster Relief Act amendments of 1974 (Executive Order 11795 [The American Presidency Project], 2009; NARA, 2009a). Nixon's legislation significantly increased the amount of federal aid available to American citizens during nationally declared periods of disaster and solidified the expectation for national leadership in the management of natural disasters.

President Ronald Reagan's administration strengthened national disaster management through the Robert T. Stafford Disaster Relief and Emergency Assistance Act (PL 100-707). Reagan signed Executive Order 12657 in 1988 to further change the Disaster Relief Act amendments of 1974 signed by Nixon, and create the statutory authority for FEMA in federal disaster response activities (NARA, 2009b). Because of FEMA's establishment under President Reagan in 1988, FEMA has become the agency representing the federal government's primary response to all national emergencies including national disasters.

U.S. disaster management's last significant change occurred in March 2003, when FEMA was consolidated into the United States Department of Homeland Security (DHS). Under DHS, FEMA is chartered to minimize loss of life and loss of property while protecting America from acts of terrorism, disasters from human intervention, natural disasters, and all other threats through mitigation, preparedness, protection, recovery, and response (FEMA, 2008). The 2005 Gulf Coast storm season occurred a little more than two years after FEMA was re-chartered and organized under DHS.

The timeline in Table 3 illustrates the executive orders written by Presidents Theodore Roosevelt, Truman, Kennedy, Nixon, and Reagan to establish federal authority for public business infrastructure support during natural disasters. To provide a historical context for national disaster management legislation, Table 3 details the chronological relationships between the timing of natural disasters and the issuance of executive orders.

2005 storm season. The severe 2005 Gulf Coast storm season, which produced 27 named storms, tested the efficacy of federal disaster management. The 2005 storm season was the first year in historical records in which storms were given Greek names including Alpha, Beta, Gamma, Delta, Epsilon, and Zeta because the prepared seasonal storm name list was exhausted (Epstein, 2006). During 2005, one category 3 and two category 4 hurricanes landed on the American Gulf coast. The 2005 season came early when category 4 (131-155 mph) Hurricane Dennis hit the Gulf Coast in July, causing \$5 to \$9 billion damage to Alabama, Florida, and Mississippi. According to NOAA (2009), Hurricane Dennis was one of the 10 most costly hurricanes in American history.

Table 3

Presidential Disaster Management Actions in Relation to Natural Disasters

Year	National Crisis	Management Action	Administration
1906	San Francisco earthquake	<ul style="list-style-type: none"> • Sent federal troops for disaster management 	T. Roosevelt
1950	Global nuclear proliferation	<ul style="list-style-type: none"> • Federal Civil Defense Act (FCDA) • Created Office for Emergency Management 	Truman
1961-1963	<ul style="list-style-type: none"> • Berlin wall crisis • Cuban missile crisis • Cyprus conflict • Communist threat in Laos 	<ul style="list-style-type: none"> • Substantially revised the FCDA • Assigned civil defense responsibility to the Secretary of Defense 	Kennedy
1964	Alaskan earthquake		Johnson
1965	Hurricane Betsy		Johnson
1969	Hurricane Camille		Nixon
1969	Ohio Independence Day flood		Nixon
1969	Hurricane Debby	<ul style="list-style-type: none"> • Disaster Relief Act of 1969 	Nixon
1970	Hurricane Celia	<ul style="list-style-type: none"> • Provided administration for the Disaster Relief Act of 1970 • Established National Council on Federal Disaster Assistance 	Nixon
1971	Hurricane Edith		Nixon
1972	Hurricane Agnes Pennsylvania floods		Nixon
1974		<ul style="list-style-type: none"> • Disaster Relief Act amendments of 1974 	Nixon
1988		<ul style="list-style-type: none"> • Robert T. Stafford Disaster Relief and Emergency Assistance Act • Created FEMA 	Reagan
2003		<ul style="list-style-type: none"> • Consolidated FEMA into DHS • Established DHS as the agency responsible for all national emergencies 	G. W. Bush

In August 2005, Hurricane Katrina struck Louisiana and Mississippi, also causing significant damage in Alabama, Florida, and Georgia. Katrina was a category 5 storm (156+ mph) reaching sustained winds of 175 miles per hour (mph) but made landfall as a category 4 hurricane causing an estimated \$100 to \$200 billion in damages. Hurricane Katrina was atypical with an estimated category 5 storm surge that caused as much damage as the wind (Holliday, 2006; Lacho, Bradley, & Cusack, 2006; Leonard & Howitt, 2006). Katrina shut down 25% of the U.S. oil supply, rendered more than a million Americans homeless, and became the one of the most devastating natural disasters in U.S. history (Chiodi & Harrison, 2008; NOAA, 2009).

Although Katrina heavily damaged the American Gulf Coast, the 2005 storm season was not over. In September 2005, category 3 (111-130 mph) Hurricane Rita struck the northeast Texas coast after slowing down from a category 5 hurricane in the Gulf of Mexico. Although the Gulf Coast was fortunate that Rita weakened to a category 3, the storm produced a significant surge that heavily damaged southwestern Louisiana, wreaked destruction in coastal communities from Alabama to Texas, disrupted oil production at 69 Gulf oil platforms, and damaged an additional 32 oil platforms (Brown, 2007, Holliday, 2006). Many Gulf Coast residents who were living in temporary shelters (e.g., tents, trailers, and mobile homes) lost the few personal items they were able to rescue from the destruction of Hurricane Katrina. The 2005 hurricane season set many records, including the most storms that formed in the month of July, the only recorded season with two hurricanes reaching category 4 by the end of July, the strongest storm recorded before August, and the most devastating hurricane in recorded American history (NOAA, 2009).

The 2005 storm season disrupted Gulf Coast businesses in Florida, Alabama, Mississippi, Louisiana, and Texas. The storms of 2005 resulted in the closing of tens of thousands of companies along the Gulf Coast. In the Fort Worth metropolitan area, 80,000 businesses were affected and 18,000 businesses were closed in New Orleans alone (Doyle, 2006; Ives & Junglas, 2006). As of 2009, many Gulf Coast businesses continued to struggle for survival. Records show 60% of businesses affected by Hurricane Katrina in Louisiana and Mississippi were still closed one year after the storm. Three years after Katrina, 33% of the former coastal populations had not returned and some local Gulf Coast communities had been completely dissolved (Colten et al., 2008; Ives & Junglas, 2006).

Categories of disaster management. Analysis of available literature shows pre-determined, scripted emergency response plans and situational disaster leadership as the two main categories of applied disaster management (Schneider, 1992). Scripted disaster management is the mainstay for national emergency response organizations, including FEMA and DHS. Results of scripted disaster responses vary in direct correlation to how well the prepared scripts from the responding organization applied to actual disaster events (Schneider, 1992). When disasters occur that fit well with pre-planned government responses, affected populations perceive government agencies supplied adequate support to meet citizen's needs. Complex disasters that do not fit well in pre-planned government response scenarios leave citizens with perceptions that emergency agencies could not meet the needs of citizens.

Disaster response leaders' use of prepared scripts has been criticized by disaster management experts as inflexible and incapable of dealing with situational realities as

disasters unfold. The foundation for pre-planned disaster management was legislation written in the 1950s with little significant change in disaster management theory. Most government emergency efforts use scripted disaster response processes created from combinations of the five emergency response variables of planning, management, mitigation, response, and recovery (Herzog, 2007; NARA, 2009a; Shaluf, 2008). The five primary emergency response variables are widely used with little variation beyond level of detail within each area, emphasis on each variable and minor rearrangement of the cycle sequence.

Historical records of disaster response by government agencies show significant variation in emergency response effectiveness through pre-planned actions (Schneider, 1992). The widespread use of scripted disaster response is based on legislation mandating federal disaster management responsibilities passed during the terms of five U.S. presidents. All 50 states followed the national example and established state disaster management responsibilities to augment local community efforts (FEMA, 2008). The national and state bureaucratic organizations instituted emergency response programs based on the FEMA model of lists, forms, and instructions as the backbone of emergency management. Bureaucracies at all levels are designed to respond to the routine needs of constituents but are ill-suited for handling emergencies that call for unique applications of resources and available skill-sets (FEMA, 2008; Lyden, 1974).

The second main category of applied disaster management is the use of situational disaster leadership to apply available resources effectively as dictated by the evolving disaster (Schneider, 1992). Disasters are inherently unpredictable generating situations difficult to anticipate or handle in a routine manner. Theories that assert adjusting

available resources to evolving crisis conditions are the most effective path to alleviate public suffering are at odds with emergency management plans built on pre-planned process sequences. Emergency response organizations react to disasters based on the methods and direction provided by executive leaders and few contemporary emergency response leaders have adopted situational disaster management (Samuels, 2008).

The early beginnings of situational disaster leadership theory are traceable to the Kennedy administration (Ausland & Richardson, 1966; May & Zelikow, 2008).

President Kennedy urged all senior officials to view each crisis holistically using input from emerging conditions to determine administration responses. Kennedy was reacting to crises that occurred so quickly, and were so different, pre-planned responses were unlikely to address the nature of the problems. Lyden (1974) suggested public administrators employ situational disaster leadership based on four internal and five external factors regarding each crisis. The four internal organizational factors are bureaucratic structure, emergency capabilities, need for effectiveness, and perceived crisis. The five external factors are situational context, timing, inter-organizational relationships, societal context, and community context of the crisis (Lyden, 1974).

The historical perspective regarding situational leadership is rich with examples in which governmental organizational resources were used in unanticipated ways to alleviate suffering during disasters (Lyden, 1974). The imaginative and innovative use of available government resources depends on a contingency leadership perspective that unlocks resources reserved for events that may never occur in pre-planned disaster response scenarios. The U.S. House of Representatives (2006) noted the failures of government pre-scripted disaster response during Hurricane Katrina were amplified when

compared to the heroic situational management efforts of faith-based groups, first responders, and private citizens. Historical documentation shows many examples in which individual situational leaders used government-provided disaster relief resources effectively. Pettibone (2007) noted retired Coast Guard Admiral Duncan stressed situational leadership through good community management was essential to the relief efforts for New Orleans in response to Hurricane Katrina. The Coast Guard used a situational concept rooted in the principles of understand the disaster, have a loose plan, and know the people (Pettibone, 2007). The Coast Guard shared the three-pronged situational concept with all disaster relief partners resulting in the rescue of 33,544 people during five days of the Katrina disaster (Pettibone, 2007). The Coast Guard adapted a core philosophy as the touchstone to organize the help of private boat owners, contain six major oil spills, and hand out water at the Superdome. The Coast Guard did not use any pre-scripted plans for any of the actions; the response resulted in praise from citizens spread across five states (United States House of Representatives, 2006).

Situational disaster leadership was essential in the recovery period after the 2005 storm season had passed. Many organizations with no formal disaster response authority assessed the public need and provided services with any available resources. The Louisiana State Office of Tourism publicized the availability of a ship docked at the New Orleans port as temporary housing for displaced citizens and the New Orleans Metropolitan Convention and Visitors Bureau led the effort to clean the French Quarter in the absence of efforts by any formal government program (Lacho et al., 2006).

Situational disaster leadership is an emerging branch of disaster management theory relying on key leaders to assess an evolving crisis and best apply resources to

mitigate or reduce human suffering and property damage. Conclusions from the U.S. Senate Hurricane Katrina Select Committee indicated increased situational leadership should be an important cornerstone for future disaster planning (United States House of Representatives, 2006). Leonard and Howitt (2006) suggested government agencies could improve situational disaster leadership by changing policies to allow decisional latitude for disaster leaders, build disaster management systems as paradigms for action instead of plans, and train disaster leaders through simulations or exercises.

Disaster response controversy. FEMA decisions about the Gulf Coast during the 2005 storm season illustrate the controversy between scripted, pre-planned actions as the basis for decisions and actions reflecting a situational management style. A select bipartisan committee report to Congress titled *A Failure of Initiative* contains numerous references to DHS and FEMA leadership inability to understand and maintain situational awareness during the Hurricane Katrina disaster (United States House of Representatives, 2006). The report points out DHS focused on terrorism rather than disaster management, although the DHS grant money could have been used to accommodate disaster management. FEMA's disaster response teams were ineffective, and both FEMA and DHS lacked trained emergency personnel. FEMA responded to the Hurricane Katrina disaster using an untested FEMA response plan and could not provide timely relief for a majority of the population, resulting in widespread documentation of ineffective efforts and poor communication with state and local authorities (Sylves, 2008). FEMA relied on pre-scripted plans with few effective counter measures against the destructive forces of Hurricane Katrina. FEMA could not adjust to evolving situational events and continued to focus on planned disaster response actions including scripts for mitigation,

preparedness, protection, recovery, and response (Sylves, 2008; United States House of Representatives, 2006).

Criticized for a failure of initiative (United States House of Representatives, 2006), DHS was described as a rigid responder to national emergencies with a seeming inability to adjust to evolving disaster situations. DHS handling of both the Katrina and Rita storms intensified disaster management controversy when DHS continued emergency response operations using ineffectively prepared plans. The U.S. Senate Hurricane Katrina Select Committee Critics suggested the complexity and unique conditions of the Katrina and Rita storms dictated wider use of situational leadership to respond effectively to rapidly changing conditions (Leonard & Howitt, 2006; United States House of Representatives, 2006). DHS's national response plan, created in 2004, provided DHS authority to deploy any essential resources, such as temporary housing, during a disaster without a request or permission from state officials (Roberts, 2006). The DHS plan noted a realistic situational operating view may not be available for 24 hours, 48 hours, or longer after the incident and disaster response action must begin without the benefit of documented needs assessment. The DHS national response plan made provisions for situational leadership in the pre-planning documents in an effort to allow leaders latitude for disaster uncertainty and to evolve disaster response in a crisis. DHS leaders appeared to ignore the situational elements written in to the response plan in favor of structured, pre-planned disaster response plans from subordinate agencies that proved ineffective in dealing with the national disaster crises (United States House of Representatives, 2006).

Organizational characteristics and structure play an essential role as organizations respond to disasters (Lyden, 1974). FEMA reorganized under DHS in 2003 and was still working through organizational integration issues with multiple sister agencies when Hurricane Katrina made landfall in 2005. FEMA's new 2003 charter made FEMA responsible to minimize loss of life and property in protecting the United States. Specific crises examples in the charter included terrorist attacks, human intervention disasters, natural disasters, and all other threats to national security and safety. The new charter gave FEMA leadership of America's emergency management to include mitigation, preparedness, protection, recovery, and response (Federal Emergency Management Agency [FEMA], 2008). FEMA was little more than two years into a major reorganization effort and the Agency was struggling with the establishment of internal organizational structure and external interfaces to DHS, seven major agencies, numerous smaller agencies, and the American public when the Katrina disaster struck the Gulf Coast (Borja, 2008). Reliance on scripted disaster plans with little resemblance to the needs of citizens during the Katrina disaster made government agencies appear uncaring, ineffective, and ill-prepared (United States House of Representatives, 2006).

Organizational dysfunction, which resulted from the DHS reorganization of multiple emergency response agencies, exacerbated the problem of ineffective disaster management plans. Hurricane Katrina was a disaster that presented unanticipated problems because the storm was one of the largest and most disruptive to hit the American Gulf Coast. The various DHS emergency agencies responding to the Katrina disaster relied on pre-planned disaster scripts written before the DHS multi-agency

reorganization and the prepared scripts did not anticipate many of the major destructive facets of the storm.

Pre-determined disaster scripting has been the traditional focus of disaster management plans. Recent additions to disaster management planning continue to build on the traditional disaster management cycle of mitigation, preparedness, protection, recovery, and response cycle. Several minor variations on the pre-scripted theme exist and one variant approaches the disaster management cycle through the phases of crisis management, crisis response, and crisis recovery (Cater & Chadwick, 2008). Herzog's (2007) theory for disaster administration adds elements of situational leadership to the traditional disaster management cycle, bridging the gap somewhat between the two main disaster management theories. Herzog's disaster administration cycle departs from other commonly used models by using the actual results from disasters as feedback to create knowledge-based theory that results in improved pre-determined plans for management of future disasters. Herzog's (2007) research suggested disaster management theory could be refined using management ideals as input to improve elements of the traditional disaster planning cycle. Government-administered disaster theories cannot predict actual events of future natural disasters because no two disasters are the same. As emergency management leaders use more situational leadership techniques, disaster management theory may change to reflect increased contingency management and play a more effective role in the disaster management elements of management, mitigation, planning, recovery, and response (Herzog, 2007).

Current Findings

Literature review provided insight into business support infrastructure, small business operations, and the failure of small businesses in conjunction with disasters. Distillation of the literature is important to determine linkages between the literature and the study (Renski, 2009). Current findings provide correlation between the literature review and the research study.

Business support infrastructure. Collapse of business support infrastructure stops the commerce needed to fuel local economies through employment, taxes for civic projects, and mutual interconnectivity between multiple small and medium businesses (Colten et al., 2008; Ives & Junglas, 2006; Runyon, 2006). The loss of business support infrastructure affects small businesses more severely than it does larger corporations and negatively affects local communities because small business employment accounts for more than 50% of all United States non-farming workers (Edmiston, 2007; Runyon, 2006; SBA, 2009). The loss of business support infrastructure relative to the 2005 storm season created a difficult economic problem for the Gulf Coast when some small businesses may have been unable to restore business operations due to lack of a suitable infrastructure (Runyon, 2006).

Some elements of necessary business infrastructure responsibilities, such as communications facilities, are not public utilities and rebuilding these facilities requires resources from private companies. Private companies working to rebuild business infrastructure elements need the services of law enforcement and government officials to ensure both safety and continuity of operations. Hurricanes Katrina and Rita spurred the failure of government services that hampered the ability for power, communication, and

trucking companies to restore needed infrastructure. The events of the 2005 storm season highlighted the inherent problems of government bureaucracy attempting to oversee the process for responding to complex public/private infrastructure problems requiring a heightened sense of urgency and situational leadership (Takeda & Helms, 2006).

