THE ROLE OF INFORMATION TECHNOLOGY IN EFFECTIVE RECOVERYAND

AIDING SUSTAINABILITY OF COASTAL REGIONS AFTER A DISASTER

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THE ROLE OF INFORMATION TECHNOLOGY IN EFFECTIVE RECOVERYAND AIDING SUSTAINABILITY OF COASTAL REGIONS AFTER A DISASTER

Barry Andrew Cumbie

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DISSERTATION ABSTRACT

THE ROLE OF INFORMATION TECHNOLOGY IN EFFECTIVE RECOVERYAND AIDING SUSTAINABILITY OF COASTAL REGIONS AFTER A DISASTER

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In 2004 Hurricane Ivan caused an estimated $13 billion of damage in the United States. The economic impact can presumably be reduced by implementing information technology (IT) disaster recovery methods. This dissertation addresses the question of what factors influence decision makers in coastal communities to adopt IT disaster recovery methods that are perceived to ensure a successful recovery. A literature review and Delphi study lead to a theoretical research model and ten research hypotheses. Two separate focus groups were conducted among coastal community stakeholders who were identified for their expertise in this area. The transcriptions from the focus groups were both analyzed using the content analysis technique in which data were independently coded.

The results of content analyses indicated that network collaboration was the most important factor related to the extent of adoption of IT disaster recovery methods. From this and other results, this research study concludes that communities interested in recovery and sustainability after a disaster should attempt to form relationships with external institutions and organizations to accomplish an otherwise overly difficult task. The difficult task is to facilitate post-disaster recovery by collecting and preserving all critical data that are useful in recovery efforts. These data include the full range of infrastructure data that tend to be dispersed across a network of actors who possess varied values on critical data and react differently to disaster warnings. The network of actors are the stakeholders among the community, for example the real estate rental industry (e.g. property owners and managers, condominium association presidents and boards), the construction industry (e.g. builders, electricians, surveyors, inspectors, engineers, architects), local and state governments and organizations (e.g. city building departments and engineers, utility service providers), the insurance industry (e.g. adjustors and providers), and other business owners.

The contribution of this research include a theoretically derived and empirically validated research model that is a platform for future and more comprehensive research in this area. Community stakeholders and especially those involved in public policy are advised from the results to recognizing the deep interdependencies of organizations and the community as well as the value of engaging in relationships to overcome the task of collecting, protecting, and effectively using critical infrastructure data in the interest of post-disaster recovery. The culmination of these efforts can extend the sustainability of

communities. Disaster can strike without warning; however, a graceful recovery is possible so long as community decision makers purposefully seek to understand the collaborative efforts necessary to overcome the complexities of community disaster recovery planning, such as those advanced by this research.

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Lastly, the author thanks his wife, Lindsey, and daughter, Avery, for their unyielding inspiration and support during the course of this research.

Style manual used

American Psychological Association (2001). *Publications Manual of the American Psychological Association, Fifth Edition.* Washington D.C.: American Psychological Solution.

Computer software used

1. Microsoft Word 2002 (Version 10.2627.2625)

2. Microsoft Excel 2002 (Version 10.2614.2625)

3. SPSS for Windows Release 15.0.0 (6 September 2006)

4. Hayes, A. F., & Krippendorff, K. (2007). Answering the call for a standard reliability measure for coding data. *Communication Methods and Measures, 1*, 77-89.

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CHAPTER 1: INTRODUCTION TO THE RESEARCH PROBLEM

This dissertation presents research pertaining to the management of information systems (IS), specifically, research in the area of information security. This field of study includes planning for the recovery from disasters that disrupt IS of which organizations are increasingly dependent upon to sustain operations. Recovering from a disaster can drastically and negatively affect an organization, even leading to its demise. The same may be said of communities, whose overall sustainability hinges on the ongoing operations and interactions of many independent organizations, public and private alike.

Presumably, managerial actions can avert these negative effects, and therefore this dissertation will explore the possible range of managerial actions that facilitate successful recovery from a disaster. Throughout the course of this research, both relevant practitioner and academic literature are reviewed and data are gathered directly from relevant decision makers. These sources are examined in depth to elicit a theoretical model that addresses questions relevant to information security.

This chapter introduces why information security is an important area of research followed by a discussion of why research related to disaster recovery, a sub-area of information security, is important. Next, the implications of unavailable critical data and information that need to be restored after a disaster are discussed. This is followed by an explanation of how this unavailability of data and information and business failure, when widespread due to a disaster, negatively affect the sustainability of an entire community.

After discussing the nature of these problems, a research question regarding the adoption of information technology (IT) disaster recovery methods in a community is posed. This chapter concludes by relating the order of the remaining chapters that will address the research question.

The Need for Information Security

The need for information security is predicated on the important role that information plays in modern economies. Information is a mid-point on the conceptual continuum that ranges from unorganized and elementary measurements that are described as data; data organized to have meaning and value, that is, information; and information combined with judgment or information that represents substantive understanding or experience, that is, knowledge. As a building block to knowledge, information and thus information security are important concerns as modern economies develop into knowledge-based economies (Drucker, 1969). These contemporary economies are driven by knowledge-workers who empower organizations not by their skilled labor or production of goods, but by their abilities to assimilate data and information into knowledge assets that can then be strategically leveraged at an organizational level to attain competitive advantages in the marketplace (Crossan, Lane, & White, 1999).

Charles Savage (1996) writes that the current age of human socioeconomic development is described as the Knowledge Age. This age was preceded immediately by the Industrial Age, which in turn was preceded by the Agricultural Age. In the Agricultural Age, land was the predominant asset and settlements on land led to the development of geopolitical systems in which contemporary geopolitical systems are

deeply rooted. In the Industrial Age, capital was the predominant asset and the steam engine and later electricity led to socioeconomic developments that shaped contemporary economies. Then in the 1950s, white-collared workers began to outnumber blue-collared workers, a change that coincided with early developments in digital computing and gave rise to today's global knowledge-based economy that values knowledge as the predominant asset. The prominent role of knowledge underscores the importance of research in areas that address protecting information, such as information security and disaster recovery.

The Importance of Disaster Recovery Research

Information security involves not only assuring the value of information that leads to knowledge, but also protecting against the misuse of information. Despite its role, research in information security related areas is sparse because of the intrusiveness of studies and the reluctance of organizations to reveal information about their current state of security to outsiders (Kotulic & Clark, 2004). Dhillon and Backhouse (2001) categorize information security by the four sociophilosophical paradigms (functionalist, interpretive, radical humanist, and radical structuralist, Burell & Morgan, 1979). From their review, the functionalist sociophilosophical paradigm is recognized for its relatively dominant use in information security research, followed by developments in the interpretive paradigm.

Three categories – checklists, risk analysis, or evaluation – encapsulate the bulk of the research on information security, and while they are useful, they fall short in driving at underlying theoretical explanations to more substantive questions. The

International Information Systems Security Certification Consortium, Inc. [(ISC)²] oversees and issues several recognized certifications to information security professionals. They specify 10 areas within the information security domain: (a) information security and risk management, (b) access control, (c) cryptography, (d) business continuity planning and disaster recovery planning, (e) telecommunications and network security, (f) security architecture and design, (g) physical security, (h) operational security, (i) application security, and (j) legal, regulations, compliance, and investigations (Tipton & Henry, 2007).

Of these 10 specified areas of information security, business continuity planning (BCP) focuses primarily on identifying threats and the probability of their occurrence and devising organizational responses that promote the ongoing operations of a business. Three broad categories of threats to organizational IS undermine the continuity of business and are as follows: (a) human-caused, (b) technical/mechanical, and (c) natural (Rike, 2003). The manifestation of each of these threats can result in the full range of disruption, from minor to extreme, to the continuing operations of an organization. Unfortunately, examples of each type of threat are not far from memory: the terrorist attacks of September 11, 2001, the 2003 North American Blackout, and Hurricane Katrina in 2005.

When this is the case, organizations employ disaster recovery strategies, a subset of BCP. The term "disaster recovery" used in reference to computer systems and electronic data originated from computer vendors when mainframes were preeminent in the field of computing (Colraine, 1998). In the increasingly networked and diverse

contemporary computing environments, disaster recovery can refer to any prophylactic practice related to reducing the likelihood that a disaster will result in unrecoverable losses of electronically stored organizational IS, including organizational data.

A search conducted in January 2007 among the top 10 IS journals (according to Mylonopoulos and Theoharakis, 2001) for "disaster recovery" and related terms from the ABI/INFORM database supported the claim that research in this area is sparse. The search yielded 10 research article results of which only one rigorously addressed this topic.

Despite these difficulties, information security research and specifically, disaster recovery research, is no less critical and does not diminish the importance of understanding the phenomena surrounding data loss and business failure. Turning to the practitioner-oriented literature, the same search for the term "disaster recovery" yielded over 7,000 results. Of these results, several are guides and tutorials for specific disaster recovery methods while others present statistics and stress the importance of planning for a disaster. One noticeable feature of this literature is that successful recovery is often precluded by the unavailability of critical data and information. The next section addresses the impact on business continuity when critical data and information are unavailable as well as examples of this data and information.

The Impact of Unavailable Critical Data and Information

In one survey, a reported 43% of businesses never reopened after a disaster (Wenk, 2004). Another study indicated that over a 5-year period, 93% of businesses fail after experiencing a significant data loss (Rike, 2003). Short of failure, other

consequences of losing critical data and information can be financial loss, damage to reputation, or legal action (Gibb & Buchanan, 2006). Financial loss arises for many reasons including lost revenues, compensatory payments, future loss of revenue, loss of productivity, and customer attrition (Marshall & Heffes, 2006; Lewis, 2005; LaPage & Gaylord, 2003; Freeman, 2000). Indirect financial impacts may be felt from damage inflicted on a brand or reputation (Eckert, 2006; Freeman). In financial industries, customer trust is of utmost importance and new legislation requires disclosure of customer data loss (Duke, 2006; Mearian, 2005). Businesses losing data invite exposure to litigation, especially for data regulated by governmental mandates such as HIPAA (Eckert; Freeman).

Critical data and IS resources depend on a specific organization's industry and business practices. For instance, although both client-centric organizations such as accountants and document-centric firms such as publishing companies are heavily reliant on data in their operations, each defines its critical data sources differently (O'Bannon, 2006). Examples of critical data resources include inventory records, personnel information, orders, invoices, payroll, customer databases, financial documents, mailing lists, and electronic data interchange forms from vendors and customers, social security numbers, and credit card numbers (Marshall & Heffes, 2006; Marlin, 2005; Ferelli, 2001; Hawkins, Yin, & Chou, 2000; Janusz, 1993).