The inability to restore public oversight for needed public infrastructure contributed to further loss of life, property damage, and continued business disruption (Banipal, 2006; Ewing et al., 2007; Phillips & Phillips, 2008; Sylves, 2008). Large-scale utility outages had the biggest influence on communications. The lack of effective communications reduced disaster management situational awareness, delayed delivery of relief supplies, limited disaster response management, and led to rampant unsubstantiated disaster reports from the media (United States House of Representatives, 2006).

Government oversight for necessary business infrastructure was lacking during the 2005 storm season. The length of the recovery period after Hurricane Katrina emphasized the critical role of information management and communications networks to provide support for large-scale disaster management operations (Banipal, 2006). Flooding of the Public Switched Telephone Network (PSTN), also called landlines, and disruption of electrical service contributed to the loss of communications and the inability of various government agencies to avoid business losses and speed recovery efforts (Banipal, 2006; Ives & Junglas; 2006; Phillips & Phillips, 2008). Decisive action may have restored infrastructure sooner, mitigating the effects of the storms on citizens and reducing the impact on coastal businesses. Hurricane Katrina disaster management was an example of poor infrastructure decisions at many levels of government (Samuels, 2008).

The effects of Hurricane Katrina caused the collapse of local law enforcement, organized medical treatment, and communications across coastal Mississippi and Louisiana resulting in violence and lawlessness (United States House of Representatives, 2006). The New Orleans Police Department was not prepared for such a large-scale disaster and city laws were ineffectual when dealing with criminal conduct during the emergency (Congleton, 2006; Leonard & Howitt, 2006; United States House of Representatives, 2006). The loss of communications in the public infrastructure hampered medical relief efforts, police coordination, and government agency response. The combined flooding from Hurricanes Katrina and Rita destroyed New Orleans' public business support infrastructure and created estimated total business losses of \$40 to \$50 billion (Colten et al., 2008).

The devastation and damage from Hurricane Katrina spread across five coastal states causing disruption for businesses, citizens, and communities. Using the parameters of lives and property affected, size of the impact zone, and intensity of the damage, Hurricane Katrina was more destructive than previous disasters including the 1993 Missouri River flood and 1992 Hurricane Andrew (Leonard & Howitt, 2006). At a category 5, Katrina interrupted business support infrastructure over 100,000 square miles along the American Gulf Coast, an area equivalent to the size of the entire United Kingdom. Katrina destroyed or damaged essential infrastructure necessary to sustain commerce including communications nodes, public utilities, law enforcement, distribution centers, railways, and roadways (Ewing et al., 2007; Phillips & Phillips, 2008). Emergency response teams, power company crews, police departments, and local officials immediately began the process of restoring infrastructure after the storm. The

chaos and disruption generated on the American Gulf Coast by Hurricane Katrina was multiplied a month later when Hurricane Rita landed, setting back the recovery progress made since Katrina (Brown, 2007, Holliday, 2006). The combined destruction from Katrina and Rita disrupted business support infrastructure that created the framework for daily business. Without the necessary public and business infrastructures in local communities, citizens were forced to leave coastal areas to find climate controlled shelter, regular food distribution, and employment.

Through the efforts of individuals and local civic organizations, there were pockets of effective management of limited public infrastructure assets during the 2005 storm disasters. The Greater New Orleans Hotel and Lodging Association (GNOHLA), a predominantly small business civilian organization consisting of 118 private companies and 102 hotels, proactively used the Internet to create a patch worked communications infrastructure. The efforts of these organizations provided disaster relief information, job openings, daily e-mail alerts, and served as an information-clearing house for citizens, government agencies, potential employers, and media organizations (Lacho et al., 2006).

GNOHLA is a good example of informal community leaders using situational awareness and available resources to provide needed business support infrastructure. Coast Guard actions during the Katrina disaster were another example of situational leadership applying available resources to provide necessary infrastructure support. On the first day of Hurricane Katrina operations, the Coast Guard realized the ineffectiveness of pre-scripted scenarios, quickly organized private boaters, enlisted private citizens with military or medical training, and created a search and rescue infrastructure that ultimately saved more than 33,000 people in five states. Business infrastructure successes during

the 2005 storm season were characterized by an acceptance of responsibility, willingness to share authority, and liberal use of situational management by emergency response managers (Pettibone, 2007). Support infrastructure disaster management is more difficult than normal business operations because crises add the elements of surprise and urgency, making the appropriate application of leadership an essential factor in minimizing any crisis (Congleton, 2006; Samuels, 2008).

Small business operations. Business is the essential element of economic recovery in storm-prone coastal regions, and small businesses in particular are at the center of the American economy. Small and medium businesses constitute more than 99% of employer-owned American businesses and employ in excess of 57 million Americans (SBA, 2009). During periods of crises, such as the 2005 twin hurricane disasters caused by Katrina and Rita, anecdotal evidence suggests small businesses along the Gulf Coast were adversely affected by the lack of business support infrastructure to support business operations (Ewing et al., 2007). The severity and extent of the adversity has not been measured. Small enterprises typically have lower operating capital and depend on public infrastructure facilities, like communications, regional distribution points, and utilities, for delivering business products and services. Lack of publicly provided infrastructure during and after natural disasters in the 2005 storm season made it difficult for Gulf Coast businesses to maintain operations and hindered small business recovery (Doyle, 2006).

Small businesses on the Gulf Coast unable to recover due to lack of business or support infrastructure subsequently created an adverse domino effect for the economic recovery of local communities. Citizens and communities already suffering from damage

to homes and property were affected additionally when local businesses could not recover, resulting in increased unemployment in the already stressed economic structure (Edmiston, 2007). The adverse cash flow influence generated for companies when business support infrastructure is unavailable creates correspondingly adverse economic conditions in local communities already devastated by the disasters. The need to speed the recovery of small businesses is supported by statistical research (SBA, 2009), indicating these organizations have the most direct bearing on the creation of new jobs for local and regional economic recovery. An investigation of the impact of available business infrastructure on the operation of small businesses may lead to a better understanding of company needs during crisis periods and could provide insight to the development of economic models for more rapid recovery after disasters. Statistics collected by the United States Small Business Administration (2008) suggested natural disasters along the Gulf Coast in 2005 resulted in the highest business failure rate recorded in the previous 25 years. Business experts traced the rise in Gulf Coast business failures to the damage caused by the 2005 storm season (Doyle, 2006; Koh, 2006). Providing distribution centers, passable roads, power, water, and communications are essential to business continuity during and after periods of natural disaster (Ewing et al., 2007).

Many definitions abound for small businesses in scholarly literature based on different metrics including number of employees, quantity of business segments, annual revenue, and sales (Cater & Chadwick, 2008; Kotey & Folker, 2007; Street & Cameron, 2007). The study relied on the U.S. Small Business Administration's (2006) definition of small businesses as organizations representing American companies of 1 to 499

employees. Small businesses depend on business infrastructure for the interconnectivity between suppliers, customers, and partners to conduct commerce. Street and Cameron (2007) asserted in order for small businesses to thrive, they must develop and maintain connectivity to external resources for sustainability and profitability. During the 2005 storm season, thousands of small businesses in five states along the Gulf Coast were disrupted or destroyed. The result was significant economic impact on Gulf Coast communities through loss of tax revenue, reduced employment opportunities, and decreased potential for future economic development (Colten et al., 2008; Ives & Junglas, 2006). The large-scale disruption of business support infrastructure eliminated external communications or access to supplies and business support services. Modern businesses have a heavy reliance on communication infrastructure for connectivity to the Internet, essential databases, data centers, and direct high-bandwidth connections with key customers and suppliers (Banipal, 2006; Phillips & Phillips, 2008).

Small business failure. Business failure is the end state for any organization that becomes deficient or inadequate to the point of closure (Liao et al., 2009). Business failures result from a variety of circumstances that vary depending on the competitive markets and size of the business. An organization's ability to withstand a crisis is dependent on the length of the crisis in comparison to the depth of resources the organization can use to sustain employees and defray cost of lost commerce through the disaster relief and disaster recovery periods (Colten et al., 2008; Doyle, 2006). The lack of investment and operating capital results in small businesses with insufficient depth of reserves unable to overcome lengthy crisis periods like Hurricane Katrina (Cater & Chadwick, 2008). Large businesses have a comparatively larger depth of reserves based

on unused resources available for redistribution, depth of personnel to address unique situations (also referred to as bench strength), and continued income from diverse, multiple locations to sustain the organizations through crises (Carter & Van Auken, 2006). The additional depth of reserves allows larger organizations to survive periods of disaster and crisis when small businesses may fail due to lack of resource depth.

Often small and medium businesses are start-up companies created by one or more entrepreneurs who lack formal business training (Cater & Chadwick, 2008; Liao et al., 2009). One of the reasons such companies failed along the Gulf Coast was the small business leaders' lack of formal education and experience to apply situational leadership effectively in disaster management. Cater and Chadwick (2008) suggested work experience and educational level of owners, in relation to company size, as two of the primary variables affecting company survival during difficult operations. Large organizations have the benefit of selecting from the top end of the available talent pool by offering less risk in employment and higher wages. Small businesses often have limited resources and select individuals from a less talented workforce, without the benefit of experienced human resources departments. Statistics about American bankruptcy reveal companies organized as partnerships or proprietorships have a larger failure rate (Carter & Van Auken, 2006). Small businesses' lack of management experience is manifested in the failure to develop and maintain external relationships to sustain business operations. To survive and thrive, small businesses need to develop external relationships leading to more depth in business development, long-term partnerships, and business growth. Managerial inexperience contributes to small business failures through talent recruiting,

employee selection, and the inexperience building external relationships fueling business growth (Street & Cameron, 2007).

Lack of sufficient business infrastructure also contributes to the failure of small businesses on the Gulf Coast. Disaster events like Hurricane Katrina disrupt small businesses in the initial catastrophe and continue to affect the organization through the disaster response and recovery periods if infrastructure is not quickly restored. The lack of small business reserve resources can result in insolvency the longer necessary business support infrastructure remains unavailable (Ewing et al., 2007). Many small businesses run on limited reserve budgets and depend on Just-In-Time (JIT) arrangements with suppliers, partners, and customers to remain solvent (Bayo-Moriones et al., 2008). JIT operations require access to communications including the Internet, civil support through community services, and available logistics transfer such as roads and airports. Three essential factors inhibiting small business recovery after disaster events are difficulties in establishing communications, lack of available supply channels for logistics, and government support in restoring other business infrastructure (Cater & Chadwick, 2008).

American small businesses are an essential link in the economic development of any region. Substantial scholarly research indicates small businesses are critical links in the U.S. economy and key indicators of economic growth and national business health (Carter & Van Auken, 2006). Small business failures through lack of resources, inexperienced management, and unavailability of public support infrastructure present a significant problem for the United States' economy. The SBA (2009) estimates small businesses produce approximately 51% of America's private sector gross domestic product, create 75% of all new jobs, and provide 67% of all workers initial job training.

Small business failure on the American Gulf Coast after the 2005 storm season created long-term economic difficulties for the entire region (Doyle, 2006; Renski, 2009). The restoration of necessary infrastructure for small businesses is important to the Gulf Coast but also has far-reaching implications for the United States economy. Louisiana offshore oil production and processing accounts for 30% of all American automotive fuel, crops from mid-America are shipped from the port of New Orleans to the entire world, and New Orleans is the conduit for energy and supplies to the thousands of businesses along the length of the Mississippi River (Doyle, 2006).

Theoretical Gaps

The historical and current literature review for disaster management theory revealed two theoretical gaps. The first theoretical gap is disaster management agencies lack diverse natural disaster response approaches, relying mainly on the traditional disaster management cycle. The second theoretical gap is the lack of scholarly leadership debate for new disaster management models. From the inception of American disaster management, relatively little has changed in the government response to unanticipated crises (Harrington, 2008; Roberts, 2006). From the presidencies of Theodore Roosevelt through Ronald Reagan, legislation has improved to commit senior national leadership for disaster response; however, the basic formula for government agencies disaster response remains essentially the same. The traditional disaster management paradigm continues to consist of the normal bureaucratic agency approach of scripted plans based on the disaster cycle elements consisting of planning, management, mitigation, response, and recovery (Herzog, 2007; NARA, 2009a; Schneider, 1992; Shaluf, 2008).

Lack of diverse disaster response. The main alternative to traditional disaster management style is situational leadership based on a loose, pre-planned scenario backed by realistic scenario training for public disaster administrators. President Kennedy advocated a situational approach to leadership during his administration from 1961 to 1963. Lyden (1974) also proposed a model for increased situational leadership as an alternative to traditional disaster management theory; yet disaster management continues to rely on the traditional paradigm (Ausland & Richardson, 1966; May & Zelikow, 2008; McLaurin, 2006). Disaster management research continues to extend the traditional paradigm but with limited new scope. Herzog's (2007) theory for disaster management and administration provides feedback from actual disasters as a partial bridge between situational disaster management and the traditional disaster management paradigm yet relies on the traditional disaster cycle paradigm (Herzog, 2007). New disaster management paradigms need to be developed to allow disaster leaders more flexibility and options for future disaster management. Using feedback from small Gulf Coast business leaders who survived the 2005 storm season, the correlational research study provided insight that may assist in the development of new disaster management models

Emergency response agencies lack practical situational leadership training and guidance for natural disaster management. Government agencies are, by legislation, the primary national response leaders for the United States (FEMA, 2008; NARA, 2009a, 2009b). Government guidance and training for emergency response, management, and recovery are rooted in the traditional style of disaster management that remains essentially unchanged for nearly 100 years. Although situational leadership examples indicate government agencies could be more effective through appropriate use of

situational awareness and situational disaster management, contemporary disaster management guidance does not significantly use situational management training (Roberts, 2006; Sylves, 2008). Government leaders in response agencies do not focus on situational awareness as the driver for resource commitment.

The literature reflects a theoretical gap in the role business infrastructure has in disaster management response and recovery. The priority focus for practical application of disaster management has been placed on safety and security of individuals with little emphasis on the need for restoration of business support infrastructure to begin the process of economic recovery (Colten et al., 2008; Ives & Junglas, 2006). The exclusive disaster response and recovery focus on safety and security may be incomplete by ignoring the need to address business infrastructure in the early stages of a disaster to spur economic recovery after the disaster. The lack of emphasis on business support infrastructure results in scenarios in which citizens recover from a lack of shelter and supplies but have no means for employment or long-term economic viability (Edmiston, 2007; Jarman & Chopra, 2008). Currently, national government leaders do not emphasize establishment of business infrastructure as part of critical checklists but focus on the reduction of individual suffering. Alleviating suffering and providing a secure environment are the primary immediate goals of disaster response, but disaster recovery efforts should encompass the restoration of business infrastructure to start economic recovery (Harrington, 2008; Herzog, 2007; Roberts, 2006). In current disaster response models, after national emergency agencies have returned to pre-disaster staging areas, local communities continue to have significant gaps in the economic structure due to damaged or absent business infrastructure.

Lack of leadership debate. Insufficient scholarly leadership discussion about new models for disaster management is a second theoretical gap in the literature. Most current scholarly discussion focuses on improvements to the traditional disaster management cycle but does not address innovative approaches or new paradigms for disaster management (Herzog, 2007; Lester & Krejci, 2007; McEntire et al., 2002). Current literature provided insight into specific examples in which public and private resources were managed with situational awareness to achieve more effective results than traditional governmental disaster management methods. Congressional testimony and several firsthand accounts indicate the need for new disaster management theories based on situational public management of government and private resources (Lacho et al., 2006; Pettibone, 2007; United States House of Representatives, 2006).

The results of a literature review suggested theoretical gaps in government disaster agencies' ability to address the economic importance of restoring business infrastructure support to small businesses after natural disasters. Significant literature supports small businesses as an important part of the American economic growth equation (Carter & Van Auken, 2006; SBA, 2009). Review of firsthand accounts indicate government emergency agencies focus on the immediate health and welfare of individuals and pay little attention to the restoration of small business operations or the economic recovery of affected regions (Banipal, 2006; United States House of Representatives, 2006). Literature review indicated that when government efforts to restore necessary business infrastructure have been lacking, local organizations, or private citizens attempt to fill the response gap and restore essential business functions (Lacho et al., 2006; Pettibone, 2007).

The review of many scholarly articles, dissertations, and government provided information that revealed a theoretical literature gap in government emergency managers acknowledging the responsibility to restore local business infrastructure support for businesses that fuel local economies. FEMA, DHS, the Coast Guard, and other national organizations ensure the safety of citizenry but do not commit resources to repair damaged small business support infrastructure necessary to restore the economies of local communities (Colten et al., 2008; Street & Cameron, 2007). During disaster management, the focus of government agencies is on the immediate needs for the safety and welfare of individuals. Once the crisis has passed, federal and state agencies return to normal operations without addressing the underlying business infrastructure necessary to spur economic recovery (Banipal, 2006; Colten et al., 2008; Street & Cameron, 2007; United States House of Representatives, 2006). Government disaster response teams appear slow to understand the public responsibility to restore infrastructure necessary to small business survival that stimulates the recovery of local and regional economies.

Gap overview model. The literature review provided the contextual framework for the quantitative study, related the study to scholarly dialogue, built on prior studies, and identified gaps in the theoretical framework (Cone & Foster, 2006; Creswell, 2009). Table 4 provides a summary of the major theoretical gaps identified during literature review.

Table 4

Theoretical Gaps Exposed through Literature Review

Theoretical Gap	Theory Area	Elements of the Theory Gap	Supporting References
Disaster management lacks diverse response approaches	Disaster management theory		Harrington, 2008; Herzog, 2007; NARA, 2009a; Roberts, 2006; Schneider, 1992; Shaluf, 2008
		Emergency response agencies lack practical situational leadership training and guidance	Roberts, 2006; Sylves, 2008
		Government emergency response lacks practical emphasis on restoration of business infrastructure	Colten et al., 2008; Edmiston, 2007; Ives & Junglas, 2006; Jarman & Chopra, 2008
Disaster management lacks scholarly leadership debate for new disaster management models	Disaster management theory		Herzog, 2007; Lacho et al., 2006; Lester & Krejci, 2007; McEntire, Fuller, Johnson, & Weber, 2002; Pettibone, 2007; United States House of Representatives, 2006
		Emergency agencies lack awareness of the economic importance of restoring business infrastructure	Banipal, 2006; Carter et al., 2006; SBA, 2009
		Emergency response agency acknowledging the responsibility to restore business infrastructure	Colten et al., 2008; Street & Cameron, 2007

Conclusions

The literature lacks information and analysis specifically related to American business support infrastructure and Gulf Coast small businesses (Renski, 2009). The scarcity of research concerning the problem highlighted the need for a quantitative study that investigated the relationship, if any, between business infrastructure availability and small business operations on the Gulf Coast during and after natural disasters. Findings from the study may provide insight to government and industry leaders for management of business support infrastructure including communications, public utilities, centralized distribution, housing, roadways, and security (Ewing et al., 2007; Holliday, 2006; Phillips & Phillips, 2008).

Summary

Literature related to public administration during natural disasters is insufficient despite the fact that American presidents declared close to 1,700 disasters during the period 1953 to 2007 (Sylves, 2008). Chapter 2 analyzed previous scholarly research related to the disaster management of business support infrastructure influencing small business operations on the Gulf Coast. The lack of scholarly discussion lends credence to the need for broader research into the management of business support infrastructure throughout natural disasters. The widespread use of a scripted disaster response paradigm suggested new, broader theoretical perspectives are needed for future disaster management to protect United States citizens (McEntire et al., 2002).

Herzog (2007) provided a brief historical overview of disaster management theory and noted few contemporary models for disaster administration were available. Disaster management theories should create goals for future disaster administration. Disaster

administration goals could include restoration of business support infrastructure. Current disaster management models focus on scripted plans based on the disaster cycle elements consisting of planning, management, mitigation, response, and recovery (NARA, 2009a; Schneider, 1992; Shaluf, 2008). The lack of innovation and variation in disaster management implies little expectation of improved disaster management performance in the future. In particular, improved disaster management requires additional examination of situational leadership models and attention to restoring business support infrastructure for economic recovery (Colten et al., 2008; Edmiston, 2007; Ives & Junglas, 2006; Jarman & Chopra, 2008). Chapter 3 details the research method, design, population, sampling techniques, and collection of data.

Chapter 3: Method

This quantitative study was to investigate what relationships, if any, exist between business infrastructure management and Gulf Coast small business operations through natural disaster. Chapter 1 identified the importance of small businesses in the economic development and need for business infrastructure support during recovery. Chapter 2 contained a review of literature that provided historical context for the study and analyzed current findings related to disaster management of business infrastructure. Given the lack of an existing instrument that can measure infrastructure-specific disaster management, the study used a two-phased approach. A pilot study tested a new business infrastructure-specific disaster management instrument. Once validated, the instrument was used in the main study of small business owners in Alabama, Louisiana, and Mississippi. Chapter 3 details the study's research method, design, population, sample, data collection, instrumentation, and data analysis.

Research Method and Design Appropriateness

Scholarly research uses mixed-method, qualitative, or quantitative methods to determine relationships between dependent and independent study variables (Neuman, 2009; Vogt, 2007). Choosing the appropriate research method was important to accomplish the study's objectives. The quantitative method was most appropriate to determine relationships between variables in the study.

Quantitative method. A quantitative research method was appropriate for testing potential relationships between independent and dependent variables (Vogt, 2007). Quantitative research was especially appropriate for collecting data in geographically dispersed populations, where the intent of the analysis was to use abstract

ideas to form conclusions (Neuman, 2009). A quantitative method is also appropriate when researchers ask specific questions, collect numerical data from participants, and analyze the numbers using statistics (Creswell, 2009). Creswell asserted researchers who use quantitative research methods often identify multiple variables and seek to ascertain relationships among the variables; thus, a quantitative method should be effective to evaluate the relationship, if any, between business infrastructure management during natural disasters and small business leaders' perceptions of actual crisis events. The study included a small number of open-ended questions to allow participants to clarify, if necessary, survey responses. The minimal use of open-ended questions did not necessitate a mixed-mode study.

A qualitative method was not aligned with the purpose of this study. Creswell (2009) indicated researchers using qualitative methods rely on the views of participants, ask general questions, collect data consisting largely of words from participants, and analyze the recurring themes or patterns in the responses. The study consisted primarily of collecting numerical, Likert-type scaled data from participants. Schilling (2006) stated researchers find qualitative research methods optimal for gathering in-depth understandings of peoples' views, experiences, and perceptions about a phenomenon. The research gathered small business leader perceptions for quantitative analysis but did not use the in-depth procedures of a qualitative study. The study used standardized and easily compared measures of government, business, and community business infrastructure planning. Qualitative research methods are inductive because researchers gather data from participants to describe and explain, explore and interpret, or build theories (Adams, Broom, & Jennaway, 2008). Adams, Broom, and Jennaway (2008)

noted quantitative studies are generally deductive in design. Small business leaders perceptions gathered from the study were analyzed through a deductive design in a quantitative method.

Correlation design. A correlational design was most appropriate for this quantitative study because such designs incorporate statistical analysis to measure the degree of association between variables (Creswell, 2009). A correlational approach provides researchers the ability to explain the relationship between business infrastructure disaster cycle planning and small business perceptions, allow prediction of future outcomes, and provide application of statistical knowledge. Neuman (2009) asserted correlational designs examine the relationship between two or more variables. Such a design was optimal for the study because the analysis correlated the independent variable (e.g., business infrastructure disaster planning) with the dependent variables (e.g., Gulf Coast small business leader perceptions throughout natural disaster response and recovery) to determine if significant relationship exists between the variables. Correlational research provides direct analysis of how two or more variables are related to one another, the characteristics the variables share, and how specific outcomes can be predicted through information from each of the variables (Neuman, 2009).

Pilot study. The first phase of the study pilot tested the validity of a business infrastructure-specific disaster management instrument (see Appendix A). Initial phrasing of items in the pilot survey was derived from business support infrastructure information reported in literature (Cater & Chadwick, 2008; Colten et al., 2008; Doyle, 2006; Ewing et al., 2007; Holliday 2006; Ives & Junglas, 2006; Phillips & Phillips, 2008; Takeda & Helms, 2006; United States House of Representatives, 2006). A subject matter

expert panel comprised of acknowledged business experts evaluated the validity of the pilot instrument's questions.

Once the pilot instrument items were validated, the items were tested for reliability using a purposive sample of non-Gulf Coast business leaders in the United States. The study used Indiana business leaders who experienced a flood disaster in 2008 to test reliability for the pilot study. The Likert-type scaled questions were not previously tested so seven open-ended questions were used to validate and crosscheck the consistency of participants' responses. Unstructured questions allowed Indiana business leaders to elaborate on responses as necessary (Salkind, 2009).

Main study. Pilot study questions were found to be both reliable and valid and were used to create the main study to survey leaders from Gulf Coast small businesses that conducted continuous business operations from 2004 through 2007. The main study questions and structure were constructed after the pilot study was completed. The main study instrument was used to survey small business leaders in Alabama, Louisiana, and Mississippi as a representative sample that examined the perceptions of Gulf Coast small business leaders relating to infrastructure management during natural disasters. Consenting participants completed the Likert-type scaled and open-ended questions to provide the primary data for research analysis. The open-ended questions provided participants the opportunity to place the quantitative information in a broader context (Salkind, 2009). The main purpose of the open-ended questions was to crosscheck the conclusions of the quantitative measures against potential survey surprises.

Population

The population for the survey was small business leaders who continuously operated in Alabama, Louisiana, and Mississippi from 2004 through 2007. Data in Table 5 (SBA, 2009) shows the total population of small businesses in the three target states for 2004 (234,290) and 2007 (248,522). Because the study targeted businesses in continuous operations from 2004 through 2007, the 2004 small business population (234,290) represented the total study population.

Table 5

Total Small Businesses in Alabama, Louisiana, and Mississippi in 2004 and 2007

State	2004	2007
Alabama	84,057*	90,419
Louisiana	96,807*	102,089
Mississippi	53,426*	56,014
Total	234,290*	248,522

*Note.** = Extrapolated from 1.6% growth rate (SBA, 2009).

Sampling Frame

The accuracy of a sample size is dependent on the creation of an appropriate sampling frame (Rea & Parker, 2005). Researchers must ensure the sample is large enough to represent the total population and has sufficient knowledge of the specific topic to represent the study's population (Creswell, 2009). The quantitative study used purposive sampling to reach Gulf Coast small businesses in Louisiana, Alabama, and Mississippi in continuous operations from 2004 through 2007. The 2004 small business

population in Alabama, Louisiana, and Mississippi was 234,290 (SBA, 2009). Using a confidence level of 95% and a confidence interval of +/- 5 for a population of 234,290 small businesses, 384 business leaders were the targeted sample size for the study (Creative Research Systems, 2009). The sample of 128 small business leaders was drawn from the coastal counties and parishes in Alabama, Louisiana, and Mississippi for generalization to the total population.

Informed Consent

Appendixes A and B show the informed consent forms that were incorporated in the web-based pilot study validity and reliability components. Appendix C illustrates the consent form embedded in the main survey online instrument and the main study questions were constructed after the pilot study concluded. Prospective participants received an e-mail requesting participation and directing them to the instrument at the online survey-hosting website. The first web page consisted of the informed consent form and an explanation of the study. Participants were not able to access the study questions until they read the informed consent page and clicked the button *I consent*.

Confidentiality

According to Salkind (2009), the least number of people handling study data promotes research confidentiality. Both phases of the study used automated online data collection with only the principal researcher accessing the data and mailing list information. Business subject matter experts responded to the content validity portion of the pilot study, Indiana business leaders who experienced the 2008 flood responded to the reliability portion of the pilot study, and the main study consisted of Gulf Coast small business leaders. All responding groups used an online survey to submit responses.

Participant responses were gathered through a professional, secured website to ensure the confidentiality of participants. As indicated in the informed consent form, the survey responses did not ask individuals to identify themselves or their organizations. Randomly assigned numbers identified participants throughout the study. Appropriate measures were taken to ensure confidentiality of the participants and the resultant data.

Data downloaded from the online survey-hosting service was processed using a stand-alone laptop incorporating government level virus protection, 14 symbol/character password protections, and Data At Rest (DAR) encryption. Data from the study will be archived for a minimum of three years on a Universal Serial Bus (USB) computer thumb drive locked in a fireproof safe. Once the archival period has expired, the USB thumb drive will be destroyed by incineration.

Geographic Location

Business subject matter experts that participate for the pilot study validation were solicited from across the United States through electronic invitations. Pilot study reliability participants were electronically solicited from Indiana business leaders who witnessed the 2008 Columbus flood (Blesch, 2008). In the main study, participants resided in coastal counties and parishes along the Gulf Coast regions of Alabama, Louisiana, and Mississippi. The sample was accessed through the e-mail addresses maintained by the Chambers of Commerce from two Gulf Coast counties in Alabama (Baldwin and Mobile); seven Louisiana parishes (Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Tammany, and Terrebonne); and three Mississippi counties (Hancock, Harrison, and Jackson). Figure 1 illustrates the 12 counties and parishes

surveyed for the sample. E-mail invitations were sent to potential survey participants containing instructions to access the main study survey online.

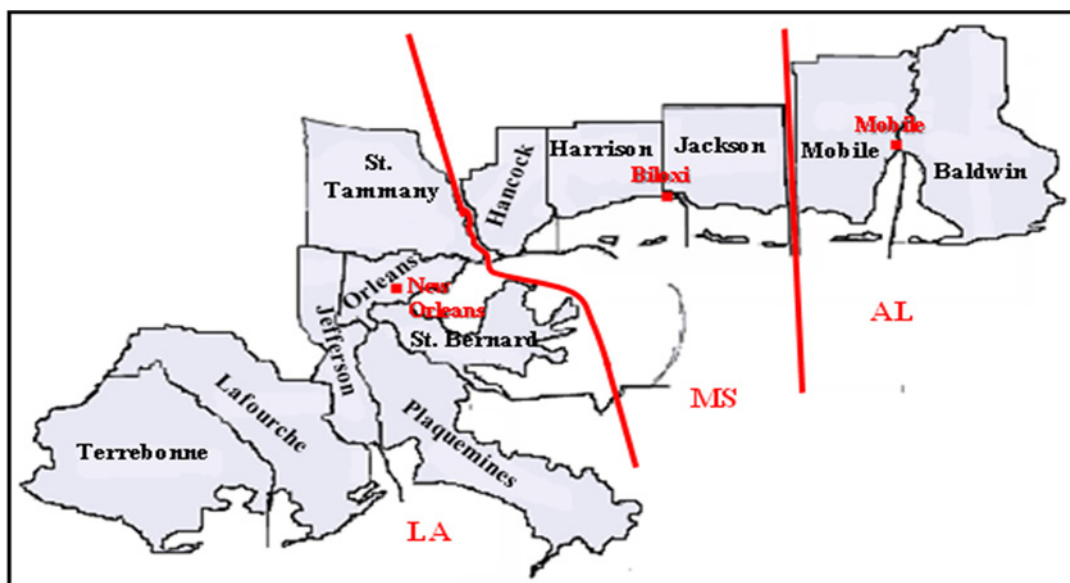


Figure 1. Map of Gulf Coast counties and parishes targeted for the sample adapted from Google Images (2009).

Data Collection

Data for both the pilot and main studies were collected using an online survey. Online surveys provide a quick turnaround of results and analysis can begin as each participant completes the electronic survey (Cooper & Schindler, 2006). Electronic data collection is most appropriate due to the geographic dispersion of the sample, need for efficient response, and to reduce study costs (Creswell, 2009; Neuman 2007). The online nature of the study was consistent with quantitative research methods; additionally, participants are often more willing to provide information in online designs that allow responses from the comfort of private offices or homes (Hanna, Weinberg, Dant, & Berger, 2005; Creswell, 2009). Online surveys work well when the sample is geographically distributed and provide the ability to collect larger sample sizes for

improved reliability and representativeness for generalization (Creswell, 2009, Van Selm & Jankowski, 2006).

Pilot study. Figure 2 illustrates the data collection process for the pilot study. The first stage of the preliminary investigation examined the validity of the infrastructure disaster instrument in Appendix A. The validity panel consisted of a purposive sample of 12 business subject matter experts that evaluated content validity for each question. The survey included open-ended questions that allowed the subject matter experts to provide additional feedback to address business infrastructure content not covered through the Likert-type questions. The second phase of the pilot study tested the reliability of items. The subject matter expert panel was recruited through the LinkedIn social networking site to ensuring qualified participants through an online invitation and each had equal opportunity to access the survey.

A self-selected purposive sample of 43 Indiana business leaders, with publicly available e-mail addresses, who experienced the 2008 Columbus flood disaster, assessed the items of the pilot study for reliability. Business leaders in the Columbus, Indiana region experienced Katrina-like conditions when storms created more than 10 inches of rain during two days in June (Blesch, 2008). Participants were recruited using e-mail invitations and each had equal opportunity to access the survey. As discussed in the data analysis section, Cronbach's alpha was computed to determine the business infrastructure instrument's reliability.

Main study. After the business infrastructure instrument was validated and tested for reliability, data collection for the main study began. E-mail invitations were sent to approximately 4,135 leaders of small Gulf Coast businesses in continuous operations

from 2004 through 2007 to achieve a sample size of at least 384 participants, or until the response rate was saturated with potential participants no longer responding to e-mail reminders. The main study used a self-selected purposive sample from Gulf Coast small business leaders with publicly available e-mail addresses who operated businesses along the Gulf Coast during the 2005 storm season. Participants were recruited using e-mail invitations and each had an equal opportunity to access the survey. After 10 days, a reminder e-mail was sent to encourage participants to respond in a timely manner. Once the sample reached saturation with 128 participants, data analysis began to determine results of the quantitative study.