Organizations are exposed to a multitude of negative results after losing critical data and information, not the least being business failure. Disasters contribute to the

failure and data loss for individual organizations; disasters also can threaten the sustainability of the overall community.

The Impact of Disasters on Community Sustainability

The failure of a single business in a community, while unfortunate, does not threaten the overall economic stability of the community. However, as demonstrated by the disaster caused by Hurricane Katrina in 2005, the simultaneous destruction of many resources within a community can effectively diminish and forever change the sustainability of a community (Rike, 2003). Disasters of extreme magnitude like these do not just affect a single business or organization; the impact is shared by the entire community. Community stakeholders include residents, businesspeople, and government officials who are concerned with the overall welfare and sustainability of the community in which they reside and operate.

Unlike a single business, the community is less purposeful as it is a loose coalition of organizations and individuals who share a common geographical region but do not necessarily share the same common beliefs and goals. Community governments are charged with the continuing operations of the community but are political organizations and, while interested in sustainability, are not directly responsible for the managerial decisions of their constituents. Managers of private businesses are autonomous in their decision making, optimizing their choices for their business and not necessarily in the interests of community sustainability.

Those coastal communities that border the ocean have a specially vested interest in post-disaster sustainability. Their region is annually under threat from ocean-borne

storms such as Hurricanes Rita and Katrina; however, these disastrous storms have not slowed down the booming growth of most coastal regions. As of 1998, over half the global population (3.2 billion people) resided within 120 miles of a coastline, and trends indicate an ongoing dramatic increase of population density in these regions (UN Atlas of the Oceans, 2007). Coastal regions of the United States are no different, and are increasing in popularity among both tourists and residents. By 2025, an estimated 75% of the U.S. population is expected to reside in coastal counties, an increase from 53% in 1999 (Hinrichsen, 1998).

Just as the need for information security is more acute as IS are increasingly used, so to does the need for promoting sustainability of coastal regions as they become more popular. Understanding the role of IT in disaster recovery may help promote the recovery and sustainability of individuals, organizations and the overall community. The negative impact of disasters on critical data and information and therefore on community stability lead to the research question addressed by this dissertation.

Research Question Addressing Community Sustainability

The research question posed in this section was derived after recognizing the need for information security, research in the area of disaster recovery, the results of losing critical data and information after a disaster, and how this can negatively affect the overall sustainability of a community. The devastation following a disaster can presumably be reduced by adopting certain preventative measures such as disaster recovery methods, prompting the question of what factors influence the adoption of such methods. Since coastal communities have a heightened threat of widespread disasters,

this question is relevant to decision makers in coastal communities. This dissertation addresses the following research question: What factors influence decision makers in coastal communities to adopt IT disaster recovery methods so as to ensure successful recovery?

By addressing this research question, the contribution of this dissertation to the literature is the development of a theoretical model that advances the understanding of information security. There is a trade-off between the two primary goals of theory: precision and power. Either a theory can be precise and predict outcomes, or it can provide a more powerful, substantive understanding of the processes of a phenomenon (Dubin, 1969). This dissertation develops the second type of theory: to develop a greater understanding of how businesses and communities can not only survive but also recover gracefully after a disaster rather than predicting which communities may fail. The research question is primarily a question of adoption, seeking to explain what theoretical factors are relevant to a particular adoption decision.

The Order of the Remaining Chapters

This section describes the remainder of the chapters in this dissertation. Chapter 2 presents the theoretical background that leads to the development of a research model from which ten research hypotheses are developed. Chapter 3 discusses the design of the research study used to evaluate the research model is discussed along with the procedures to analyze the data generated from the research study. Chapters 4 and 5 report the results of the research study and subsequent analysis, directly adhering to the procedures set forth in Chapter 3. The reported results are discussed in Chapter 6, culminating in a

revised research model. These steps lead to discussing the broader implications of these results in Chapter 7. Chapter 8 acknowledges the limitations of this research and suggests directions for future research. Finally in Chapter 9 the contributions of the dissertation are stated and are followed by the conclusion of this research. This document also lists the complete bibliographical information for all references cited in the text and provides several appendices that allow for replication of this research.

CHAPTER 2: RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

To address the research question discussed in Chapter 1, it is necessary to devise a theoretical research model that can lend understanding of the phenomena of successful recovery after a disaster. The research model developed in this chapter and used for this dissertation is shown in Figure 2a. This chapter continues by discussing each part of the research model, beginning with IT disaster recovery methods and followed by the factors affecting adoption. Finally, the interaction of IT disaster recovery methods and factors affecting adoption are discussed as well as the research model as a whole.

IT Disaster Recovery Methods

The first block in the upper-left corner of Figure 2a is IT disaster recovery methods. As discussed in Chapter 1, a major cause of business failure is lost information and a major cause of both business failure and data loss is disasters (Wenk, 2004; Rike, 2003). This section discusses characteristics of specific disaster recovery methods, a step that lends context to research theory which is important in IS research given the trend of fast-changing technology (Orlikowski & Iacono, 2001). Examining disaster recovery methods provides a backdrop for understanding the extent to which these methods are adopted. IT disaster recovery methods are examined at first by reviewing relevant literature. These were further refined so as to be applicable to community stakeholders. A Delphi study methodology was used for this purpose.

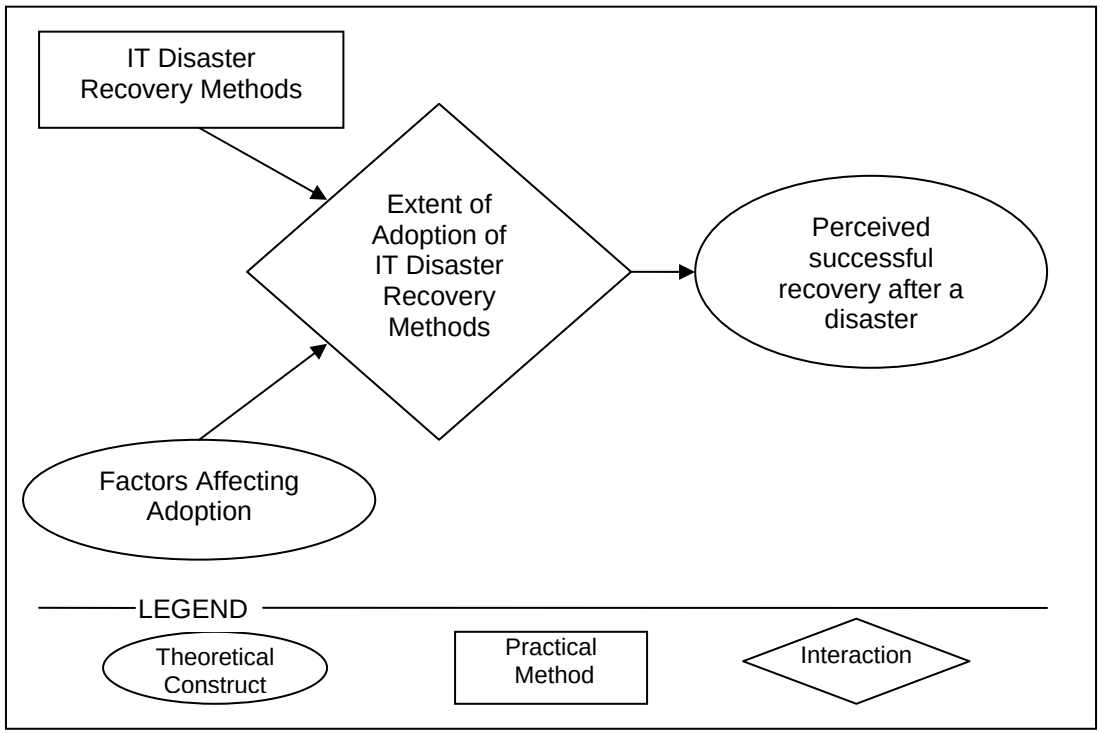


Figure 2a. The Research Model

Literature Review of Disaster Recovery Methods

IT-related disaster recovery methods focus on protecting critical data and information from being lost. The literature review identified the recovery time objective (RTO) as a critical determinant of the optimum disaster recovery practice to use (Connor, 2006a; O'Bannon, 2006; Eckert, 2006; Ferelli, 2001; Patrowicz, 1998). RTO refers to the minimum acceptable duration of time in which recovery after a disaster must occur in order to ensure business continuity. As a rule, the less time specified by an RTO, the more expensive the practice will be (Connor, 2006a). Therefore, the value of continual

access to organizational data must be weighed against the cost of the recovery practice. Figure 2b provides a summary of the various practices given in the literature.

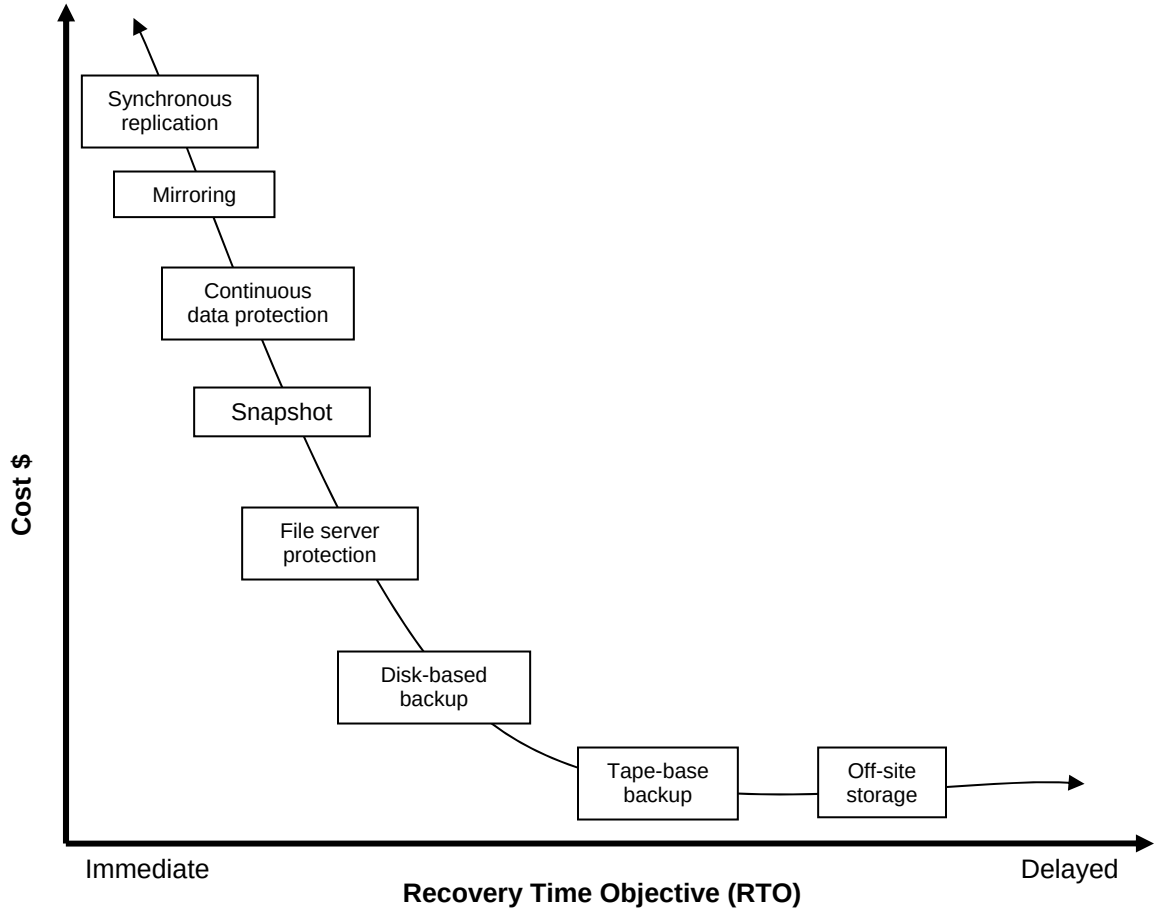


Figure 2b. Disaster Recovery Methods as Determined by RTO (Adapted from Connor, 2006b)