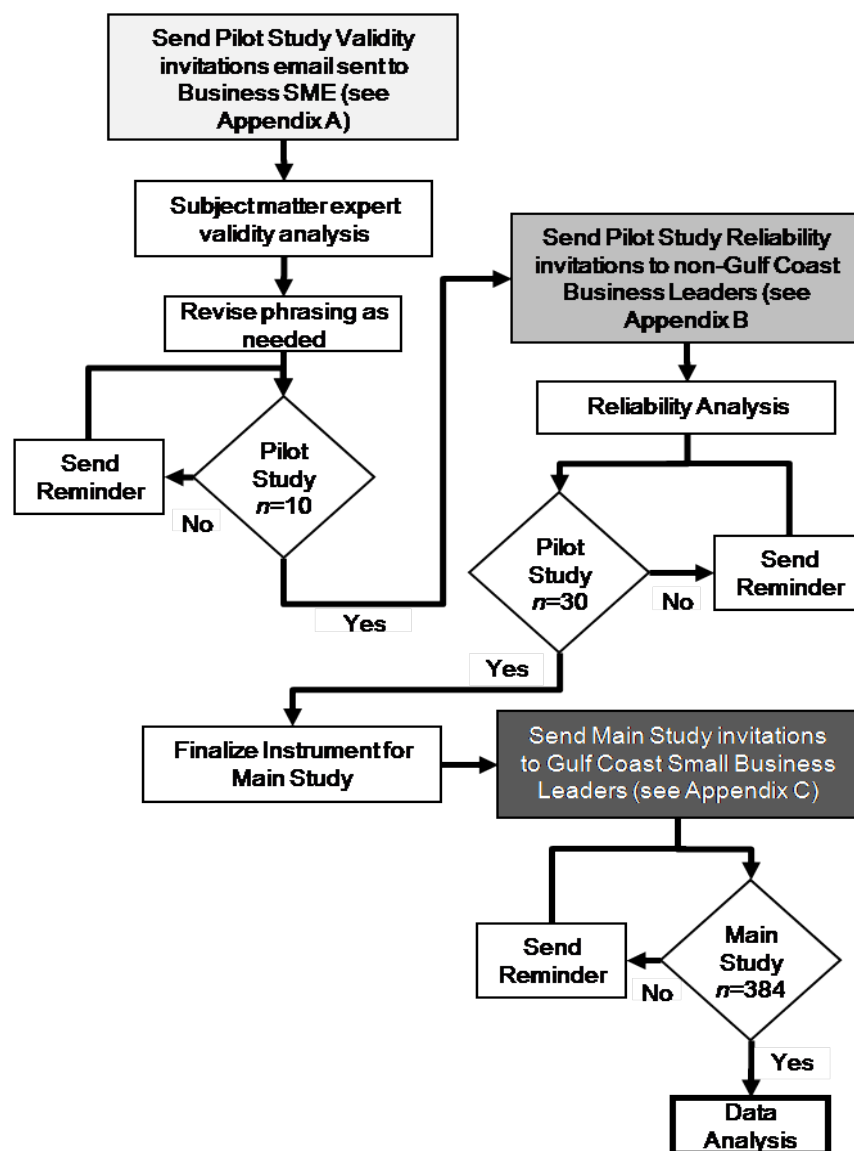


Figure 2. Model of study collection showing testing of the pilot study and collection for the main quantitative study.

Data collection instruments. General and demographic data were collected using nominal data to measure gender, ordinal data to measure planning and small business perception variables, and interval data indicating years of business operation and experience. Because a business infrastructure-specific disaster management instrument

was not reported in the literature, the study tested a preliminary instrument in a pilot study. After validation, the survey questions were used to collect data from small businesses in Alabama, Louisiana, and Mississippi.

Pilot study implied measures. Authors and researchers frequently discuss business infrastructure variables without specifically referencing a data collection instrument or explicitly stating the questions used. Variable measurement constructs are the primary method to connect measurement testing with theory development with well-defined measurement constructs resulting in well-tested theory (Echambadi, Campbell, & Agarwal, 2006). Through the literature review, several measures were implied for business infrastructure. Table 6 shows the implied measures for business infrastructure in context of the references implying the measure. Implied measures are referenced for the business infrastructure elements communications, public utilities, distribution centers, housing, roadways, and physical security.

Appendix A represents the business infrastructure measures in the instrument tested in the content validation portion of pilot study. Likert-type scaled questions were used to measure business experts' opinions because such instruments are used widely in survey and require less development time than other types of question (Salkind, 2009; Vogt, 2007). Appendix B details the preliminary instrument used in the reliability portion of the pilot study; only those measures determined to be valid by the subject matter expert panel were included in the second phase of the pilot study. Multiple items were used to assess small businesses leaders' perceptions of business infrastructure during the disaster cycle elements planning, mitigation, management, and response. Such

items can be summed into a ranking that tends to be more accurate than single questions (Vogt, 2007).

Table 6

Implied Measures for Business Infrastructure with Supporting Literature References

Business Infrastructure Measure	References in Literature
Communications Infrastructure <ul style="list-style-type: none"> - Cell phone network - High bandwidth links (OC, DWDM) - Telephone landlines (PSTN) 	Colten, et al., 2008; Holliday 2006; Ives & Junglas, 2006; Takeda & Helms, 2006; United States House of Representatives, 2006
Public Utility Infrastructure <ul style="list-style-type: none"> - Electrical power - Sewer lines - Water lines 	Colten, et al., 2008; Ewing, et al., 2007; Holliday 2006; Ives & Junglas, 2006;
Centralized Distribution Centers <ul style="list-style-type: none"> - Gasoline - Groceries - Replacement equipment 	Doyle, 2006; Ewing, et al., 2007; Holliday 2006; Ives & Junglas, 2006; Phillips & Phillips, 2008; Takeda & Helms, 2006; United States House of Representatives, 2006
Housing <ul style="list-style-type: none"> - Workers living quarters - Office space - Warehousing 	Cater & Chadwick, 2008; Ewing, et al., 2007; Holliday 2006; Ives & Junglas, 2006; Phillips & Phillips, 2008; United States House of Representatives, 2006
Roadways <ul style="list-style-type: none"> - Local streets - Major highways 	Holliday 2006; United States House of Representatives, 2006
Physical Security <ul style="list-style-type: none"> - Law enforcement - Police patrols 	Colten, et al., 2008; Holliday 2006; Ives & Junglas, 2006; Takeda & Helms, 2006; United States House of Representatives, 2006

As shown in Appendix B, the first section of the pilot study instrument measured the perceived effectiveness of government, business, and community disaster planning/mitigation on a 5-point scale (1 = *Don't know*, 2 = *Poor planning*; 3 = *Moderate*

planning; 4 = *Good planning*; 5 = *Extremely effective planning*). The significance of specific infrastructure problems was assessed by measuring perceptions of the actual reality of the disaster (1 = *No damage at all*; 2 = *Minor damage*; 3 = *Moderate damage*; 4 = *Major damage*). The perceived effectiveness of government, business, and community disaster management/response was measured with a 5-point scale (1 = *Not effective at all*, 2 = *Minimally effective*; 3 = *Somewhat effective*; 4 = *Effective*; 5 = *Extremely effective*).

In combination, the instrument's information identified opportunities for improvement. For instance, if business leaders report major damage to roadways (in the Actual Reality section of the survey) and an ineffective disaster management response, the information indicated a significant opportunity for improvement. On the other hand, reports of major damage to roadways with an extremely effective response represented evidence of significant success in management of the disaster.

Pilot study open-ended measures. The pilot survey included some open-ended questions allowing participants to describe relevant thoughts that were measured in the pilot study's closed questions. Open-ended questions allowed participants to share perspectives, issues, or viewpoints that may not have been originally anticipated (Colker, 2009). It is important to note the purpose of the open-ended questions was not exploratory, suggesting a qualitative method. Open-ended content crosschecked the validity of the quantitative, Likert-type scaled measures, providing an opportunity to monitor the presence of any unexpected results.

Main study measures. The main study survey instrument was based on the results of the pilot study. Only pilot study questions were found to be both reliable and valid were used in the main study. The main study consisted predominantly of closed

questions constraining participants to pre-selected answers. Closed-answer questions are valuable to gather precise data without burdening participants and allowed comparison of sets of measures for analysis (Colker, 2009). The main study also contained seven open-ended questions that allowed participants to add context and crosscheck the validity of the Likert-type scaled items.

Reliability

The lack of published business infrastructure-specific measures indicated the need for a pilot study. Cone and Foster (2006) suggested measures are not immediately clear from existing literature when researchers are scrutinizing new research areas. The results from the Likert-type scaled questions in the pilot study, implied in the current literature, were compared with comments from the open-ended questions to crosscheck for unexpected results.

The primary criterion for any data collection instrument is production of reliable data (Cone & Foster, 2006). Survey analysis used several techniques to evaluate the reliability of the pilot survey. The few open-ended questions in the pilot study were tested for inter-rater reliability because the survey tested the reliability coefficients of the percentage of agreement (Salkind, 2009) between the business expert participants. Reliability consists of using multiple measures with the same outcomes so posing the questions in different ways helps researchers reliably measure participant's opinions.

To develop a list of questions for the main study, Cronbach's alpha split-half reliability tested the closed questions in the pilot study to ensure the business infrastructure measures were correlated (Vogt, 2007). Questions used in the main study related to measures strongly correlated to public infrastructure. The questions for the

main study came from the pilot study seeking the validation of business experts, and Cronbach's alpha assessment ensured strong correlation to the desired variable. Perfect internal consistency was measured as a one and the absence of internal consistency was a zero. The closer the alpha reliability coefficient is to a 1.00 the better internal consistency, a .70 as deemed acceptable, a .80 is considered good, and .90 represents outstanding internal consistency (Vogt, 2007). The survey participant data were analyzed using Cronbach's alpha consistency to determine quantitative correlation between the research variables.

Validity

Validation of the study's survey instrument was necessary to ensure content and the ability to generalize findings to a larger population (Neuman, 2007; Salkind, 2009). The researcher's analysis used McIntire and Miller's (2007) content validity process to determine content validity for the business infrastructure measures. Survey instrument items validated by subject matter experts were used to construct the main study.

Internal validity. Examination of an instrument's content validity is designed to ensure the questions effectively measure the intended variable. Salkind (2009) suggested content validity is often best determined through expert judgment from professionals. The validity of the pilot survey instrument was assessed with the input of a subject matter expert panel of business professionals from industry and academia. Using McIntire and Miller's (2007) content validity process, 12 business subject matter experts served as panelists to determine if each business infrastructure item was *essential*, *useful but not essential*, or *unnecessary* measure of a business support infrastructure. The validation data from the business subject matter experts was analyzed to determine the content

validity ratio (CVR) for the business infrastructure measures. Since 12 raters were used to determine content validation, a minimum CVR of .62 was considered sufficiently valid (McIntire & Miller, 2007). Once the business experts completed the validation of the business infrastructure measure, the measures were tested for reliability. The validated measures were sent to 30 business leaders in Indiana who experienced the 2008 Columbus flood (Blesch, 2008) to test reliability. The resultant reliability responses were tested for instrument reliability using Cronbach's alpha test.

External validity. External validity measures the ability to generalize the findings from a small research group to a larger population (Neuman, 2007). Generalizability is the process of extending research findings from a sample to the entire population through inferential statistics (Creswell, 2009; List, 2008). The target population of the main study was Gulf Coast small business leaders who operated businesses continuous from 2004 through 2007. The participants for the pilot study validation were business subject matter experts from across the United States and pilot study reliability participants consisted of Indiana business leaders who witnessed the 2008 Columbus, Indiana flood. The main study accessed a sample of 128 (Creative Research Systems, 2009) small business leaders, and was a sufficient sample to generalize the study's conclusions to the population of small business leaders in coastal Louisiana, Mississippi, and Alabama.

Data Analysis

The quantitative research study used a pilot study to validate a new survey instrument and then a main study to gather research data. The pilot study input was analyzed for validity and reliability. Validated and reliable elements from the pilot study

were used to construct the main study. The main study was subjected to correlation and content analysis.

Pilot study. Data analysis for the pilot study consisted of content validation and reliability analysis. Main study analysis included correlation analysis and content analysis. Pilot study analysis was composed of content validation and reliability analysis.

Content validation study. Using McIntire and Miller's (2007) validation process, 12 business subject matter expert panelists were asked to review each question in Appendix A to assess whether the item was *essential*, *useful but not essential*, or *unnecessary* measure of business support infrastructure. Only items receiving a minimum content validity score (CVS) of .62 from the assessment of the 12 business subject matter experts were retained for the next portion of the analysis. Once the pilot study content was validated, the pilot study was tested for reliability.

Reliability analysis. In June 2008, Columbus, Indiana was inundated with more than 10 inches of rain over a two-day period (Blesch, 2008). The damage and devastation resembled earlier events caused by hurricane Katrina. A purposive sample of 43 Indiana business leaders who witnessed the flood in 2008 responded to the validated items of the pilot study to test pilot study reliability. These data were used to compute a Cronbach's alpha score assessing the internal consistency of the instrument. The closer the alpha reliability coefficient is to 1.00 the better the internal consistency. A score of .70 was considered minimally acceptable, a score of .80 was good, and a Cronbach's alpha score of .90 indicated excellent internal consistency (Vogt, 2007). Researchers generally consider a .70 level of reliability as the lower limit of construct validity

(Govindarajan & Kopalle, 2006). Appendix B shows the reliability instrument with incorporated electronic informed consent form.

Main study. The main study was constructed based on the validation and reliability testing results from the pilot study. The main study collected Gulf Coast small business leaders' perceptions based on the instrument developed in the pilot study. Frequencies were computed for the study's general and demographic variables, such as small businesses on the Gulf Coast and business infrastructure measures. Because multiple indicators were used to assess the constructs in the pilot study, a codebook was developed after the pilot study to compute scores for business infrastructure measures and small business perceptions during and after natural disasters.

Correlation analysis. Descriptive statistics were computed to evaluate normal distribution of the data. According to Rea and Parker (2005), a skew of less than +/- 2.00 is considered sufficient for correlational analysis. Table 7 summarizes the data analysis for the main study's research questions. Because business infrastructure disaster planning and small business perceptions were measured by ordinal variables, Spearman's rho correlational analysis quantified the strength of the relationship between the variables in the study's two research questions. Spearman's rho correlation provides mathematical insight to the direction and magnitude of associations between any two variables on a ratio scale (Reindel, 2006).

Table 7

Summary of Data Analysis by Main Study's Research Questions

	Research Questions	Variables	Type of Data	Analysis
RQ1	What influence, if any, does business infrastructure planning/mitigation have on small business during natural disasters?	<ul style="list-style-type: none"> • Business infrastructure disaster planning • Gulf Coast small business leaders' perceptions of the 2005 storm season • List open-ended questions from Main study (when developed) 	Ordinal & open-ended	Correlation (Spearman's rho) Content analysis (Cronbach's alpha)
RQ2	How, if at all, can government, business, and community leaders improve the response to business infrastructure problems caused by natural disasters?	<ul style="list-style-type: none"> • Strategies to improve response to public infrastructure • Infrastructure disaster planning • Gulf Coast small business leaders perceptions of the 2005 storm season • List open-ended questions from Main study (when developed) 	Ordinal & open-ended	Correlation (Spearman's rho) Content analysis (Cronbach's alpha)

Note. Frequencies and descriptive statistics were also computed for the study's general and demographic variables. Measures of each variable were in the pilot study validity and reliability surveys in Appendixes A and B.

Content analysis. Insight about the study's two research questions are found in the open-ended questions regarding small business leaders' perceptions during and after natural disasters. A content analysis of the open-ended questions in the main study, built from pilot study data, was conducted to evaluate how, if at all, business infrastructure planning influences natural disaster outcomes. Three individuals trained in doctoral-level

research techniques independently coded themes in the open-ended responses. Inter-rater reliability was computed to determine the consistency and objectivity of the coding. A similar process was used with RQ2, which examined potential strategies for improving infrastructure disaster management.

Summary

Chapter 3 outlined the method for the quantitative study with a correlational design that studied how, if at all, business infrastructure management planning influenced small business leaders' perceptions of natural disasters during and after in the storm season of 2005. Because a business infrastructure-specific measurement instrument was not reported in the literature, a pilot study with open and closed questions was used to test an instrument based on measures implied by previous researchers (Cater & Chadwick, 2008; Colten et al., 2008; Doyle, 2006; Ewing, et al., 2007; Holliday 2006; Ives & Junglas, 2006; Phillips & Phillips, 2008; Takeda & Helms, 2006; United States House of Representatives, 2006). Prior to data collection, a subject matter panel of business experts evaluated the validity of the proposed instrument (Appendix A). A convenience sample of Indiana business leaders, who recently experienced a major flood disaster, shared their perceptions to test pilot instrument for reliability (Appendix B). The main study used items found to be both reliable and valid (Appendix C).

The main study, which collected data using an online survey, targeted business leaders of Gulf Coast small businesses in continuous business operation from 2004 through 2007. Mailing lists were accessed from publicly available electronic-mail lists in Alabama, Louisiana, and Mississippi counties and parishes. The resulting data were analyzed in chapter 4 using correlational and content analysis.

Chapter 4: Results

This quantitative correlational study was to investigate what relationship, if any, existed between the availability of business infrastructure during the Gulf Coast natural disasters of 2005 and small business leaders' perceptions of disaster management. The analysis examined the insight of Gulf Coast small business leaders who successfully sustained business operations during Hurricanes David, Katrina, and Rita in 2005. The results of the pilot study, which sampled business leaders who experienced a major flood in Indiana, was used to test and refine a new infrastructure disaster management instrument for the main study. After reviewing the findings of the Indiana pilot study, the main study of the Gulf Coast disaster was created, distributed, and completed.

Pilot Study

Analysis of the pilot study results examined the validity and reliability of the business infrastructure instrument in Appendix B. The first stage of the preliminary investigation used a subject matter expert (SME) panel to evaluate the content validity of each question. The second stage of the pilot study tested the reliability of items with a sample of business leaders who experienced a major flood in Indiana.

Content validation panel. The content validation panel consisted of 12 business experts evaluating 15 infrastructure items using McIntire and Miller's (2007) content validity process. SMEs indicated whether each item was *essential*, *useful but not essential*, or *unnecessary* to measure the validity of infrastructure survey items. As specified in chapter 3, in order to be included in the main study a panel of 12 experts required a content validation ratio (CVR) of .62 (McIntire & Miller, 2007).

Retained items. As shown in Table 8, six items had CVRs of at least .62. Cell phone networks, electrical power, law enforcement, employee housing, major highways, and police patrols were considered *essential* infrastructure for business operations by nine of 12 panelists. All six items were retained for use in the main study. Five dimensions of infrastructure were perceived to be *essential* by seven to eight subject matter experts (see Table 8). Telephone landlines, sewer lines, water lines, gasoline, and local streets received CVRs ranging from .27 to .45. Whereas the ratios for these items were below the McIntire and Miller's (2007) minimum of .62, content analysis of the open-ended comments provided insight from the panelists that the type of business influenced whether a particular element of infrastructure was deemed *essential*.

Subject matter experts suggested construction businesses and some manufacturing industries do not depend on telephone landlines, sewer lines, water lines, and local streets in the course of daily business operations. When responding to the essential nature of public utilities, one of the panelists stated, "These are essential elements if the business is traditional brick and mortar. Businesses not requiring a physical footprint (e.g., internet-based business, data and transactional processing) would be less concerned about sewer and water" (Pilot Study SME Panelist 5, 2010). Other panelists said internet businesses may consider landlines *essential*, while different organizations might view such connections as *essential but not necessary*. Likewise, office and service industries might categorize water and sewer lines as *essential* because they operate in brick and mortar structures. Because panelists indicated ratings of *essential* varied by the type of company, four items with mid-scoring CVRs (telephone landlines, sewer lines, water lines, and local streets) were retained for the main Gulf Coast study. The four survey

items close to the minimum CVR coupled with insight from the survey prompted the inclusion of an additional question in the main study for participants to indicate their business industry.

Table 8

Content Validity Ratio Results from Subject Matter Expert Panel

How essential is each type of infrastructure for business operations?	Content Validity Ratio	# Panelists Rating the Item as Essential	Phrasing	
			Retained	Revised
Cell phone networks	1.00	11	✓	
Electrical power	1.00	11	✓	
Law enforcement	.82	10	✓	
Employee housing	.64	9	✓	
Major highways	.64	9	✓	
Police patrols	.64	9	✓	
Telephone land lines	.45	8	✓	
Sewer lines	.45	8	✓	
Water lines	.45	8	✓	
Gasoline	.27	7		✓
Local streets	.27	7	✓	
Groceries	.09	6		✓
Replacement equipment	.09	6		
Office space	-.09	5		
Warehouses	-.27	4		

Rephrased items. As shown in Table 8, the grocery and gasoline items were rephrased for the main study. Both items were below the minimum CVR of .62, but

open-ended comments from the panelists suggested there were problems with the phrasing of the original items. One expert noted, “The unimpeded availability of groceries is not only critical for mobility of business, but it also has a massive impact on the overall psyche of an area affected by a natural disaster” (Pilot Study SME Panelist 10, 2010). Another panelist similarly noted, “Eating [groceries] is not optional” (Pilot Study SME Panelist 1, 2010). Despite these statements, the CVR for the grocery item was very low (.09). Content analysis of the open-ended comments about the item suggested groceries describes a supply, not a dimension of infrastructure (grocery stores). As a result, the original groceries question was altered to describe “food access (groceries, restaurants, other).”

Panelists also expressed concern about the term *gasoline*. One SME (Pilot Study SME Panelist 2, 2010) noted that trucks and generators frequently use diesel, not gasoline. Other experts suggested, “As we move to alternatively powered vehicles, gasoline will become less critical” (Pilot Study SME Panelist 1, 2010). Rather than discard a potentially useful dimension of infrastructure before the main study, the phrasing of the gasoline item was revised to inquire about the availability of “fueling points (gasoline, diesel, other).”

Discarded items. The remaining three items (replacement equipment, office space, and warehouses) were rated as *essential* by six or less subject matter experts. The finding resulted in CVRs below the minimum of .62. As a result, the replacement equipment, office space, and warehouse items were excluded from the main study

Main study data instrument. As shown in Appendix B, subject matter experts expressed concern about the validity of 3 of the pilot study’s original 15 items. The panel

validated a final instrument containing 12 items for the Gulf Coast study. Ten of the items retained the exact phrasing from the pilot study instrument in Appendix A; two of the items (groceries and gasoline) were rephrased.

Indiana reliability study. The second stage of the pilot study tested the reliability of the 12 validated items by sampling business leaders in Columbus, Indiana. In 2008 and 2009, the region experienced a major flood (Anonymous, 2009) as well as a series of intense snowstorms that deposited 12.5 inches of snow that produced the sixth heaviest snowfall ever recorded for the region (The National Oceanic and Atmospheric Administration, 2009b). As described in chapter 3, a Columbus Chamber of Commerce e-mail list (Chamber of Commerce, 2009) was used to invite 536 individuals to share their thoughts about how natural disasters influenced their businesses. Of the 536 invitations, 43 Indiana business leaders responded to the reliability survey.

As shown in Appendix B, participants were asked to respond to the 12 infrastructure dimensions in seven different contexts: (1) government prior planning, (2) business prior planning, (3) community prior planning, (4) actual damage, (5) government response, (6) business response, and (7) community response. Table 9 shows the reliability scores when the infrastructure scale was used in each context of the survey. Cronbach's alpha scores ranged from .92 to .98. The 12-item scale's average reliability of .96 exceeded Vogt's (2007) benchmark score for minimal reliability of .70. As a result, all the validated pilot study items were considered sufficiently reliable for inclusion in the main Gulf Coast study.

Table 9

Indiana Pilot Study Reliability Results

Disaster Management Category	<i>N</i>	Cronbach's Alpha
Planning Prior to the Disaster		
Government leaders	29	.97
Business leaders	27	.94
Community leaders	24	.98
Actual Damage	21	.92
Response After the Disaster		
Government leaders	21	.97
Business leaders	19	.98
Community leaders	19	.97
Average Reliability Score		.96

Main Study

The Gulf Coast survey instrument (see Appendix C) was used to gather Gulf Coast small business leaders' perceptions about the hurricane mega-disaster of 2005. The quantitative study investigated what relationships, if any, existed between the availability of business infrastructure during the Gulf Coast natural disasters of 2005 and small business leaders' perceptions of disaster management. Analysis of the survey data included quantitative information regarding frequencies, descriptive statistics, correlation, and content analysis.

The population for the main study consisted of leaders of small Gulf Coast businesses in continuous operations from 2004 through 2007. E-mail invitations were sent to approximately 4,135 leaders of small Gulf Coast businesses in Alabama,

Louisiana, and Mississippi to achieve a sample size of 384 participants or until the response rate was saturated with potential participants no longer responding to e-mail reminders. Data collection continued until saturation and ended with 128 participants.

Frequencies. Calculating frequencies provided the basis for the study's data analysis (Neuman, 2007; Vogt, 2007). Frequencies were calculated for primary state and business type. Results from the frequency analysis provided context for further correlation and content analysis.

Primary business state. The main study sampled small business leaders along the Gulf Coast in Alabama, Louisiana, Mississippi, and Texas ($N = 128$). As shown in Figure 3, 1% of business leaders indicated the primary location of their business was in Alabama; 40% identified Louisiana, with 47% from Mississippi, while 11% of the participants did not indicate the location of their businesses. Although the sample design did not specifically target Texas, 1% of the business leaders indicated Texas was the primary location of their business.

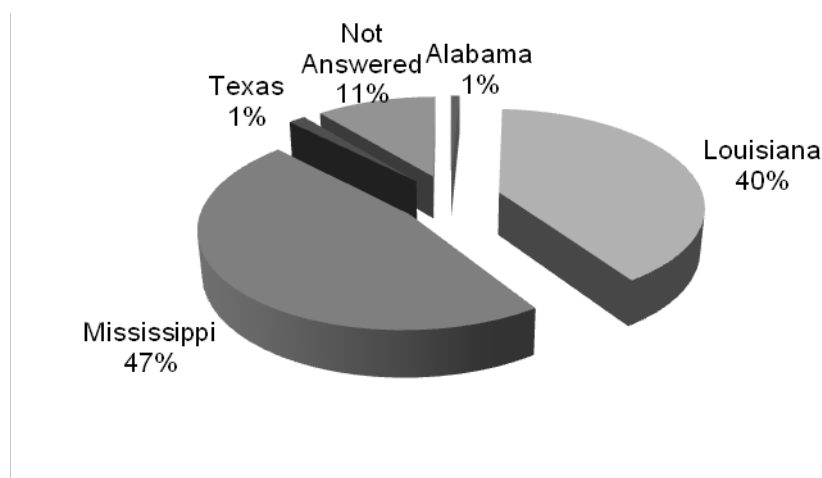


Figure 3. Main study frequency distribution by state.

Business type. Business leaders responding to the main study were asked to identify their type of business. There were five categories: construction, internet-based,

services/intellectual property, professional services, and other. Figure 4 shows the frequency of type of business reported by the study participants. About half of the sample (55.5%) categorized their businesses as services or intellectual, 21.9% were professional offices, 10.9% as construction businesses, 7.8% Internet, and 3.9% other.

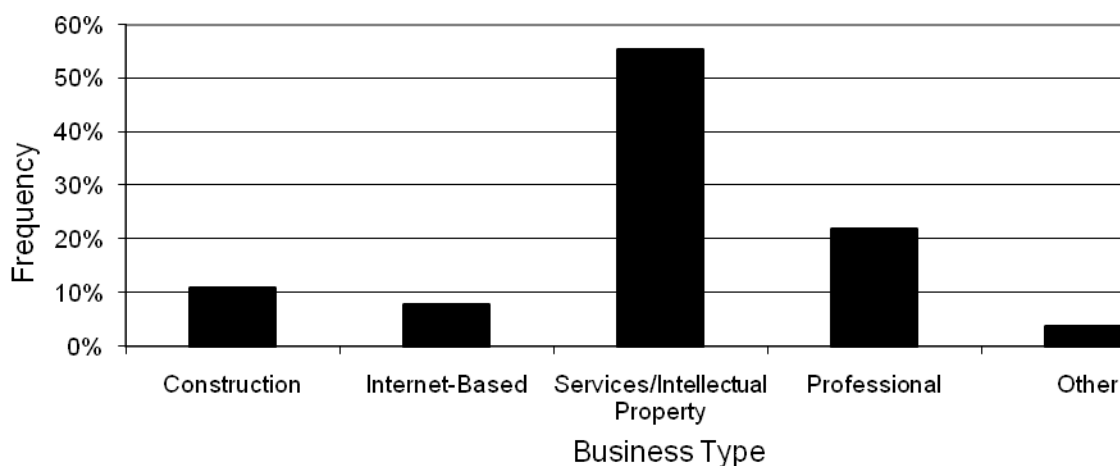


Figure 4. Main study frequency distribution by business type.

Descriptive statistics. According to Vogt (2007), descriptive statistics are an integral part of scholarly quantitative studies (Vogt, 2007). In the main study, descriptive statistics compared leaders' perceptions of disaster planning before and results of disaster response management after the disasters. Analysis included computations for the mean, standard deviation, and skew for the study's variables.

Before and after comparison. Table 10 compares business leaders' perceptions of government, business, and community pre-disaster planning efforts with the perceived effectiveness of disaster response after the hurricanes of 2005. Average scores were computed for each dimension of infrastructure (i.e., communication, utilities, distribution, roadways, and physical security). Leaders' perceptions of disaster planning before the disasters and leaders perceptions of the results of disaster planning after the 2005 storm season were used to compute scores reflecting the gap between perceived planning and

perceived actual results for each dimension of business infrastructure. A five-point scale (1 = *Don't know*, 2 = *Poor planning*, 3 = *Moderate planning*, 4 = *Good planning*, and 5 = *Extremely effective planning*) was used to score government, business, and community disaster planning before the disasters. None of the study's participants selected "don't know" in response to the items measuring perceived planning before the disaster. The results from disaster planning were then compared with the business leaders' perceptions of the effectiveness of government, business, and community disaster responses (1 = *Not effective at all*, 2 = *Minimally effective*, 3 = *Somewhat effective*, 4 = *Effective*, and 5 = *Extremely effective*) of effectiveness. The gap between the before and after scores indicated the disparity between perceived government, business, and community planning efforts, and the perceived effectiveness of the disaster response for the actual disasters. A low gap score reflected similarity between perceived planning and perceptions of disaster response. A high gap score indicated disparity between perceived planning and perceived actual disaster response.

Table 10

Comparison of Average Government, Business, and Community Scores Before and After the Hurricane Disasters of 2005

Dimension of Business Infrastructure	Context of Natural Disaster Perceptions														
	Government					Business					Community				
	Before		After		Gap	Before		After		Gap	Before		After		Gap
	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>		<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>		<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	
Communications	2.10	(0.69)	2.12	(0.95)	0.02	2.73	(0.94)	2.86	(1.05)	0.13	1.94	(0.76)	2.30	(1.01)	0.36
Utilities	2.56	(0.90)	2.62	(1.03)	0.06	2.49	(0.99)	2.92	(1.07)	0.43	2.21	(0.96)	2.54	(1.06)	0.33
Distribution	2.16	(0.78)	2.29	(0.86)	0.13	2.70	(1.17)	2.82	(1.03)	0.12	1.98	(0.72)	2.64	(0.97)	0.66
Roadways	2.63	(0.99)	2.54	(0.94)	-0.09	2.25	(0.96)	2.60	(1.03)	0.35	2.04	(0.81)	2.68	(0.95)	0.64
Physical Security	2.63	(0.95)	2.99	(1.13)	0.36	2.02	(1.11)	2.60	(1.22)	0.58	2.32	(1.03)	2.87	(1.12)	0.55

As shown in Table 10, small business leaders' perceptions of government leaders' planning and disaster response scores were similar. There were only slight differences in the before and after scores for communication, utilities, distribution, and roadways. The largest positive gap (0.36) related to participants' perceptions of government leaders' response to physical security issues after the disaster.

The largest gaps for business leaders' planning and disaster response related to roadways (0.35), utilities (0.43), and physical security (0.58). Business leaders ($mean_{after} = 2.86$) received higher average scores for their disaster response to communication problems than government leaders ($mean_{after} = 2.12$). Business leaders also had higher average scores than their government counterparts when responding to issues related to utilities and distribution.

Community leaders consistently received the lowest average scores for planning, ranging from 1.94 for communication to 2.32 for physical security. Average scores after the disaster; however, were similar to government and business leaders. As a result, community leaders had the largest positive gap scores for all infrastructure dimensions, including 0.66 for distribution and 0.64 for roadways.

Results from actual damage. Table 11 summarizes the descriptive statistics generated from business leader's perceptions for the actual damage created by the 2005 mega-disaster. The mean scores shown in Table 11 are based on a 4-point scale (0 = no damage at all; 4 = major damage). As shown in Table 11, participants perceived that distribution ($M = 3.49$, $SD = .73$) and communications ($M = 3.49$, $SD = .71$) were the dimensions of infrastructure with the greatest amount of damage. Utilities were perceived as the infrastructure dimension with the third highest amount of damage ($M =$

3.39, SD = .74) and roadways (M = 3.33, SD = .71) rated fourth of the five dimensions. Business leaders perceived physical security (M = 3.08, SD = .97) as the business infrastructure element least damaged by the 2005 storm season.

Table 11

Mean, Standard Deviation, and Skew Average Scores for Actual Mega-Disaster

Damage

Actual Damage after the Natural Disaster	<i>M</i>	<i>(SD)</i>	<i>Skew</i>
Distribution	3.49	(0.73)	-1.37
Communications	3.49	(0.71)	-1.54
Utilities	3.39	(0.74)	-1.25
Roadways	3.33	(0.71)	-1.15
Physical Security	3.08	(0.97)	-0.69

Note. 4-point scale (0 = no damage at all; 4 = major damage)

Correlation Analysis

Correlational analysis was used to measure the degree of association between the study's main variables (Creswell, 2009). Correlational analysis provided mathematical quantification of the relationship between infrastructure disaster planning and small business leaders' perceptions. Spearman's rho was used to quantify the strength of the relationship between the variables in the study's two research questions.

Hypothesis 1 – Planning and actual response. As indicated in chapter 1, the study's first hypothesis examined the correlation between perceived infrastructure planning and actual management responses after a natural disaster. Average scores for government, business, and community were used to compute an overall score for

planning before and actual response after the hurricanes of 2005. As shown in Figure 5, the compiled total scores for leader planning and leader disaster response ranged from 3 to 15, because each of the 3 infrastructure dimensions had a possible perception value between of 1 to 5. A statistically significant correlation ($r_{(1,77)} = .29, p = .01$) was detected, supporting the alternative hypothesis that there was a significant relationship between business leaders' perception of disaster planning and their perceptions about the actual response. The adjusted R^2 was .07, indicating approximately 7% of the variance in leaders' perceptions of the actual response after the disaster could be predicted by business leaders' perceptions of prior planning.

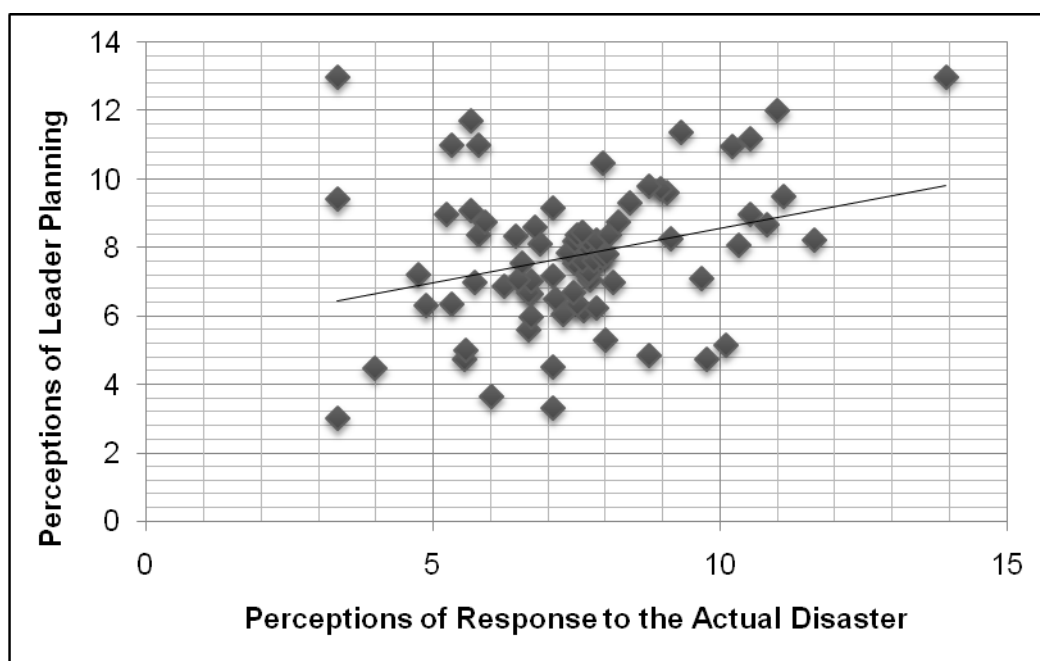


Figure 5. Scatter plot of perceived planning before and actual response after the mega-disaster.