The most demanding RTO requires an online data-oriented disaster recovery process in conjunction with fully redundant IS, or a so-called "hot site." This practice

requires dedicated telecommunication lines that transmit data synchronously to a redundant system that can seamlessly continue operations when the primary site fails (Connor, 2006b; Phelan & Hayes, 2003; Ferelli, 2001). Immediate RTOs are measured in seconds to minutes, thus requiring on-line disaster recovery practices, but a less demanding alternative maintains a "cold site" consisting of computer-ready facilities that are capable of supporting operations but are not equipped with data or IS (Patrowicz, 1998). This option is less expensive than maintaining a fully redundant IS facility and is suitable for a less immediate RTO. Speedy shipping arrangements with vendors can provide delivery of IS hardware to cold sites within 3 to 5 days (Patrowicz, 1998; Phelan & Hayes, 2003). Upon receipt, installation and configuration of IS hardware and data can then be restored from online or external sources.

Less stringent RTOs, measured in hours or days, rely on data using periodic backups and stored on high-capacity, but slow external media. These RTOs require external media such as tape drives, floppy disks, external hard-drives, CDs, DVDs, and removable media (O'Bannon, 2006; LaPage & Gaylord, 2003; Moore, 1999). External media have the highest storage capacity for a given expenditure of any backup medium, but this lower cost comes at the price of accessibility speed, an attribute compatible with a delayed RTO. Several different types of external media are available. It is important to diversify the type of storage media used; tape-based or optical media options have a life expectancy of 10 years or less for major brands and 50 years or less for high quality brands (Betts, 1999), so no single type of storage medium should be relied upon for disaster recovery. A media rotation strategy calls for different media to be regularly

rotated, thus reducing the risk of a single media type becoming damaged during storage. The media also needs to be stored securely in an environment that protects them from harmful agents such as heat and water.

Delphi Study of IT Disaster Recovery Methods

Given the wide range of available IT disaster recovery methods as determined based upon the RTO and the fast changing nature of IT and needs within a community, which ones are relevant to coastal-community stakeholders? A Delphi study was used to gather empirical data from a panel of experts. This method is an effective way to identify and prioritize issues of interest that can both avoid the bias of researchers and capture the local viewpoint of experts while allowing the flexibility to obtain rich data towards research questions (Okoli & Pawlowski, 2004). The empirically generated list can be compared to those identified from the initial review of relevant practitioner-oriented literature. Together, these steps indicate a list of IT disaster recovery methods.

Okoli and Pawlowski (2004) relate the guidelines of how to conduct a valid Delphi study. Three phases – brainstorming, narrowing down, and ranking – are conducted to identify relevant issues among an assembled panel of experts. The experts respond independently and anonymously from each other while the researcher acts as a liaison to solicit and compile responses, and calculate a statistical measure of consensus. Kendall's *W* coefficient of concordance is a non-parametric measure of consensus among related samples. A value of 0.7 in a possible range of 0 (no consensus) to 1 (perfect consensus) indicates a satisfactory level of agreement (Okoli & Pawlowski).

A Delphi study was conducted from November 8, 2006 until February 27, 2007 and was administered entirely via e-mail. The duration of the study included a 5-day recruiting period and suspension of the study over the holiday season. Participants were identified by independent consultations with two county officials in Alabama's Baldwin County, an area prone to hurricanes. The panel was rounded out with three non-coastal IT companies to provide contrast. Overall, 9 of the 20 recruited executives of small businesses participated throughout all phases of the study while each phase had 10 participants, meeting the threshold on generally accepted number of participants (Okoli & Pawlowski, 2004). The demographic information of the participants who participated in all phases is presented in Table 2a.

The first of the three phases in the Delphi study asked participants to brainstorm about the components of disaster recovery methods that are appropriate to protect against a community-wide disaster. Throughout the three phases, participants were able to combine like items, edit existing items, or append new items to the lists. During the brainstorming phase, 40 unique disaster recovery components were identified. The second phase, narrowing down, called for each participant to rank the top 10 most important components and resulted in 10 components that were retained by at least 40% of the participants. Of the 10 components, 3 were retained by 6 participants, 2 were by 5 participants, and the remaining 5 were by 4 participants. The third phase involved ranking the components in order of importance. After one round of ranking, the group reached a low level of consensus measurement (Kendall's $W = 0.135$), indicating

disagreement in the rankings. Table 2b reports the top 10 identified disaster recovery components.

Table 2a

Delphi Study Demographic and Descriptive Statistics[a]

Demographic	Mean	Std. Dev.	Range
Years in Business	23.9	29.1	[5, 87]
Years Employed	8.8	6.3	[1.5 22]
Estimated Number of Employees[b]	24	33	[1, 95]
Estimated Revenues (in $1,000)[b]	2,073	2,205	[25, 5000(+)]

Demographic	Number	Percent
Privately owned	7	78
Family owned	3	33
Centralized	8	89
Formal IT staff	4	44

[a]N = 9. [b]A conservative estimate calculated from precise and estimated responses

Of the initially identified 40 disaster recovery methods, 10 were identified as most important and ranked in order of importance even though the group did not reach a statistically measured agreement on the order of the rankings. The complete list of identified methods is listed in Appendix A. Of the identified and ranked methods, it is noteworthy what the research panel did not identify. Present in the literature review but absent among the Delphi panelists' responses are the following disaster recovery methods: (a) assess the risk of losing data, (b) select mode of governance, (c) regulatory

compliance, (d) digitization, (e) encryption, and (f) media rotation. The reason for these differences could be that certain practices are specific to an industry that the panelist did not represent.

Table 2b

Delphi Study Results

Disaster Recovery Method	Rank[a]
Provide remote access to data and e-mail via the Internet	6.78
Maintain all pertinent data on servers, not desktops or laptops	6.56
Ensure technical IT expertise to perform actual practices	6.22
Test restoring data to ensure accuracy	6.11
Set up communications alternative to phones for contact with vendors and support	5.77
Devise a comprehensive recovery plan for daily to large scale emergencies	5.56
Designate roles and responsibilities	5.44
Plan to restore data	5.22
Establish a single communication touch-point for employees	4.22
Perform a risk analysis to identify real threats	3.11

[a]Kendall's $W = 0.135$

Of course, the specific mix of methods depends on the business context, but business executives seem to recognize that piecemeal adoption is not effective. To borrow an analogy from the popular novelist Tom Robbins (1976), it would be like brushing one tooth. Therefore, having comprehensive protection against losing critical data and information relies on the extent to which disaster recovery methods are adopted.

This leads to the first hypothesis, which groups IT disaster recovery methods and is illustrated in Figure 2c.

H1: The extent of adoption of IT disaster recovery methods leads to a perceived successful recovery after a disaster.

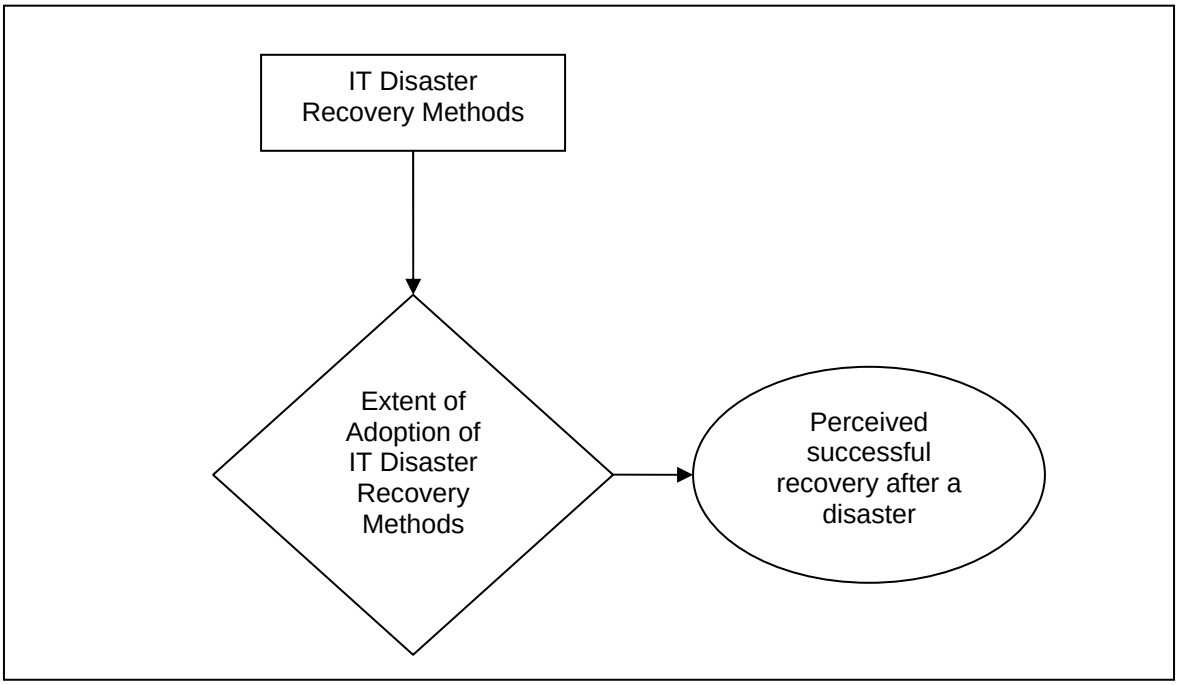


Figure 2c. Extent of Adoption of IT Disaster Recovery Methods and Perceived Successful Recovery After a Disaster

Factors Affecting Adoption of IT Disaster Recovery Methods

The next block of the research model to investigate is the factors that affect the decision to adopt the identified disaster recovery methods. A literature review was conducted and resulted in the identification of two broad categories of factors that affect

adoption: internal and external. Many factors were identified from the literature per each factor category and hypotheses were developed pertaining to the nature of the relationship between each factor and adoption of IT disaster recovery methods.