Hypothesis 2 – Actual damage and management response. The study's second hypothesis investigated the relationship, if any, between perceived actual infrastructure

damage and management responses after the disaster. An insignificant correlation ($r_{(1,77)} = .12, p = .28$) was detected. The finding supported the null hypothesis there were no significant relationship between small business leaders' perceptions of actual damage and their perceptions of disaster leaders' response.

Figure 6 illustrates opportunities for improvement in leaders' response to disasters. The average scores of actual disaster damage (y-axis) and perceived leader response (x-axis) were compared. Business leader's perceptions of actual damage to business infrastructure from the 2005 storm season are shown using a four-point scale (1 = *No damage at all*, 2 = *Minor damage*, 3 = *Moderate damage*, and 4 = *Major damage*). Business leaders' perceptions of disaster management response to the disasters used a five-point scale (1 = *Not effective at all*, 2 = *Minimally effective*, 3 = *Somewhat effective*, 4 = *Effective*, and 5 = *Extremely effective*). Gaps between the two lines in Figure 6 identify opportunities for improvement. The element of infrastructure indicating the least opportunity for improvement was physical security and the largest opportunities for improvement related to housing and communication.

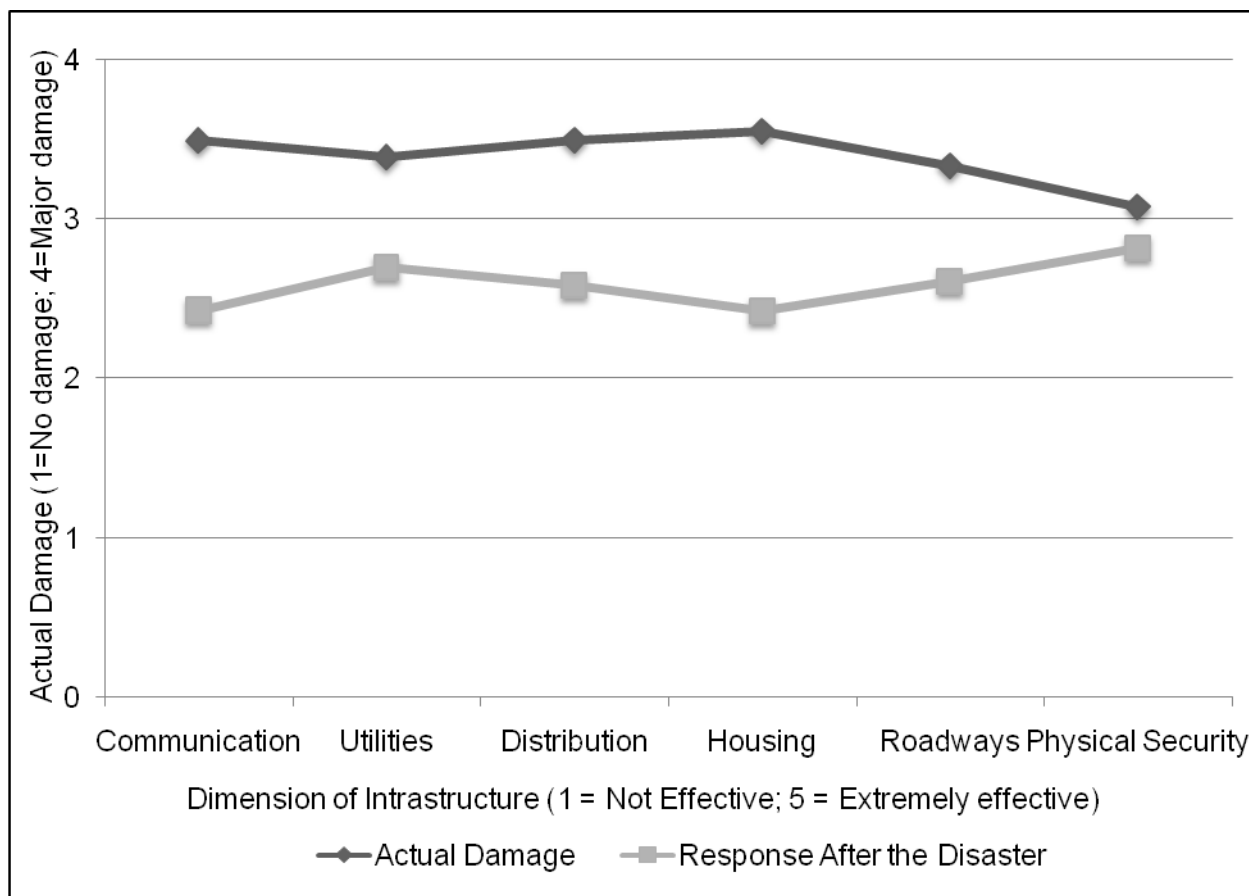


Figure 6. Comparison of perceived actual damage to perceived leader response.

Content Analysis.

Content analysis of the open-ended questions was conducted to uncover potential unexpected information from participants and/or identify outlier comments related to the quantitative findings. As shown in Figures 7 and 8, analysis of participant's open-ended comments identified seven different categories for discussion. Figure 7 shows three discussion topics that emerged from the open-ended questions concerned disaster planning. About 45% ($n = 29$) of the participants who shared open-ended comments about the disaster described the ineffectiveness of government planning. Another 39% (n

= 25) indicated that disaster planning of business leaders was inadequate for Hurricane Katrina; 16% ($n = 10$) stated the planning of community leaders was poor.

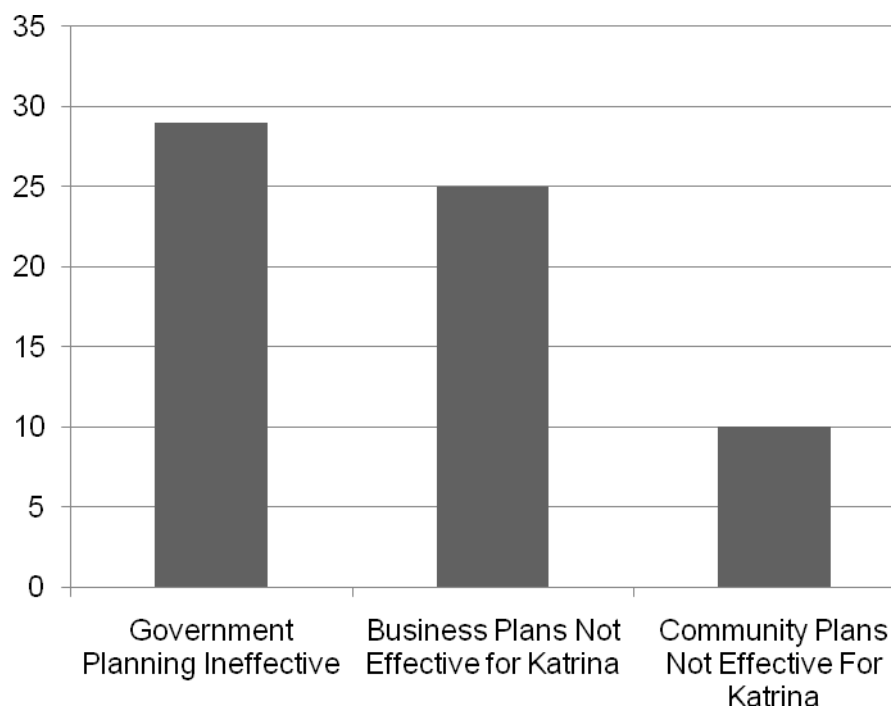


Figure 7. Frequency of planning discussion topics from open-ended questions.

Participants responses to the open-ended questions provided in the study communicated anecdotal information. Selected comments from the open-ended questions were briefly discussed regarding frequency and topic. Figure 8 illustrates the four discussion topics that emerged from the open-ended questions regarding leaders' responses to the disaster. Small business leaders' disappointment in government response after the mega-disaster provided 16 comments, representing 36% of the open-ended remarks from participants. One leader criticized national government leaders, "The GOP's White House and Congress were indifferent at best" (Main Study Participant 3, 2010). The same participant praised a volunteer law enforcement team that arrived from outside the area noting, the "Canadian Mounted Police were the first on the scene"

(Main Study Participant 3, 2010). The central tone from the 16 comments suggested business leaders were disappointed in disaster response from local, regional, and federal government managers.

Business leaders' efforts to restore infrastructure after the disaster were anecdotally described in 14 open-ended comments (32%). Participants perceived the response by business leaders was hampered by the lack of business support infrastructure for disaster response operations. One participant noted, "Some businesses that came back could not be sustained" (Main Study Participant 46, 2010). Study participants indicated business response was poor because recovery efforts were not sustained through lack of sufficient support infrastructure.

Participants used the open-ended questions to comment on the lack of disaster response funding available to local communities. Participants comments indicated volunteers and non-paid community groups responded when local officials could not respond. One leader noted, "The local community can be proud of the local citizens who volunteered their time in the recovery effort" (Main Study Participant 46, 2010). One small business leader described the heroic local effort by "Sandy Rosenthal/Levees [who] should win a Nobel Prize" (Main Study Participant 103, 2010) for working to maintain the levees throughout the storm. Another comment noted effective nonprofit organizations participation in the response saying, "National nonprofit groups were also perceived as effective" (Main Study Participant 9, 2010).

Study participants used survey open-ended comments to share thoughts about their perception that the community disaster response was poor. Participants' comments attributed the ineffective community response to lack of planning. One study participant

stated, “Personnel and resources cannot be staged in a possible flood zone and adequate inland shelters are now being built” (Main Study Participant 33, 2010).

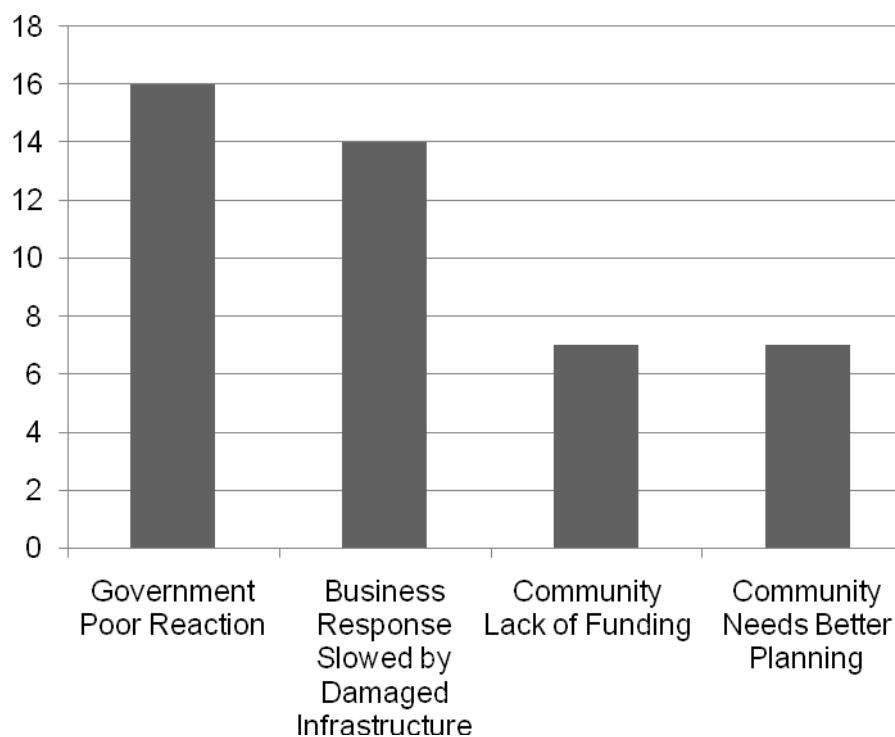


Figure 8. Frequency of response discussion topics from open-ended questions.

Summary

The study investigated what relationship, if any, exists between the availability of business infrastructure during the Gulf Coast natural disasters of 2005 and small business leaders’ perceptions of disaster management. A two-part pilot study investigated the validity and reliability of the infrastructure survey instrument. Based on feedback from subject matter experts, 12 items in the pilot study were retained or revised. The resulting instrument displayed high reliability, with an overall Cronbach’s alpha score of .96.

The main study surveyed 1284 business leaders representing four Gulf Coast states. Correlational analysis found statistical support for Hypothesis 1, which indicated

there is a significant relationship between business leaders' perceptions of disaster planning and disaster leaders' response after a disaster. However, planning was about 7% of the variance in leaders' response. No significant support was found for Hypothesis 2, which tested the association between actual damage and leaders' response.

Content analysis detected seven areas of discussion in participants' open-ended comments. While business leaders criticized government agencies for failure to respond in a timely fashion, they praised community efforts for innovative responses to the disaster. Chapter 5 presents the distilled study analysis presenting findings, implications, and recommendations.

Chapter 5: Findings, Implications, and Conclusion

A quantitative, correlational study investigated the potential relationship between the availability of business infrastructure during the Gulf Coast natural disasters of 2005 and small business leaders' perceptions of disaster management. As reviewed in chapter 4, small business leaders along the Gulf Coast evaluated government, business, and community planning as well as these leaders' response to communications, utilities, resources distribution, roadways, and physical security infrastructure issues after the disaster. Gulf Coast leaders also reported the severity of infrastructure damage during the 2005 storms. Chapter 5 presents a discussion of the study's findings and provides an analysis of the results' implications, limitations, and recommendations for future research.

Research Questions

As indicated in chapter 2, disasters are typically described in three phases: pre-disaster planning, actual events, and post-disaster response. Analysis of the study's first RQ examined the correlation between small business leaders' perceptions of pre-disaster planning and actual disaster events. Analyzed data from the second RQ investigated the relationship between business leaders' perceptions of actual natural disaster events and post-disaster response efforts.

RQ1 – Pre-disaster Planning

The first research was designed to asked, *“What influence, if any, do business infrastructure planning and mitigation have on small businesses after natural disasters?”*

The null and alternative hypotheses tested:

H1₀ – Business infrastructure planning and mitigation do not significantly correlate with small business leaders’ perceptions after natural disasters.

H1_A – Business infrastructure planning and mitigation significantly correlate with small business leaders’ perceptions after natural disasters.

As indicated in chapter 4, there was a statistically significant correlation between small business leaders’ perceived pre-disaster planning and their perceptions of the severity of actual events. When participants reported that pre-disaster planning was poor, they also tended to perceive the actual disaster events were severe. While the significance of the finding suggested that the result did not occur due to random chance, the predictive strength of the correlation was weak. Only about 7% of variance in leaders’ perceptions of the disaster response could be explained by participants’ pre-disaster planning responses (see Figure 5).

The weakness in the correlation between perceived planning and perceived disaster events was attributed to several factors. Brewer et al. (2006) suggested eyewitness accounts lose accuracy through time and events recalled several years later could be influenced by non-related events. Data collection occurred five years after the actual events of the 2005 storm season. The trauma of the 2005 storm season may have magnified the perceived severity of the actual damage when recalled years later. Participants’ likely witnessed extensive news reports that could have influenced recall accuracy during the intervening time from the 2005 storm season.

With the study examining six very different types of infrastructure, there was no surprise that business leaders’ aggregated perceptions did not detect a significant correlation. When all the dimensions of pre-disaster infrastructure planning were

distilled, the aggregated variables were not good predictors of perceptions of actual disaster events. The aggregation of the perceptions coupled with the aggregation of the infrastructure variables potentially contributed to an insignificant correlation.

RQ2 – Post-disaster Response

The second research question was designed to ask: “*How, if at all, can natural disaster management leaders improve the response to business infrastructure problems based on perceptions from small business leaders?*” The null and alternative hypotheses created for RQ2 tested:

H₂₀ – Disaster management leaders’ response to business infrastructure problems did not significantly correlate with small business leaders’ perceptions of actual infrastructure problems.

H_{2A} – Disaster management leaders’ response to business infrastructure problems significantly correlated with small business leaders’ perceptions of actual infrastructure problems.

As reviewed in chapter 4, the insignificant correlation between the perceived severity of actual events and small business leaders’ perceptions of the post-disaster response was insignificant. The finding suggested that perceptions about the severity of the actual disaster were disconnected from participants’ perceptions about the post-disaster response. Even though small business leaders perceived there was major damage from the hurricanes, the data did not reflect perceptions of a disaster response that was equal to the major damage along the Gulf Coast.

Much like the findings from RQ1, the analyzed results from RQ2 were not surprising. There was significant criticism of the government’s post-Katrina response

(Leonard & Howitt, 2006; Schneider, 1992; United States House of Representatives, 2006). The insignificant correlation suggested business leaders' perceptions of disaster response of leaders' planning were not consistently connected with perceptions of disaster response results after the actual disaster. Analyzed results of the study suggested business leaders have different needs based on whether businesses are traditional brick and mortar enterprises or Internet-based organizations. Feedback from the experts in the pilot study coupled with the business type data shown in Figure 4 suggested internet-based organizations perceived the response as too focused on roadways and physical security to the detriment to their perceived needs for communications and distribution (Pilot Study SME Panelist 5, 2010).

Alternatively, businesses operating from a traditional brick and mortar perspective may have perceived disaster response efforts spent on Internet-based infrastructure as wasted resources. The study did not provide conclusive correlations, and the possibility of disaster response according to business type could be explored in future research.

As with RQ 1, the disconnect between perceptions of the disaster's actual severity and post-disaster response management may have been due to the lag between actual events and the study survey five years later (Brewer et al., 2006). Studies suggested eyewitness accounts become less accurate as the time lag between actual events and participant recollection increases. The insignificant results may have been influenced by the distillation of the overall perception of the severity of the disaster and the overall perception of the response. When the multiple business infrastructure elements were combined in analysis, the particular elements of business infrastructure that had effective

response were not clearly delineated. When a segmented analysis was conducted (see Figure 6), specific trends were apparent.

Implications

As of July 5, 2010, the Federal Emergency Management Agency (FEMA) declared an average of 8.5 United States disasters occur each month (see Table 12), representing the highest frequency of disasters in the past decade. Between January and July 2010, the U.S. government responded to 51 disasters, including major disasters in Puerto Rico, the District of Columbia, and 27 other states (FEMA, 2010). The frequency and intensity of such events highlight the importance of critically evaluating the effectiveness of current disaster management strategies.

Table 12

Frequency of FEMA Disaster Declarations by Year (Rouse, 2010)

Year	Number of FEMA Disaster Declarations	
	<i>Annual</i>	<i>Monthly</i>
2000	45	3.8
2001	45	3.8
2002	49	4.1
2003	56	4.7
2004	68	5.7
2005	48	4.0
2006	52	4.3
2007	63	5.3
2008	75	6.3
2009	59	4.9
2010	51	8.5

Note. *Based on FEMA (2010) data as of July 5, 2010. *2000 to 2009 monthly calculations based on 12 months. * 2010 monthly calculation based on 6 months.

Need for Segmented Disaster Planning

Research questions 1 and 2 analyzed aggregated measures of pre-disaster planning, actual disaster severity, and post-disaster response. Aggregated variables were computed based on small business leaders' perceptions of six dimensions of infrastructure: communication, utilities, distribution, housing, roadways, and physical security. The combination of individual infrastructure scores may have resulted in the inability to identify trends unique to particular types of infrastructure. For instance, study participants indicated that the element of infrastructure with the least opportunity for improvement was physical security (see Figure 6). This finding was consistent with a report by the U.S. House of Representatives (2006) that indicated government officials approached the disaster from a national security perspective. Prior literature suggested the emphasis on physical security issues evolved from early American disaster efforts that focused on emergency medical care, providing food, and restoring public safety (Harrington, 2008; Roberts, 2006). Historically, American disaster recovery focuses on emergency response to restore the basic elements of stabilizing health and welfare, rather than focusing on the need for quick economic recovery.

Analyzed data from the main study suggested the government's best performance related to physical security. Participants indicated gaps between small business leaders' needs (measured by their perceived severity of infrastructure damage) and post-disaster response (see Figure 6). Responses from small business leaders identified housing and communication as the greatest opportunities for improvement in the 2005 storm season.

Analysis of data from the pilot study indicated business leaders' perceptions of infrastructure vary depending on their type of business. Such variance might result in

business leaders having different disaster management priorities. For instance, restoration of communication infrastructure might be a significant concern to Internet-based businesses that require connectivity and communication with customers. In contrast, restoration of roadways and physical security might be a larger concern for construction, manufacturing, and retail businesses operating in traditional brick and mortar models.

Given the different types of infrastructure and businesses, data from the study suggested leaders should avoid generic, ‘one size fits all’ approaches to disaster management efforts. A segmented approach, such as the one conducted in this study, might help disaster management leaders to identify unique infrastructure needs. Quick government response to small business infrastructure needs is particularly important to speed economic recovery and development in disaster-affected communities (Edmiston, 2007; Ives & Junglas, 2006).

Need for Community-driven Disaster Planning

During major disasters, the federal government typically leads the recovery effort through the Federal Emergency Management Administration (FEMA). The FEMA approach appears to bring significant attention and resources to the disaster recovery effort. Participants’ perceptions from the study suggested the FEMA ‘top down’ leadership approach may have significant limitations especially regarding local community disaster recovery.

Retrospective investigations into the 2005 mega-disaster found that community-driven recovery efforts were frequently constrained by funding, resources, and federal government oversight (Colten et al., 2008; Street & Cameron, 2007). Consistent with

intense criticism from the mass media, small business leaders who participated in the study rated government, business, and community leaders' disaster management response as *minimally effective*. Participants' responses to the open-ended questions criticized the federal government command and control systems. The participants noted problems with disaster command centers mistakenly established in flood zones, disaster resources stored in storm surge areas, out-of-state law enforcement officials arriving without local information, and response managers using valuable time to acclimate to local conditions. Consistent with the anecdotal evidence provided by small business leaders in the study, the U.S. House of Representatives (2006) also noted that the federal government's response plans did not facilitate the quickest possible disaster recovery for the local communities that had unique needs.

Federal disaster management agencies may want to consider creating new training programs to teach disaster management leaders to use available resources for quickest restoration of business infrastructure (Harrington, 2008; Herzog, 2007). Training in local situational awareness might also foster innovative problem solving to assist disaster managers as they react to emerging variables, such as subordinate capabilities, time constraints, available resources, and unique characteristics of the disaster (McLaurin, 2006). Business leaders may also want to consider creating interfaces with federal and local authorities for disaster planning, mitigation, response, and recovery efforts. Local Chamber of Commerce organizations could be leveraged to create comprehensive disaster planning tailored to the specific business needs of local communities and regions.

Research Implications

As discussed in chapter 4, the pilot study resulted in changes to the main study's survey instrument. A subject matter expert panel noted that participants from different business industries could have different interpretations of the survey questions. In responding to the utilities questions, one expert panelist noted, "These are essential elements if the business is traditional brick and mortar. Businesses not requiring a physical footprint would be less concerned about sewer and water" (Pilot Study SME Panelist 5, 2010).

Emerging infrastructure needs. Results from the expert validation panel indicated that a difference exists between the business infrastructure needs of traditional brick and mortar businesses versus the needs of internet-based organizations (Hagel & Brown, 2005; Laudon & Traver, 2007). Office space, replacement equipment, warehousing, roadways, and physical security are important to construction businesses, traditional retail operations, and warehousing facilities. Communications and utilities are important business infrastructure for businesses based on professional services, the internet-based economy, or global operations.

Effectiveness of electronic surveys. The study survey instrument was sent to 535 email addresses in the original invitation, 3,000 Gulf Coast Chamber of Commerce members, more than 400 invitations through the University of New Orleans business school, and over 200 invitations through the Hancock County Chamber of Commerce (Mississippi). More than 4,135 email invitations resulted in 128 responses to the survey or a 3.1% response rate. As noted in chapter 3, electronic data collection was deemed the most appropriate for geographically dispersed samples and online surveys provide a

quick turnaround of results (Cooper & Schindler, 2006; Creswell, 2009; Neuman 2007).

Future researchers should consider the difficulty of data collection and low response rate when planning online surveys (Creative Research Systems, 2009; Fincham, 2008). Potential study participants received a large number of electronic requests daily for response to the point of attention saturation. Researchers may have difficulty getting past electronic spam filters set to automatically reduce the volume of electronic marketing messages sent to personal and professional inboxes.

Snowballing efforts with known sponsors, chambers of commerce, created a higher sample results than the electronic email lists. Snowballing efforts produced 112 of the 128 survey responses or 88% of the total responses. Issuers of future electronic surveys should consider active sponsorship to achieve useful population results based on the experience gained in this study. Professional panel lists purchased commercially may produce higher response results due to the incentives provided by the panel managers.

Limitations of the Study

Results from the Gulf Coast business infrastructure study must be considered within the context of limitations in the research design. In reviewing the results, scholars should consider the location of the study, targeted sample, and sample size gathered (Creative Research Systems, 2009; Rea & Parker, 2005; SBA, 2009).

Participants were self-selected small business leaders from the Gulf States of Alabama, Louisiana, Mississippi, and Texas. Although the study represented small businesses, the findings may not be applicable to other regional areas with similar small business populations, due to the uniqueness of business markets as expressed in the survey open-ended comments. The sample size was limited to 128 participants operating

small businesses on the Gulf Coast. Viewed through the survey limitations, the results should not be generalized to all American small business regions. Additionally, all survey data were self-reported with no attempt to verify accuracy of participants' input (Creswell, 2009; Wikman, 2007). The study design assumed participants' responses were honest and accurate reflections of the events of the 2005 storm season and mega-disaster describing disaster experiences that occurred two or more years in the past (Brewer et al., 2006).

Recommendations for Future Research

The study's final sample size of 128 participants indicates future studies should consider other survey methods to garner higher response rates. Researchers should consider use of commercial panel solicitations, demographically targeted lists from commercial database vendors, and surveys sponsored through trusted groups such as universities, chambers of commerce, or other recognized organizations. Research concerning business infrastructure influence on small businesses should be geographically broadened to determine scalability of infrastructure trends nationally or internationally. Study results recommend additional research focused on the specific business infrastructure requirements for different business industry segments as noted by the study's expert validation panel (Pilot Study SME Panelists 2, 5, 11, 2010).

Based on the study, future research should compare disaster planning, response, and management from other recent disasters including the earthquakes that rocked Haiti and Chile, the oil spill in the Gulf of Mexico, and the Nashville flood of 2010 (Alberts, 2010; Britt, 2009; Jonsson, 2010). Insight into disaster planning and response best practices to enlighten American disaster professionals is achievable through comparison

of disasters worldwide. The most effective measures used around the world should be applied to similar disasters occurring in United States territories.

Future research could build on the study results by investigating the effectiveness of revised disaster planning approaches (Banipal, 2006; U.S. House of Representatives, 2006). New approaches could include disaster manager training in situational awareness, disaster plans that provide broad outlines allowing latitude for responders to tailor responses to local conditions, and tighter integration with community leaders in all stages of disaster planning. Research targeting community involvement in disaster planning might also offer opportunities to create faster disaster response adaption to local needs and conditions.

Recommendations for Leadership

Based on results from the study, disaster management leaders should approach disasters from a local or regional community viewpoint, fund future research for insight into effective disaster planning, provide situational awareness training for key disaster responders, and use planning strategies that provide resources to broad non-specific disaster planning (Banipal, 2006; Colten et al., 2008; Street & Cameron, 2007).

Community leaders should ensure local or regional disaster planning integration into national planning, fund research to understand the mix of businesses needs within the community, and plan for community support of businesses during disasters (Hagel & Brown, 2005; Laudon & Traver, 2007; U.S. House of Representatives, 2006). Small business leaders should seek opportunities to provide business-specific input to community leaders, integrate business contingency plans into disaster planning efforts at

all levels whenever possible, and build disaster contingency funding into operational plans (Cater & Chadwick, 2008; Edmiston, 2007; Renski, 2009; Runyon, 2006).

Conclusions

The quantitative study detected a significant, though small, relationship between business leaders perceptions of disaster management planning and perceived response to the damaged infrastructure necessary for sustaining small businesses. Study results supported the literature and suggested disaster response leaders approached disaster management from a security viewpoint were not attuned to the severity of damage to business infrastructure or the needs of small businesses as the economic generator for local communities (Colten et al., 2008; Edmiston, 2007; SBA, 2009). The findings suggested federal government leaders do not tend to use situational awareness in disaster management to respond to the uniqueness of each community (Roberts, 2006; Sylves, 2008).

Future presidential administrations should direct revisions of government disaster planning including oversight of potential disaster environments, and providing broad resources through non-specific disaster plans (Recio et al., 2010). Government and community leaders should abandon strategies that create checklist-driven, specific disaster plans that have little value in unique disaster situations. Disaster response leaders should focus planning efforts on creating response leaders with increased situational awareness.

Disaster response leaders' lack of focus on local business infrastructure requirements lengthens community recovery time because of loss of tax base, lack of employment for returning citizens, and hampers small businesses without emergency

capital to survive long dormant periods (Chiodi & Harrison, 2008; Edmiston, 2007; Holliday, 2006; Ives & Junglas, 2006; Jarman & Chopra, 2008). Data in Table 10 as well as some open-ended comments displayed in Figure 8 similarly suggested that failure to address infrastructure issues lengthened the recovery time for communities and businesses.

Analysis of data in the quantitative study compared the perceived actual damage from the disasters to the perceived leader response and indicated opportunities to improve future leaders' response to disasters. The best opportunities for improved response for specific business infrastructure improvement, based on analysis of study input, are in housing and communications. Government, business, and community leaders can improve future disaster responses through focus on housing and communication infrastructure.

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APPENDIX A: PILOT STUDY – CONTENT VALIDATION SURVEY INCLUDING
INFORMED CONSENT FORM

Dear Business Subject Matter Expert,

My name is [REDACTED] and I am a student at the University of Phoenix working on a Doctor of Business Administration (DBA) degree. I am conducting a research study entitled “Infrastructure Disaster Management: Gulf Coast Small Business Analysis after 2005 Natural Disasters.”

The nature of the research study is to investigate how, if at all, natural disaster damage to business infrastructure influences the operations of Gulf Coast small businesses. The purpose of the study is to examine what relationships, if any, exist between business infrastructure management and Gulf Coast small business operations through natural disasters cycles. The study consists of two phases. The first phase will pilot test the validity of a series of business infrastructure disaster management measures. Items found to be sufficiently valid will then be evaluated for reliability. After a suitable set of measures is developed, the second (main) phase of the investigation will collect data from small business owners along the Gulf Coast.

Your participation will involve assisting in the pilot study as a business subject matter expert. You will be asked to review a series of questions and determine how effectively each item measures the study’s variables. The entire survey should take no more than 15 minutes. The results of the research study may be published but your identity will remain confidential and your name will not be disclosed to any outside party.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, you can do so without penalty or loss of benefit to yourself. To withdraw from the study, at any time, return to the survey URL and fill out the posted study withdrawal form. The commercial survey collection officials will notify the researchers of the data to be removed from the survey population.

In this research, there are no foreseeable risks to you.

Although there may be no direct benefit to you, a possible benefit of your participation is better understanding of the influence business infrastructure on small business operations, academic insight to disaster management of business infrastructure, and investigation of potential improvement for business leadership in natural disasters.

I believe there is significant value studying the influence of business infrastructure on small business operations during natural disasters. The results of the study may help federal, community, and business leaders improve management of business infrastructure for small business operations.

If you have any questions concerning the research study, please call me at [REDACTED] or e-mail me at [REDACTED]. If you have any questions, comments, or complaints about participating in the study, you may also contact my faculty advisor, Dr. [REDACTED] at [REDACTED].

As a participant in this study, you should understand the following:

1. You may decline to participate or withdraw from participation at any time without consequences.
2. Your identity will be kept confidential.
3. [REDACTED], the researcher, has thoroughly explained the parameters of the research study and all of your questions and concerns have been addressed.
4. Data will be stored in a secure and locked area. The data will be held for a period of three years, and then destroyed.
5. The aggregated research results will be used for publication.

Sincerely,

[REDACTED]
[REDACTED], 2010

“By signing this form I acknowledge that I understand the nature of the study, the potential risks to me as a participant, and the means by which my identity will be kept confidential. My signature on this form also indicates that I am 18 years old or older and that I give my permission to voluntarily serve as a participant in the study described.”

- I CONSENT** – Use this as my electronic signature consenting to the information above
- I do NOT CONSENT.**

Thank you for helping with the study! The survey is divided into two main sections. The entire process should take no more than 15 minutes. Please keep in mind that all of your responses will be strictly confidential.

Preliminary information:

Which of the following best describes your experience (check all that apply):

- Business leadership for more than 20 years
- Business academic leader who has taught business for more than 20 years
- Acknowledged business expert with less than 20 years leadership experience
- None of the above

If “None of the above” was selected above, please describe your business, academic, or industry leadership experience:

Below is a list of potential items to measure ‘business infrastructure.’ There is no upper or lower limit on the number of items to be included in the final instrument.

- If ALL of the items are ‘essential,’ please mark all of them as ‘essential.’
- If NONE of them are ‘necessary,’ mark them all as ‘not necessary.’
- If SOME are ‘essential’ and others ‘not necessary,’ mark them appropriately.

Section I: General Questions about Business Infrastructure

Business infrastructure is generally defined as the set of support components enabling business operations. Please read the following statements then indicate how essential each element is to BUSINESS INFRASTRUCTURE.

Communications infrastructure elements:	Essential measure of business infrastructure	Useful but not essential measure of business infrastructure	Not necessary to measure business infrastructure
How essential are cell phone networks for business operations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How essential are telephone landlines for business operations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

General comments about the validity of the **Communication** categories listed above. Please suggest any additions/revisions you believe are appropriate when studying communication infrastructure as it relates to disaster management:

Public utility infrastructure elements:	Essential measure of business infrastructure	Useful but not essential measure of business infrastructure	Not necessary to measure business infrastructure
How essential is electrical power for business operations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How essential are sewer lines for business operations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How essential are water lines for business operations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

General comments about the validity of the **Public Utility** categories listed above. Please suggest any additions/revisions you believe are appropriate when studying communication infrastructure as it relates to disaster management:

Centralized distribution infrastructure elements:	Essential measure of business infrastructure	Useful but not essential measure of business infrastructure	Not necessary to measure business infrastructure
How essential is gasoline for business operations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How essential are groceries for business operations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How essential is replacement equipment for business operations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

General comments about the validity of the **Centralized Distribution** categories listed above. Please suggest any additions/revisions you believe are appropriate when studying communication infrastructure as it relates to disaster management:

Housing infrastructure elements:	Essential measure of business infrastructure	Useful but not essential measure of business infrastructure	Not necessary to measure business infrastructure
How essential is employee housing for business operations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How essential is office space for business operations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How essential are warehouses for business operations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

General comments about the validity of the **Housing** categories listed above. Please suggest any additions/revisions you believe are appropriate when studying communication infrastructure as it relates to disaster management:

Roadway infrastructure elements:	Essential measure of business infrastructure	Useful but not essential measure of business infrastructure	Not necessary to measure business infrastructure
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How essential are **local streets** for business operations?