Literature Review of Adoption Factors

A 2002 Gartner survey reported that only 35% of small- and medium-sized enterprises had prepared a comprehensive disaster recovery plan. If the extent to which disaster recovery methods are adopted leads to perceived successful recovery, precisely why do the majority of smaller organizations – a major piece of community composition – fail to plan? Contrasted to the scarcity of information security research, IS adoption and innovation literature is extensive. IS innovation literature is relevant in that an innovation is "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 2003, p. 12; consistent with Zaltuman, Duncan, & Holbek, 1973). Disaster recovery methods are, by definition, innovative to those individuals and organizations without them. Additionally, a sociological approach is thought to be better at explaining IS innovation than economic or organizational theory (King et al., 1994).

Several different theoretical perspectives were reviewed and the review is included in Appendix B. From the review, two general categories emerged that classify the factors related to the decision to adopt the innovation of disaster recovery methods: internal and external (see Figure 2d). These categories encompass both innovation diffusion theory as well as other research perspectives of innovation adoption (Rogers, 2003; Karahanna, Straub, & Chervany, 1999; Hu, Saunders, & Gebelt, 1997; Cooper &

Zmud, 1990; Tornatzky & Fleisher, 1990). Internal factors are perceptions of the potential adopter. External factors include the overarching and deep-rooted social, economic, cultural, and systems that are at once comprised by, shared among, and external to a potential adopter.

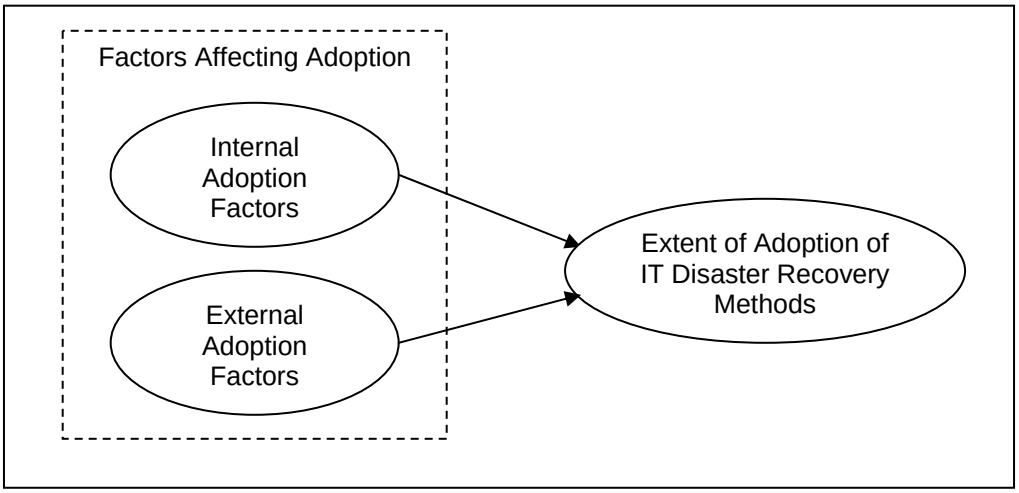


Figure 2d. Adoption Factor Categories

Internal Adoption Factors

The first category of factors affecting the adoption of disaster recovery methods is classified as "internal" and encompasses cognition, that is, how individuals become knowledgeable, which pertains to the inner workings of a decision maker's thought processes. The degree to which perceptual uncertainty is reduced relates to increased rates of diffusion (Chatterjee & Eliashberg, 1990).

Alternative theoretical perspectives of cognitive factors that affect the adoption of an innovation are predominately and explicitly consistent with innovation diffusion

theory. The Technology Acceptance Model (TAM, Davis, 1989) is linked to innovation diffusion theory by its inclusion of perceived factors and is used to model perceived usefulness and perceived ease of use (Agarwal & Prasad, 1997; Karahanna, et al., 1999; Pathasarathy & Bhattercherjee, 1998; Yi, Jackson, Park & Probst, 2006). The Theory of Reasoned Action (TRA, Fishbein & Ajzen, 1975) and its extension, the Theory of Planned Behavior (TPB, Ajzen, 1991) are also integrated with innovation diffusion theory to explain adoption (Karahanna, et al., 1999; Yi, et al., 2006). This study identifies the following perceived internal factors: relative advantage, value and need compatibility, complexity, trialability, and observability.

Relative advantage. Relative advantage "is the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers, 2003, p. 229). The greater the perceived advantage, the more likely an innovation will be adopted. In a meta-analysis of 75 innovation diffusion studies, relative advantage (along with compatibility and complexity) was among the three strongest predictors of the decision to adopt (Tornatzky & Klein, 1982). The construct "usefulness" from the TAM is often equated with relative advantage (Agarwal & Prasad, 1997). Discussions of relative advantage usually begin with a cost-benefit analysis, and innovations in organizations may be adopted in order to reduce costs or increase revenues, as exemplified in Prekumar, Ramamurthy, and Nilkanta's (1994) study of the adoption of electronic data interchange technologies. Other dimensions that refine relative advantage identified by researchers include image (Karahanna, et al., 1999; Yi, et al., 2006), symbolic and emotional efficiencies such as instilling hope, signaling innovativeness (a component of image), and

relieving boredom (Zhu & Kraemer, 2005; Agarwal & Prasad, 1997; Abrahamson, 1991; Chatterjee & Eliashberg, 1990).

Relative advantage encompasses both the financial and non-financial costs associated with adopting disaster recovery practices. Limited resources are allocated among competing business needs, so despite the risk of potential business failure the preventative nature of disaster recovery methods could inhibit managers from adopting methods and instead lead them to allocate scarce resources to more pressing matters with more certain and timelier outcomes. Adopting a strategy to absorb the result of a disaster is to literally weather the storm when, and importantly if, it occurs. On the other hand, the cost of assuaging the threat of a negative impact from a disaster may be viewed favorably, despite the ongoing costs to develop and maintain disaster recovery methods. This leads to the second hypothesis:

H2: Perceived relative advantage is positively related to the extent of adoption of IT disaster recovery methods.

Value and need compatibility. Value and need compatibility is "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and the needs of potential adopters" (Rogers, 2003, p. 240). An innovation will be adopted so long as it is perceived to be aligned with an individual's perceived values, experiences, and needs. In the case of a preventative innovation such as disaster recovery, a cue-to-action event may trigger the perceived need for identifying and possibly adopting a particular innovation (Rogers, 2003). The degree to which a need or problem is felt will in turn drive the decision to pursue an innovation that will fill the

need or correct the problem. Experientially driven previous practices of an adopter and the degree to which previous practices are perceived as being similar or different from an innovation will also shape the perceptions and decision to pursue a particular innovation. Generally, past negative experiences and practices perceived to be related to a current innovation-decision inhibit the adoption of a disaster recovery method. In sum, adoption decisions of preventative practices are based upon the felt needs of the adopter and are encouraged after a cue-to-action event. Furthermore, the success or failure of previous practices and the alignment of the adopter's values and the perceived values of a practice will also encourage adoption leading to the third hypothesis.

H3: Perceived value and need compatibility is positively related to the extent of adoption of IT disaster recovery methods.

Complexity. Complexity is "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 2003, p. 257). Technically incompatible system hardware or software creates an added degree of complexity when components are perceived to be difficult to integrate with existing systems or need to be customized for individual needs. Complexity is also likely to be related to other factors such as communicability, the degree to which an innovation can be easily communicated (Tornatzky & Klein, 1982), which is inversely related to complexity. The simpler an innovation, the easier it is to communicate. Complexity is synonymous with the inverse of the "ease of use" construct of the TAM, which is positively related to the adoption of a technology (Agarwal & Prasad, 1997; Karahanna, et al., 1999; Pathasarathy &

Bhattercherjee, 1998). The characteristics of complexity are stated in the following hypothesized relationship:

H4: Perceived complexity is negatively related to the extent of adoption of IT disaster recovery methods.

Trialability. As defined by Rogers (2003, p. 258), trialability "is the degree to which an innovation may be experimented with on a limited basis." The greater the trialability of an innovation, the greater the rate of adoption should be (Rogers). Testing a disaster recovery plan is the final but crucial step to ensure a reliable data and systems recovery. Testing differs from trialability, however, in that the former is a step taken after the disaster recovery innovation has been adopted and implemented, while the latter refers to being able to try out disaster recovery before adopting it fully. The characteristics of trialability are reflected in the following hypothesized relationship:

H5: Perceived trialability is positively related to the extent of adoption of IT disaster recovery methods.

Observability. As defined by Rogers (2003, p. 258), observability "is the degree to which the results of an innovation are visible to others". Preventative innovations present a particular problem for observability in that the consequences of innovation adoption are not necessarily directly observable. Results demonstrability is also associated with this concept, in that the more readily the results of adopting a particular innovation can be demonstrated, the more observable is the innovation (Karahanna, et al., 1999; Yi, et al., 2006). Usually only after a disaster do the results of prior adoption of disaster recovery methods become evident; in retrospect it is easy to identify the

businesses that resume operations more quickly and those that do not. However, observation of the outcome does not reveal the underlying technology, processes, and overall cost of adopting and vigilantly maintaining disaster recovery methods. The characteristics of observability are reflected in the following hypothesized relationship:

H6: Perceived observability is positively related to the extent of adoption of IT disaster recovery methods.

External Adoption Factors

Whereas the internal factors pertain to the inner workings of a decision maker's thought processes, external factors describe the overarching systems to which a potential adopter belong. The diffusion of innovations is described as a social change and contributes to an overarching social system (Rogers, 2003). The social norms, or socially acceptable boundaries, of an organization are determined by the normative beliefs of top management, supervisors, peers, friends, the MIS department, and local computer specialists (Karahanna, et al., 1999). These norms, in part, shape the communication behavior, degree of network collaboration, and homophily between a potential adopter and their social environment. The difference between early adopters and later adopters in some instances has been found to be related to the following characteristics of adopters: youth, externally oriented communication behavior, greater education, greater mass media exposure, greater interpersonal communication exposure, and greater opinion leadership in regard to business related matters and computer related matters (Brancheau & Wetherbe, 1990). The literature review identifies the following external factors: network collaboration, communication, homophily, and socioeconomic status.