How essential are **major highways** for business operations?

General comments about the validity of the **Roadway** categories listed above. Please suggest any additions/revisions you believe are appropriate when studying communication infrastructure as it relates to disaster management:

Physical security infrastructure elements:	Essential measure of business infrastructure	Useful but not essential measure of business infrastructure	Not necessary to measure business infrastructure
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How essential is **law enforcement** for business operations?

How essential are **police patrols** for business operations?

General comments about the validity of the **Physical Security** categories listed above. Please suggest any additions/revisions you believe are appropriate when studying communication infrastructure as it relates to disaster management:

APPENDIX B: PILOT STUDY - RELIABILITY SURVEY INCLUDING INFORMED
CONSENT FORM

Dear Indiana Business Leader,

My name is [REDACTED] and I am a student at the University of Phoenix working on a Doctor of Business Administration (DBA) degree. I am conducting a research study entitled "Infrastructure Disaster Management: Gulf Coast Small Business Analysis after 2005 Natural Disasters."

The nature of the research study is to investigate how, if at all, natural disaster damage to business infrastructure influences the operations of Gulf Coast small businesses. The purpose of the study is to examine what relationships, if any, exist between business infrastructure management and Gulf Coast small business operations through natural disasters cycles. The study consists of two phases. The first phase will pilot test the validity of a series of infrastructure disaster management measures. Items found to be sufficiently valid will then be evaluated for reliability. After a suitable set of measures is developed, the second (main) phase of the investigation will collect data from small business owners along the Gulf Coast.

Your participation will help check the reliability of the items in the pilot study. You will be asked to complete an online survey about the influence of infrastructure on business operations after a natural disaster. There are no pre-determined correct answers; the survey merely asks about your perceptions. The entire survey should take no more than 15 minutes. The results of the research study may be published but your identity will remain confidential and your name will not be disclosed to any outside party.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, you can do so without penalty or loss of benefit to yourself. To withdraw from the study, at any time, return to the survey URL and fill out the posted study withdrawal form. The commercial survey collection officials will notify the researchers of the data to be removed from the survey population.

In this research, there are no foreseeable risks to you.

Although there may be no direct benefit to you, a possible benefit of your participation is better understanding of the influence business infrastructure on small business operations, academic insight to disaster management of business infrastructure, and investigation of potential improvement for business leadership in natural disasters.

I believe there is significant value studying the influence of business infrastructure on small business operations during natural disasters. The results of the study may help federal, community, and business leaders improve management of business infrastructure for small business operations.

If you have any questions concerning the research study, please call me at [REDACTED] or e-mail me at [REDACTED]. If you have any questions, comments, or complaints about participating in the study, you may also contact my faculty advisor, Dr. [REDACTED] at [REDACTED].

As a participant in this study, you should understand the following:

1. You may decline to participate or withdraw from participation at any time without consequences.
2. Your identity will be kept confidential.
3. [REDACTED], the researcher, has thoroughly explained the parameters of the research study and all of your questions and concerns have been addressed.
4. Data will be stored in a secure and locked area. The data will be held for a period of three years, and then destroyed.
5. The aggregated research results will be used for publication.

Sincerely,

[REDACTED]
2010

“By signing this form I acknowledge that I understand the nature of the study, the potential risks to me as a participant, and the means by which my identity will be kept confidential. My signature on this form also indicates that I am 18 years old or older and that I give my permission to voluntarily serve as a participant in the study described.”

- I CONSENT** – Use this as my electronic signature consenting to the information above
- I do NOT CONSENT.**

Thank you for helping with the study! The survey is divided into two main sections. The entire process should only take no more than 20 minutes. Please keep in mind that all of your responses will be strictly confidential.

Preliminary information:

Which of the following best describes your type of business (check all that apply):

- Construction Business
- Internet-Based Business
- Services/Intellectual Property Business
- Professional Offices
- None of the above

If “None of the above” was selected above, please describe your business, academic, or industry leadership experience:

When responding to the questions below, please recall a significant natural disaster (high-wind, ice storm, flood, tornado, etc.) that influenced your community and business.

Planning/Mitigation

Using the provided scale, indicate what level of **GOVERNMENT PLANNING** was in **place BEFORE the natural disaster** to minimize problems with each of the following types of infrastructure:

	Don't Know	Poor Planning	Moderate Planning	Good Planning	Extremely Effective Planning
COMMUNICATION					
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC UTILITIES					
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CENTRAL DISTRIBUTION					
Fueling Points (Gasoline,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

diesel, other)

Food Access (Groceries, restaurants, Other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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HOUSING

Employee housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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ROADWAYS

Local streets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Main highways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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PHYSICAL SECURITY

Law enforcement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Public patrols	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Comments about GOVERNMENTAL planning BEFORE the natural disaster:

When responding to the questions below, please recall a significant natural disaster (high-wind, ice storm, flood, tornado, etc.) that influenced your community and business.

Using the provided scale, indicate what level of **YOUR BUSINESS PLANNING** was in place **BEFORE the natural disaster** to minimize problems with each of the following types of infrastructure:

	Don't Know	Poor Planning	Moderate Planning	Good Planning	Extremely Effective Planning
COMMUNICATION					
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC UTILITIES					
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CENTRAL DISTRIBUTION					
Fueling Points (Gasoline, diesel, other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food Access (Groceries,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

restaurants, Other)

HOUSING

Employee housing

ROADWAYS

Local streets

Main highways

PHYSICAL SECURITY

Law enforcement

Public patrols

Comments about BUSINESS planning BEFORE the natural disaster:

When responding to the questions below, please recall a significant natural disaster (high-wind, ice storm, flood, tornado, etc.) that influenced your community and business.

Using the provided scale, indicate what level of **COMMUNITY PLANNING** was in **place BEFORE the natural disaster** to minimize problems with each of the following types of infrastructure:

	Don't Know	Poor Planning	Moderate Planning	Good Planning	Extremely Effective Planning
COMMUNICATION					
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC UTILITIES					
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CENTRAL DISTRIBUTION					
Fueling Points (Gasoline, diesel, other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food Access (Groceries, restaurants, Other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HOUSING					
Employee housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ROADWAYS					
Local streets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Main highways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PHYSICAL SECURITY					
Law enforcement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public patrols	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments about COMMUNITY planning BEFORE the natural disaster:

When responding to the questions below, please recall the same significant natural disaster (high-wind, ice storm, flood, tornado, etc.) that influenced your community and business.

Actual Reality

Using the provided scale, indicate **actual severity of the natural disaster** with respect to each of the following types of infrastructure:

	No damage at all	Minor damage	Moderate damage	Major damage
COMMUNICATION				
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC UTILITIES				
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CENTRAL DISTRIBUTION				
Fueling Points (Gasoline, diesel, other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food Access (Groceries, restaurants, Other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HOUSING				
Employee housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ROADWAYS				
Local streets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Main highways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PHYSICAL SECURITY				
Law enforcement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Public patrols

Comments about the ACTUAL REALITY of the natural disaster as it related to business infrastructure:

When responding to the questions below, please recall the same significant natural disaster (high-wind, ice storm, flood, tornado, etc.) that influenced your community and business.

Management/Response

Using the provided scale, indicate the effectiveness of the **GOVERNMENT'S management/response AFTER the natural disaster** to address problems with each of the following types of infrastructure:

	Not effective at all	Minimally effective	Somewhat effective	Effective	Extremely effective
COMMUNICATION					
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC UTILITIES					
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CENTRAL DISTRIBUTION					
Fueling Points (Gasoline, diesel, other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food Access (Groceries, restaurants, Other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HOUSING					
Employee housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ROADWAYS					
Local streets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Main highways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PHYSICAL SECURITY

Law enforcement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public patrols	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How might GOVERNMENTAL leaders have improved infrastructure management/response AFTER the natural disaster?

Using the provided scale, indicate the effectiveness of **BUSINESS LEADERS' management/response AFTER the natural disaster** to address problems with each of the following types of infrastructure:

	Not effective at all	Minimally effective	Somewhat effective	Effective	Extremely effective
COMMUNICATION					
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC UTILITIES					
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CENTRAL DISTRIBUTION					
Fueling Points (Gasoline, diesel, other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food Access (Groceries, restaurants, Other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HOUSING					
Employee housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ROADWAYS					
Local streets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Main highways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PHYSICAL SECURITY					
Law enforcement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public patrols	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How might BUSINESS leaders have improved infrastructure management/response AFTER the natural disaster?

Using the provided scale, indicate the effectiveness of the **COMMUNITY'S management/response AFTER the natural disaster** to address problems with each of the following types of infrastructure:

	Not effective at all	Minimally effective	Somewhat effective	Effective	Extremely effective
COMMUNICATION					
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC UTILITIES					
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CENTRAL DISTRIBUTION					
Fueling Points (Gasoline, diesel, other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food Access (Groceries, restaurants, Other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HOUSING					
Employee housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ROADWAYS					
Local streets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Main highways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PHYSICAL SECURITY					
Law enforcement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public patrols	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How might COMMUNITY leaders have improved infrastructure management/response AFTER the natural disaster?

APPENDIX C: MAIN STUDY SURVEY INCLUDING THE INFORMED CONSENT
FORM

Dear Gulf Coast Small Business Leader,

My name is [REDACTED] and I am a student at the University of Phoenix working on a Doctor of Business Administration (DBA) degree. I am conducting a research study entitled “Infrastructure Disaster Management: Gulf Coast Small Business Analysis after 2005 Natural Disasters.”

The nature of the research study is to investigate how, if at all, natural disaster damage to business infrastructure influences the operations of Gulf Coast small businesses. The purpose of the study is to examine what relationships, if any, exist between business infrastructure management and Gulf Coast small business operations through natural disasters cycles.

Your participation will include completion of an online survey about the influence of infrastructure on small business performance after the 2005 storm season. There are no pre-determined correct answers; the survey merely asks about your perceptions. The entire survey should take no more than 20 minutes. The results of the research study may be published but your identity will remain confidential and your name will not be disclosed to any outside party.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, you can do so without penalty or loss of benefit to yourself. To withdraw from the study, at any time, return to the survey URL and fill out the posted study withdrawal form. The commercial survey collection officials will notify the researchers of the data to be removed from the survey population.

In this research, there are no foreseeable risks to you.

Although there may be no direct benefit to you, a possible benefit of your participation is better understanding of the influence business infrastructure on small business operations, academic insight to disaster management of business infrastructure, and investigation of potential improvement for business leadership in natural disasters.

I believe there is significant value studying the influence of business infrastructure on small business operations during natural disasters. The results of the study may help federal, community, and business leaders improve management of business infrastructure for small business operations.

If you have any questions concerning the research study, please call me at [REDACTED] or e-mail me at [REDACTED]. If you have any questions, comments, or complaints about participating in the study, you may also contact my faculty advisor, Dr. [REDACTED] at [REDACTED].

As a participant in this study, you should understand the following:

1. You may decline to participate or withdraw from participation at any time without consequences.
2. Your identity will be kept confidential.
3. [REDACTED], the researcher, has thoroughly explained the parameters of the research study and all of your questions and concerns have been addressed.
4. Data will be stored in a secure and locked area. The data will be held for a period of three years, and then destroyed.
5. The aggregated research results will be used for publication.

Sincerely,

[REDACTED]
2010

“By signing this form I acknowledge that I understand the nature of the study, the potential risks to me as a participant, and the means by which my identity will be kept confidential. My signature on this form also indicates that I am 18 years old or older and that I give my permission to voluntarily serve as a participant in the study described.”

- I CONSENT** – Use this as my electronic signature consenting to the information above
- I do NOT CONSENT.**

Thank you for helping with the study! The survey is divided into two main sections. The entire process should only take no more than 20 minutes. Please keep in mind that all of your responses will be strictly confidential.

Preliminary information:

Which of the following best describes your type of business (check all that apply):

- Construction Business
- Internet-Based Business
- Services/Intellectual Property Business
- Professional Offices
- None of the above

If “None of the above” was selected above, please describe your business, academic, or industry leadership experience:

When responding to the questions below, please recall a significant natural disaster (high-wind, ice storm, flood, tornado, etc.) that influenced your community and business.

Planning/Mitigation

Using the provided scale, indicate what level of **GOVERNMENT PLANNING** was in **place BEFORE the natural disaster** to minimize problems with each of the following types of infrastructure:

	Don't Know	Poor Planning	Moderate Planning	Good Planning	Extremely Effective Planning
COMMUNICATION					
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC UTILITIES					
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CENTRAL DISTRIBUTION					
Fueling Points (Gasoline,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

diesel, other)

Food Access (Groceries, restaurants, Other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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HOUSING

Employee housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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ROADWAYS

Local streets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Main highways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PHYSICAL SECURITY

Law enforcement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public patrols	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments about GOVERNMENTAL planning BEFORE the natural disaster:

When responding to the questions below, please recall a significant natural disaster (high-wind, ice storm, flood, tornado, etc.) that influenced your community and business.

Using the provided scale, indicate what level of **YOUR BUSINESS PLANNING** was in place **BEFORE the natural disaster** to minimize problems with each of the following types of infrastructure:

	Don't Know	Poor Planning	Moderate Planning	Good Planning	Extremely Effective Planning
COMMUNICATION					
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC UTILITIES					
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CENTRAL DISTRIBUTION					
Fueling Points (Gasoline, diesel, other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food Access (Groceries,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

restaurants, Other)

HOUSING

Employee housing

ROADWAYS

Local streets

Main highways

PHYSICAL SECURITY

Law enforcement

Public patrols

Comments about BUSINESS planning BEFORE the natural disaster:

When responding to the questions below, please recall a significant natural disaster (high-wind, ice storm, flood, tornado, etc.) that influenced your community and business.

Using the provided scale, indicate what level of **COMMUNITY PLANNING** was in **place BEFORE the natural disaster** to minimize problems with each of the following types of infrastructure:

	Don't Know	Poor Planning	Moderate Planning	Good Planning	Extremely Effective Planning
COMMUNICATION					
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC UTILITIES					
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CENTRAL DISTRIBUTION					
Fueling Points (Gasoline, diesel, other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Food Access (Groceries, restaurants, Other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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HOUSING

Employee housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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ROADWAYS

Local streets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Main highways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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PHYSICAL SECURITY

Law enforcement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Public patrols	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Comments about COMMUNITY planning BEFORE the natural disaster:

When responding to the questions below, please recall the same significant natural disaster (high-wind, ice storm, flood, tornado, etc.) that influenced your community and business.

Actual Reality

Using the provided scale, indicate **actual severity of the natural disaster** with respect to each of the following types of infrastructure:

	No damage at all	Minor damage	Moderate damage	Major damage
<hr/> COMMUNICATION				
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<hr/> PUBLIC UTILITIES				
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CENTRAL DISTRIBUTION

Fueling Points (Gasoline, diesel, other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food Access (Groceries, restaurants, Other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

HOUSING

Employee housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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ROADWAYS

Local streets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Main highways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PHYSICAL SECURITY

Law enforcement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public patrols	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments about the ACTUAL REALITY of the natural disaster as it related to business infrastructure:

When responding to the questions below, please recall the same significant natural disaster (high-wind, ice storm, flood, tornado, etc.) that influenced your community and business.

Management/Response

Using the provided scale, indicate the effectiveness of the **GOVERNMENT'S management/response AFTER the natural disaster** to address problems with each of the following types of infrastructure:

	Not effective at all	Minimally effective	Somewhat effective	Effective	Extremely effective
COMMUNICATION					
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC UTILITIES					
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CENTRAL DISTRIBUTION					
Fueling Points (Gasoline, diesel, other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food Access (Groceries, restaurants, Other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HOUSING					
Employee housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ROADWAYS					
Local streets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Main highways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PHYSICAL SECURITY					
Law enforcement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public patrols	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How might GOVERNMENTAL leaders have improved infrastructure management/response AFTER the natural disaster?

Using the provided scale, indicate the effectiveness of **BUSINESS LEADERS'** management/response **AFTER the natural disaster** to address problems with each of the following types of infrastructure:

	Not effective at all	Minimally effective	Somewhat effective	Effective	Extremely effective
COMMUNICATION					
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC UTILITIES					
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CENTRAL DISTRIBUTION					
Fueling Points (Gasoline, diesel, other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Food Access (Groceries, restaurants, Other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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HOUSING

Employee housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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ROADWAYS

Local streets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Main highways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PHYSICAL SECURITY

Law enforcement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public patrols	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How might BUSINESS leaders have improved infrastructure management/response AFTER the natural disaster?

Using the provided scale, indicate the effectiveness of the **COMMUNITY'S management/response AFTER the natural disaster** to address problems with each of the following types of infrastructure:

	Not effective at all	Minimally effective	Somewhat effective	Effective	Extremely effective
COMMUNICATION					
Cell phone networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High bandwidth internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone landlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PUBLIC UTILITIES					
Electric power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sewer lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CENTRAL DISTRIBUTION					
Fueling Points (Gasoline, diesel, other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food Access (Groceries, restaurants, Other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>