Network collaboration. An often overlooked factor that shapes the social environment of a potential adopter is network collaboration and, conversely, network externality, which refers to those elements outside of an adopter's control such as complementary products (Brancheau & Wetherbe, 1990). Third parties providing supplemental disaster recovery products or services such as tutorial books may help the adopter understand an innovation more readily. Industry, competitors, and regulatory agencies also contribute to the external environment of potential adopters inasmuch as system openness is present in the environment (Zhu & Kraemer, 2005; Sharma & Rai, 2003). Another determining factor of network collaboration is the organization's role in a supply chain. The degree of independence from others will likely influence the extent of network interconnectivity. For example, companies supplying a retailer such as Wal-Mart must comply with very specific inventory system standards so that systems are integrated throughout the supply chain. In this instance of tight integration between business partners, the adoption decision may be predicated on the negotiating power of a business within the context of a supply chain. Furthermore, the adoption rates among network partners are likely to influence an adoption decision of an interconnected organization. Network interconnectivity, therefore, will positively influence an adoption so long as the members of the network exhibit collaborative behaviors, thus leading to the next hypothesis.

H7: Network collaboration is positively related to the extent of adoption of IT disaster recovery methods.

Communication behavior. Individual characteristics of executives and managers are expected to shape the social norms and communication behavior of an organization. In the earlier adoption decision stages, mass media sources are more important, but these are replaced by interpersonal sources in the later stages. Mass media sources include newspapers, TV, advertisements, magazines, and vendor literature; while interpersonal sources include consultants, vendor personnel, computer specialists, colleagues, teachers, and friends (Brancheau & Wetherbe, 1990). Given a greater exposure to mass media communications, an organization could overcome the limiting factors of their community to identify service providers that can provide geographical diversity and a dependable level of service. Therefore, both broad reaching and interpersonal communication behaviors favorably affect an adoption decision.

H8: Flexible communication behavior is positively related to the extent of adoption of IT disaster recovery methods.

Homophily. Adoption rates also increase with the degree to which the individuals communicating the innovation share similar characteristics, or are homophilous (Rogers, 2003). Likewise, differences between individuals, or heterophily, are likely to slow the rate of innovation diffusion. Communication is easier between homophilous pairs and leads to a positive reinforcement of the homophily, which in turn facilitates communication. However, in some cases friction between a potential adopter and the communicator of an innovation is a necessary component for new ideas to enter into a homophilous group (Rogers, 2003). Therefore, innovations are expected to originate

from heterophilous groups such as non-related industries or businesses, but diffuse by way of homophilous groups within an industry or business.

H9: Homophily is positively related to the extent of adoption of IT disaster recovery methods.

Socioeconomic status. In addition to the factors influenced by social norms, an organization's socioeconomic status is also associated with earlier adoption of innovations (Rogers, 2003). In businesses, organizational slack describes the availability of resources to allocate to new projects. It is reasonable to expect those firms with more organizational slack and a higher economic status to be more capable of devoting resources to identifying and adopting innovations. An organization charged with the overall well-being of a community such as a community development agency is likely to have insufficient resources to allocate time, money, or employees to address the problem of disaster recovery.

H10: Socioeconomic status is positively related to the extent of adoption of IT disaster recovery methods.

Discussion of Research Model

Up to this point, the individual elements that comprise the research model shown in Figure 2a have been discussed. In this section, the research model as a whole is discussed. This section and chapter conclude with a summary of the hypotheses.

The Research Model

IT disaster recovery methods are varied and change with the pace of technology. Several methods were identified from the literature and a Delphi study. These methods

need to be adopted comprehensively so that a community can recover from disasters. Therefore the relationship between IT disaster recovery methods and the extent of their adoption is correlated and the extent of their adoption is hypothesized to lead to a perceived successful recovery after a disaster. The extent of adoption of these methods is also predicated on the identified adoption factors. For example, the disaster recovery method of maintaining pertinent data on servers is adopted based upon the identified internal and external adoption factors. For the purposes of this study, the disaster recovery methods are grouped together as a broad category. This effectively increases the power of the model in terms of substantive understanding but limits the predictability of the model to detect the effects of specific disaster recovery methods (Dubin, 1969).

Summary of Hypotheses

The extent of adoption of IT disaster recovery methods is hypothesized (H1) to lead to perceived successful recovery after as disaster as shown in Figure 2e. Disaster recovery methods protect critical data and information that, when lost, can lead to business failure. Despite this relationship, these methods may not be adopted. Certain theoretical factors, categorized as internal or external, can relate to the adoption of these methods.

Internal factors include relative advantage (H2), value and need compatibility (H3), complexity (H4), trialability (H5), and observability (H6). Each of these internal factors are hypothesized to positively relate to the extent of adoption of IT disaster recovery methods with the exception of complexity (H4) which is hypothesized to relate negatively.

External factors include flexible communication behavior (H7), network collaboration (H8), homophily (H9), and socioeconomic status (H10). Each of these external factors is hypothesized to positively relate to the extent of adoption of IT disaster recovery methods. Figure 2f illustrates each adoption factor as hypothesized to relate to the adoption of IT disaster recovery methods.

Each hypothesis is designed to test a particular relationship of the research model. To test these, data need to be collected and analyzed in accordance to the model. The next chapter defines the research design and analysis procedures to measure and subsequently test each hypothesis.

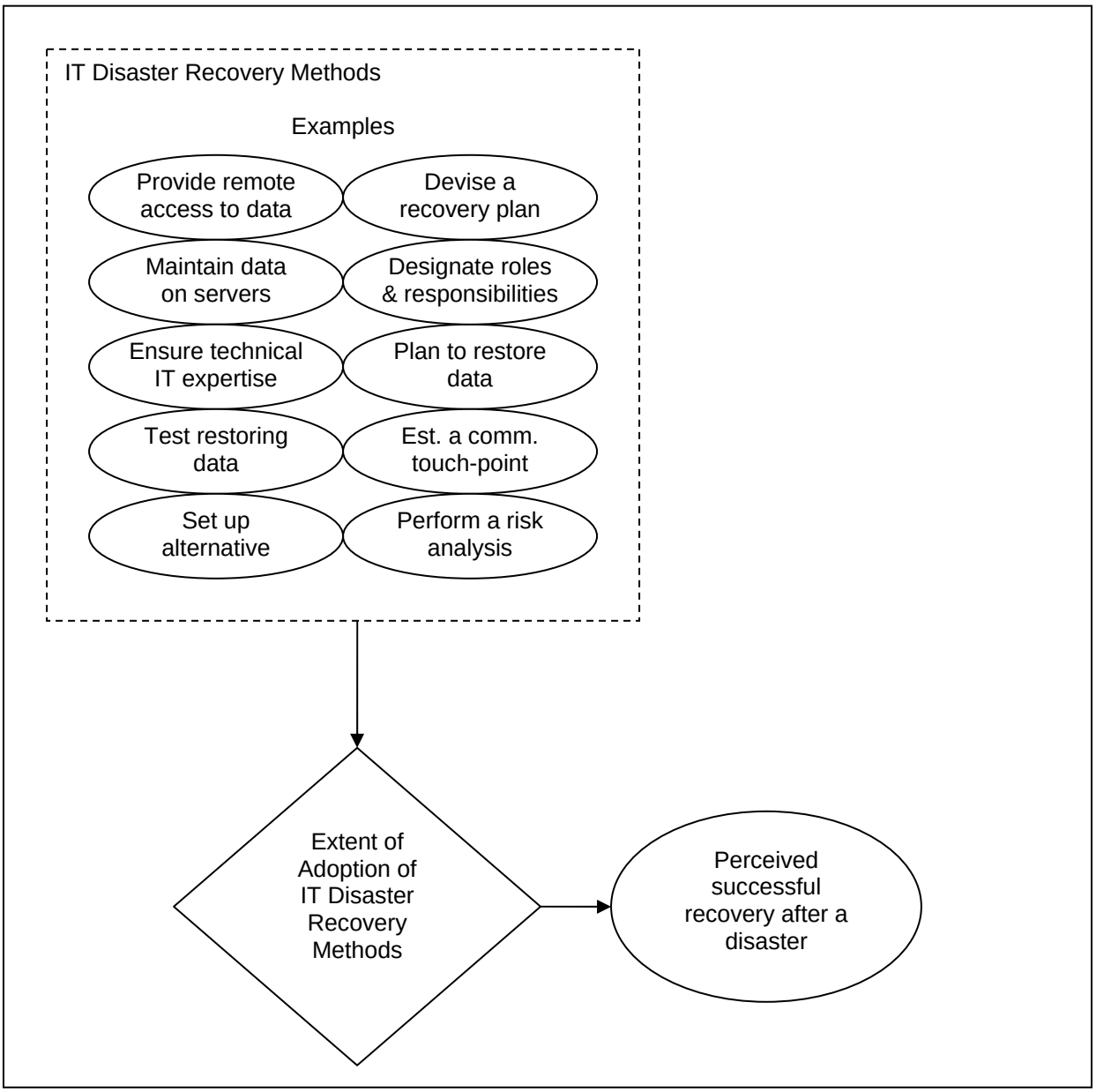


Figure 2e. Examples of IT Disaster Recovery Methods and Perceived Successful Recovery After a Disaster

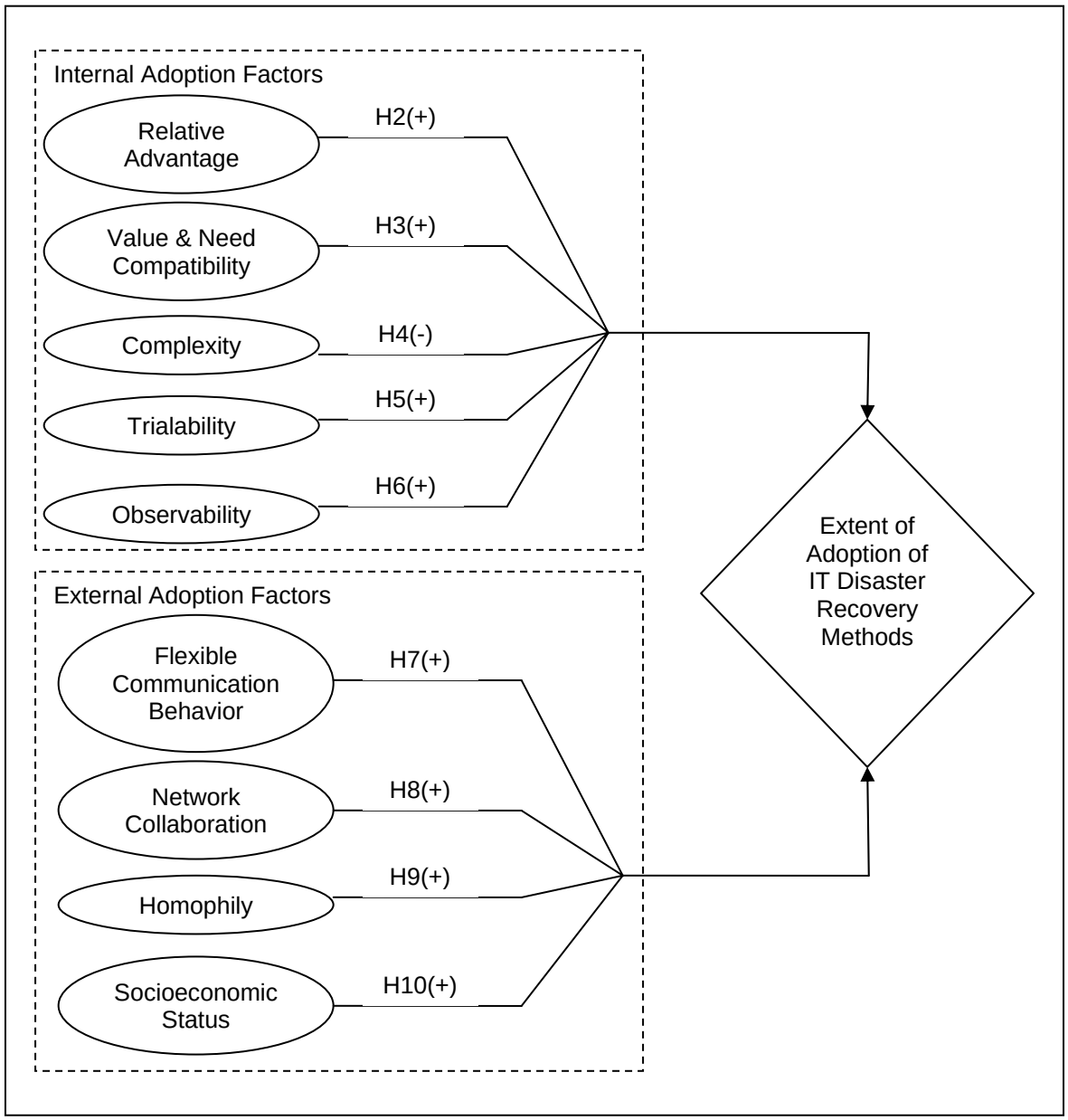


Figure 2f. Factors Affecting the Extent of Adoption of IT Disaster Recovery Methods

CHAPTER 3: RESEARCH DESIGN AND ANALYSIS PROCEDURES

This chapter presents the research methodology used to evaluate the theoretical model and hypotheses developed in the previous chapter. First, the reasons for choosing the research method, two focus groups, are described. This is followed with an overview of the content analysis method used to analyze the discussions among participants of the focus groups. The remaining sections follow the nine steps that are typical to a content analysis process (Neuendorf, 2002). Each section describes what is to happen per step of the content analysis process. These sections are again repeated in Chapters 4 and 5, but describe what did happen in the course of this research study. This chapter concludes with a summary of the research design and analysis procedures.

Selection of Research Method

Generally, research studies seek to maximize three goals: realism of context, generalizability, and precision of measurement (Scandura & Williams, 2000). The lack of substantive theory and research in the area of disaster recovery in communities led to the chosen research design of this dissertation: an initial and confirmatory focus group, both subjected to a content analysis (Koutlic & Clark, 2004; Dhillon & Backhouse, 2001).

Focus groups are semi-structured, moderated discussions among a group of participants selected for their expertise on a particular issue. This method is effective at generating contextually-rich data and is flexible to explore emergent issues as well. The

transcriptions of these discussions tend to be voluminous and the content analysis technique is both a rigorous and scientific way to digest large amounts of data to achieve a substantive understanding of important individual, group, institutional, or social matters (De Wever, Van Keera, Schellensa, & Valckea, 2007; Neuendorf, 2002; Stemler, 2001; U.S. General Accounting Office, 1996; Weber, 1990). Data collected from focus groups that are to be analyzed using the content analysis technique need to be recorded, usually by using audio and/or video recording devices for later scrutiny and transcription. This data can be supplemented with notes taken by moderators and any other data form that is relevant to the focus group discussion. Prior to recording the discussion, each participant should consent to having their conversation recorded for the purposes of the research.

This research method uses a content analysis on data generated from an initial focus group. From these results, a second, confirmatory focus group was conducted and analyzed. Afterward, the aggregate data from both focus groups were analyzed. In this manner, the results of the analysis from the initial focus group determine the participants and issues addressed in the confirmatory focus group. The next section describes the content analysis in general and is followed by the specific steps for this analysis method.

Content Analysis Overview

Shapiro and Markoff (1997) define content analysis as "any systematic reduction of a flow of text (or other symbols) to a standard set of statistically manipulable symbols representing the presence, the intensity, or the frequency of some characteristic relevant to social science" (p. 14). This rigorous nature of the content analysis technique is again asserted by Neuendorf's (2002) guidelines that it is reliant on the scientific method, that

the message of the communication is the unit of analysis and/or data collection, that it is quantitative and applicable to all contexts, and available for all message characteristics to be analyzed. The analysis is achieved by categorizing the data in a coding scheme.

The research design follows the methodology prescribed by Neuendorf (2002) and is adapted to include both computer-assisted and human data coding as well as multiple rounds of gathering and coding data. The nine steps of this process are presented in Figures 3a and 3b.

Step 1: Theory and Rationale

The first step of the content analysis process begins with establishing the theory and rationale for conducting the analysis. In this step, the following questions are addressed: What content should be analyzed? Why should this content be analyzed? What theories indicate that this content is important? Is there a research question? Are there hypotheses? The rationale for the analysis is established by addressing each of these questions. The last three of these five questions were addressed in Chapters 1 and 2 which articulate the research question, theoretical research model, and research hypotheses. The first two questions are answered in the following paragraphs.

Content to be Analyzed

The focus group method involves gathering participants identified for their expertise in a particular area and facilitating a moderated discussion on particular issues. The value of this method lies not only in the individual responses of the participants but also in the discussions that arise among the respondents that reflect a shared, social understanding of a particular topic. Additionally the opportunity exists for the

researchers who are moderating the focus group discussion to delve deeper into any emergent topics that arise from these semi-structured, dynamic discussions.

The recommended number of participants for a focus group is 6 to 10. Of these participants, a degree of homogeneity is both expected when recruiting participants who are knowledgeable on a specific topic and desirable to promote interaction among participants (Gibbs, 1997). A degree of diversity, however, is also beneficial in preventing conformity, which may suppress the voicing of important issues.

Gibbs (1997) describes an obstacle of conducting focus groups is in identifying and recruiting participants. This process can be time consuming especially when no immediate direct benefits are evident for participants. A key informant, that is, an individual with both knowledge and influence among a group of potential participants, can assuage this process by assisting in identifying and recruiting participants. The use of a key informant does limit the randomness of the selected participants; however, a focus group is predicated on recruitment of participants with expertise in a given area which is usually a narrow population. The recruitment process includes the need to designate a meeting time and place and the onus is on the researcher to coordinate a meeting time and place that is acceptable to all participants. All of these steps can be facilitated by the use of a key informant.

Justification of Content to be Analyzed

The justification for analyzing data from focus groups depends upon the context of the focus group. In line with the research question of this study, the context of the focus groups represents community decision makers who are experienced and

knowledgeable about disasters of extreme magnitude and decisions regarding IT disaster recovery methods. The importance of this context will be discussed in the corresponding section of the following chapter.

Theoretical Importance of the Content

In Chapter 2, a research model was developed from past literature and theoretical perspectives. These came together to form a model that includes IT disaster recovery methods and factors that affect adoption that, together, lead to the extent of adoption of IT disaster recovery methods. The extent of adoption is modeled to be a driver of a successful recovery after a disaster. The theoretical importance of content analysis of focus group participants' discussion is to gain insight in order to test the hypotheses.

Research Question

The research question of this study stated in Chapter 1 is as follows: What factors influence decision makers in coastal communities to adopt IT disaster recovery methods so as to ensure successful recovery? This question was posed after recognizing the need for information security, the importance of disaster recovery research, the unavailability of critical data and information, and the impact of disasters on communities.

Research Hypotheses

In the course of developing the research model in Chapter 2, 10 research hypotheses were also developed. These hypotheses primarily relate to the factors that affect the adoption of IT disaster recovery methods.

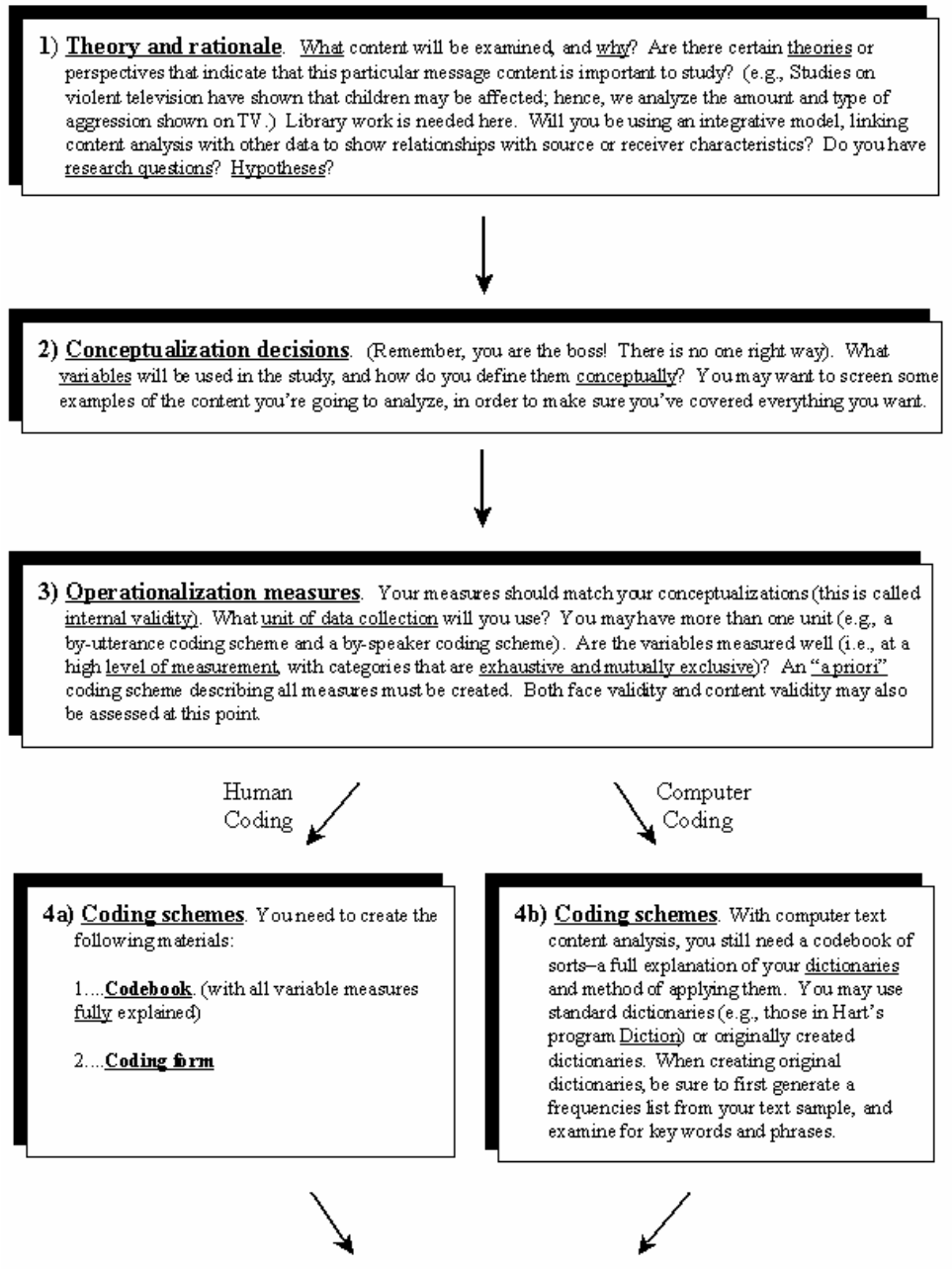


Figure 3a. Neuendorf's (2002) Typical Content Analysis Process (Steps 1-4)

Note. From The Content Analysis Guidebook (p. 50) by K. A. Neuendorf, 2002, Thousand Oaks, CA: Sage Publications. Copyright 2001 by Sage Publications Inc Books. Reproduced with permission.

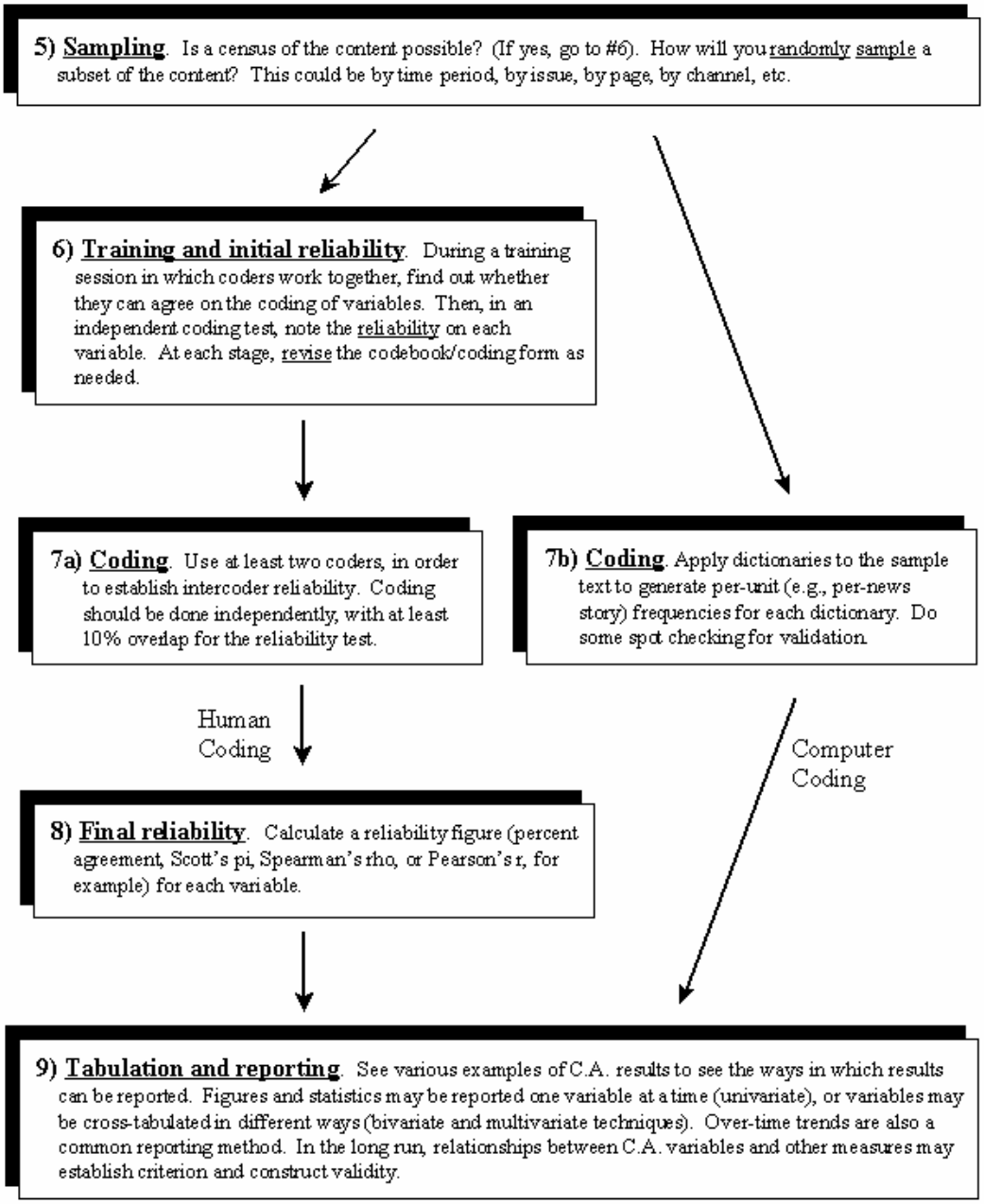


Figure 3b. Neuendorf's (2002) Typical Content Analysis Process (Steps 5-9)

Note. From The Content Analysis Guidebook (p. 51) by K. A. Neuendorf, 2002, Thousand Oaks, CA: Sage Publications. Copyright 2001 by Sage Publications Inc Books. Reproduced with permission.

Step 2: Conceptualization Decisions

After establishing the theory and rationale for the content analysis, the next step is to conceptualize (that is, define) the variables that are to be detected from the content. At this stage, the content can be previewed when possible to ensure that the conceptualizations are appropriate for the content. The important feature of this step is not necessarily that each conceptualization is universally accepted, but that they are well-defined prior to coding the data. As with much of the theory and rationale, the conceptualizations of the variables were accomplished in Chapter 2 during the course of reviewing literature and developing hypotheses. In the section from Chapter 4 that corresponds to this one, the variables and the conceptualizations will be presented again.

Step 3: Operationalization Measures

Upon deciding on the definitions of the variables, the manner in which they are measured directly follows. In this step, care needs to be taken to make sure that the conceptualizations and the operationalized measures match. The question will be asked: Are the conceptual definitions of the variables consistent with the way they are measured? To address this question, the measures need to be both mutually exclusive and exhaustive. This task will be accomplished by a computer-assisted keyword and key phrase analysis conducted using the web-based application, *Keyword Analysis Tool: Advanced Keyword and Keyphrase Extraction Technology for Content Analysis and Search Engine Optimization* (Hoskinson, 2008). This application generates a frequency list of keywords and key phrases from the data. The resulting keywords and key phrases will then be matched to the operationalized measures, checking to see that each result

matches with only one measure (mutually exclusive), and that all results are categorized (exhaustive). At this time, additional categories are made if necessary so that the data are exhaustively measured.

Also during this step, the decision about what the unit of data collection will be made and a mechanism to assess the validity will be established. Finally, the decision about what route the coding scheme will take, either human or computer coding, is made which leads to the development of the codebook and coding forms in the following step. To address each of these steps of the operationalization of the measures, the section from Chapter 4 that corresponds to this one will have the following sub-sections: *Mutually Exclusive & Exhaustive Measures, Unit of Data Collection*, and *Selection of Coding Scheme*. The assessment of validity is presented in Chapter 5.

Step 4: Coding Scheme

Based upon the decisions in the previous step, the coding scheme is either human or computer based. For either scheme, a codebook is needed. For human coding the codebook is developed from the past conceptualizations of the variables. A codebook is a document that identifies and defines the variables of interest. The codebook is derived directly from the theoretical constructs identified in the theoretical model and research hypotheses. Preparing a codebook *a priori* to gathering and analyzing data contributes to the rigor of the content analysis but does not rule out further revisions to the codebook throughout the process in pursuit of mutual exclusivity and exhaustiveness (Neuendorf, 2002; Stemler, 2001; Weber, 1990;). The specific categories included in the codebook are largely at the control of the researcher so long as they are clearly defined and are

considered internally valid when categories are exhaustive and mutually exclusive (Neuendorf).

For computer coding, the codebook can be from standard coding dictionaries inherent to the coding program. Either way also benefits from conducting a keyword and key phrase analysis as explained in the previous step to assess the consistency of the codebook with the data. For human coding, a coding form needs to be developed. This form is developed to be consistent with the chosen manner by which the variables are operationalized.

Step 5: Sampling

The fifth step of the content analysis process is to determine the manner, if any, by which a random sample of the content will be selected for analysis. This step is unnecessary if the entirety of the content, called a census, is feasible for analysis.

Step 6: Training and Initial Reliability

When using human coding, a step to train the coders to use the codebook and coding form is necessary. During this step, coders work together to determine if they initially agree on the way the variables are coded. Throughout this entire step, the codebook is modified so that a satisfactory level of reliability is achieved.

Upon agreement, each coder independently codes a portion of the data as a pilot test after which a statistical measure of consensus is calculated to indicate the degree that the coding can be considered externally reliable. Statistical reliability measures that fall within acceptable limits support the validity of the results of the content analysis by indicating consistency of coding between coders (Weber, 1990). Two types of reliability

are stability and reproducibility (Stemler, 2001). Stability is also described as intra-rater reliability, the ability of a coder to consistently code the data on subsequent attempts. Reproducibility is also described as inter-rater reliability, the consistent coding of data among independent coders. One statistical reliability measure is Krippendorff's alpha (α). This measure calculates the percent of agreement of coding attempts while controlling for the probability of similar coding merely by chance and is robust for missing data and data of all levels of measurement. Values of reliability coefficients above 0.90 are nearly always acceptable, 0.80 are generally acceptable, 0.70 are acceptable for exploratory studies, and values below 0.70 tend to indicate poor to slight strength of agreement. Krippendorff's α is a conservative measure and therefore, slightly lower (0.80 to 0.90) values can be accepted (Lombard, Snyder-Duch, & Campanella Bracken, 2005).

Step 7: Coding

Only after the preceding steps are completed can the actual coding of the data begin. Human coding must involve at least two coders who independently code the data, thus allowing for reliability to be measured. At least 10% of the data must be coded by both coders for reliability to be measured. Computer coding involves spot checking the results of the coding program.

Step 8: Final Reliability

For human coding, a final reliability measures per variable needs to be calculated in the same manner that the initial reliability was calculated. Ideally, the final reliability

statistic will indicate a favorable strength of agreement. If this is not achieved, the results of the coding will not have evidence to support that they are reliable.

Step 9: Tabulation and Reporting

Reporting the results of the coding efforts can be done in varied ways including but not limited to such techniques as analysis of variance, factor analysis, multiple and logistic regression, cluster analysis, and structural equation modeling (Franzosi, 2004; Neuendorf, 2002). Determining the technique to use largely depends on the nature of the hypotheses; frequency counting is yet another technique that is effective for hypotheses that test the presence of factors in the data. The frequency of which variables are coded from the data represents the degree to which the construct is relevant to the research model.

Summary of Research Design and Analysis Procedures

The research design and analysis procedures were presented in this chapter. To summarize, these were a content analysis of data collected from two focus groups. The focus groups were chosen for their high realism of context. Data from focus groups tend to be voluminous and thus a content analysis was chosen as an analysis method. The procedures of the content analysis follow the nine steps of a content analysis according to Neuendorf (2002). The next chapter describes how these steps were carried out on the data from the initial focus group, reporting the results of following the research design and analysis procedures.

CHAPTER 4: APPLICATION OF RESEARCH DESIGN ON THE INITIAL FOCUS GROUP DATA

The sections in this chapter follow those discussed in the previous chapter. Whereas Chapter 3 discussed the research method and analysis procedures to be done, this chapter presents the results of applying those procedures on data from an initial focus group. The content analysis of data from the initial focus group is discussed in the following sections: *Step 1: Theory and Rationale*, *Step 2: Conceptualization Decisions*, *Step 3: Operationalization Measures*, *Step 4: Coding Schemes*, *Step 5: Sampling*, *Step 6. Training and Initial Reliability*, *Step 7: Coding, Step 8: Final Reliability*, and *Step 9: Tabulation and Reporting*. The chapter concludes with a summary of the results of the application of the analysis procedures on data from the initial focus group.

Step 1: Theory and Rationale

The research design was applied to analyze transcribed discussions from a focus group among community stakeholders from Orange Beach, Alabama and Gulf Shores, Alabama held on February, 5 2007, in Orange Beach. The justification of this content was based upon its representation of the growing population of coastal areas, the economic importance of these communities, and by the negative effect of disasters. As specified in the previous chapter, the theoretical importance of the content, research question, and research hypotheses are discussed in Chapters 1 and 2. The following sections fully describe the content.

Content to be Analyzed

The content analyzed were data generated from a focus group and was in the form of the words spoken and messages expressed during the course of these moderated discussions. An executive director of Baldwin County Economic Development Alliance was identified as a key informant who could identify and recruit hurricane-experienced decision makers within the stated research context. The Economic Development Alliance is a coalition of community and business leaders in Alabama's Baldwin County that was formed in 1995 to promote and sustain the economic growth of the region, with recognition of the critical economic role of a narrow stretch of beaches.

The initial focus group was held at the Alabama Gulf Coast Convention & Visitors Bureau building in Orange Beach, Alabama. This location was selected for its geographical proximity for the participants. The discussion took place between 11:00 a.m. and 2:00 p.m. on February 5, 2007. Ten people, including the key informant, participated in the initial focus group. Four researchers from Auburn University's Departments of Mechanical Engineering, Management, and Sociology led the discussion and the faculty member from the Department of Sociology served as the moderator. The participants were hurricane-experienced government officials and private business representatives. They provided insight into the most critical components and adoption issues related to disaster recovery and discussed the components of appropriate disaster recovery methods and the issues that prevent or encourage the adoption of those methods. The participants completed a demographic questionnaire (available in Appendix C) that identified the organization they represented and their role in the organization. This

questionnaire also disclosed to the participants the intended use of the data collected. A summary of the data obtained from the questionnaire is shown in Table 4a. The discussion from the moderated focus groups meeting were recorded with audio equipment and supplemented with notes taken by the moderators. The audio recording of the discussion was approximately 71 minutes long. These recordings were transcribed into text complete with timestamps of each speaking turn and the identities of each speaker. The transcript of the initial focus group is featured in Appendix D.

Table 4a

Initial Focus Group Participant's Organization's Demographic Statistics

	Government (n = 6)		Commercial (n = 4)		Total (N =10)	
Demographic	Mean	Range	Mean	Range	Mean	Range
Years of Operation	22	[12, 50]	35.3	[16, 55]	34.7	[12, 55]
No. of Employees	70	[5, 200+]	182.8	[51, 300+]	136.6	[5, 300+]
Years of Experience	11.2	[5, 20]	11.5	[5, 16]	11.3	[5, 20]
Annual Revenues in $1,000	10,058	[500, 26000]	5,000	[5000+]	7,392	[500, 26000]
No. of IT Staff	0.83	[0, 5]	12.3	[0, 25]	2.6	[0, 25]

Justification of Content to be Analyzed

The data collected for this study originated from neighboring cities located on the coast of the Gulf of Mexico in Alabama's Baldwin County: the City of Orange Beach and the City of Gulf Shores. These two coastal cities have experienced increased growth in population, are of vital and growing economic importance, and have experienced numerous hurricanes; therefore, issues of disaster recovery are prominent within the

community. This context is a suitable testing ground for the research model and research hypotheses.

The Orange Beach and Gulf Shores areas are reflective of the trends of increased population and growing economic importance of coastal regions. The five fastest growing states are coastal and even though Alabama is not among these, the Alabama coastline is typical of this trend with approximately 4 million visitors every year, 70% of whom are from out of state, who spend approximately $2 billion on travel-related expenses and support about 43,000 tourism-related jobs. Lodging expenditures in Baldwin County, one of the state's two coastal counties, were $241 million in 2006, 28% of the entire expenditures incurred in the state (Alabama Gulf Coast Convention & Visitors Bureau, 2007).

The tourism industry is of vital importance to the economies of both Baldwin County and Alabama as a whole. Tourist spending tends to peak during the summer months and the local population has grown steadily in recent years to accommodate the demands of the area's tourism-based services. High-rise condominiums now dominate long stretches of the coastline, with more being built at a blistering pace. Returning visitors and residents recognize that a once quaint beach community populated with rental houses and beach shacks on stilts has been replaced with modern condominiums that in turn fuel the economy of the region. However, while proximity to the ocean affords visitors and residents a uniquely desirable lifestyle, coastal storms pose a constant threat to residents and visitors alike. For the community stakeholders (residents, businesspeople, and government officials) in coastal communities, a major concern is

how to sustain the economic viability and stability of this region, especially in the aftermath of devastating Atlantic hurricanes. Although Alabama's coastline is only 53 miles in length, a mere 1.8% of the 2,925 miles of coastline of the continental U.S., this problem is common to many other coastal communities in the U.S. (Infoplease, 2007).

In 2004, Hurricane Ivan made landfall directly in the Baldwin County city of Gulf Shores, causing extensive and lasting damage. Much of the real estate rental property in this and nearby communities that cater to tourists required extensive time and financial resources to rebuild and reopen for business. From the community's perspective, this time equates to lost revenues and potential business failure as beach-seeking tourists spent their vacation dollars in nearby communities that either sustained less damage or that recovered more quickly. The history of this region makes for an ideal backdrop to investigate the nature of successfully recovery by engaging those who have extensive experience of disasters and the subsequent recovery efforts.

Step 2: Conceptualization Decisions

The theory and rationale having been established, the variables that are important in this content need to be identified. The variables are as follows: disaster recovery methods, and the factors identified in Chapter 2: relative advantage, value and need compatibility, complexity, trialability, observability, network interconnectivity, communicability, homophily, and socioeconomic status. The conceptualizations of each variable are a result of the literature review that indicated their theoretical importance in an adoption decision. In Appendix E, the conceptualizations of each variable are presented in full as part of the content analysis codebook.

Step 3: Operationalization Measures

Following the identification and conceptualization of the variables to study, the method by which these variables are operationalized, that is, measured from the data, was determined. The variables were measured by counting the frequency of their occurrence within the data according to the categories defined in the codebook. Operationalization also involves ensuring that measures are mutually exclusive and exhaustive, identifies the unit of data collection, and selects the coding scheme to be used.

Mutually Exclusive and Exhaustive Measures

In accordance with the research design procedures to establish mutually exclusive and exhaustive operationalization measures, a computer-assisted keyword analysis was performed on the data set. A keyword and key phrase analysis generated a frequency list of keywords and key phrases present in the data. From these results, the codebook was refined to include certain non-contributory categories including mentions of geopolitical locations, moderating comments, and demographic information.

The geopolitical location category was useful to framing the geopolitical boundary to which the discussion pertained to but did not relate to the theoretical factors under study. Moderation comments represented remarks including questions by the moderators and participants which were part of the administration of the focus group. The demographic information represented data units that described the participants and was likewise non-contributory. Independent coders coded, on average, 131 coding units per these control categories. These were not included in the analysis because they are non-contributive to the research question.

The inclusion of these categories allowed for the data to be exhaustively categorized in accordance with content analysis guidelines (U.S. General Accounting Office, 1996). Aside from these new categories, the data were well represented by the codebook. Furthermore, this analysis verified that each unit of data was exclusive to one and only one category in the codebook.

Unit of Data Collection

The data were coded as propositional coding units, that is, they were coded with consideration to contextual connotations. The propositional coding unit carries a more substantive understanding than word frequency counts at the expense of engaging the coders at a deeper level (Stemler, 2001). Coding data according to propositional coding units is akin to a semantic text grammar perspective, also called a thematic text analysis, of content analysis in which the data being analyzed are considered to be related and convey messages that can be discovered by generalizing the data among dominant themes (Franzosi, 2004). In this manner, a lengthy discussion among the many participants with no apparent theme can be codified to reveal the dominant themes.

Selection of Coding Scheme

The selection of a coding scheme, human or computer coding, is limited when the unit of data collected are propositional coding units. Coding along the lines of propositional coding units is facilitated by using human coders who are able to understand nuances of conversation more readily than computer-assisted techniques. Therefore, human coding was used for the coding scheme.

Step 4: Coding Scheme

This step involves the manner in which the data will be coded. Coding schemes differ by the method of coding: human or computer. This study employs human coding and a coding scheme is devised which includes developing a data codebook and a coding form. The data codebook (Appendix E) includes the full definition and explanation of the variables to be measured.

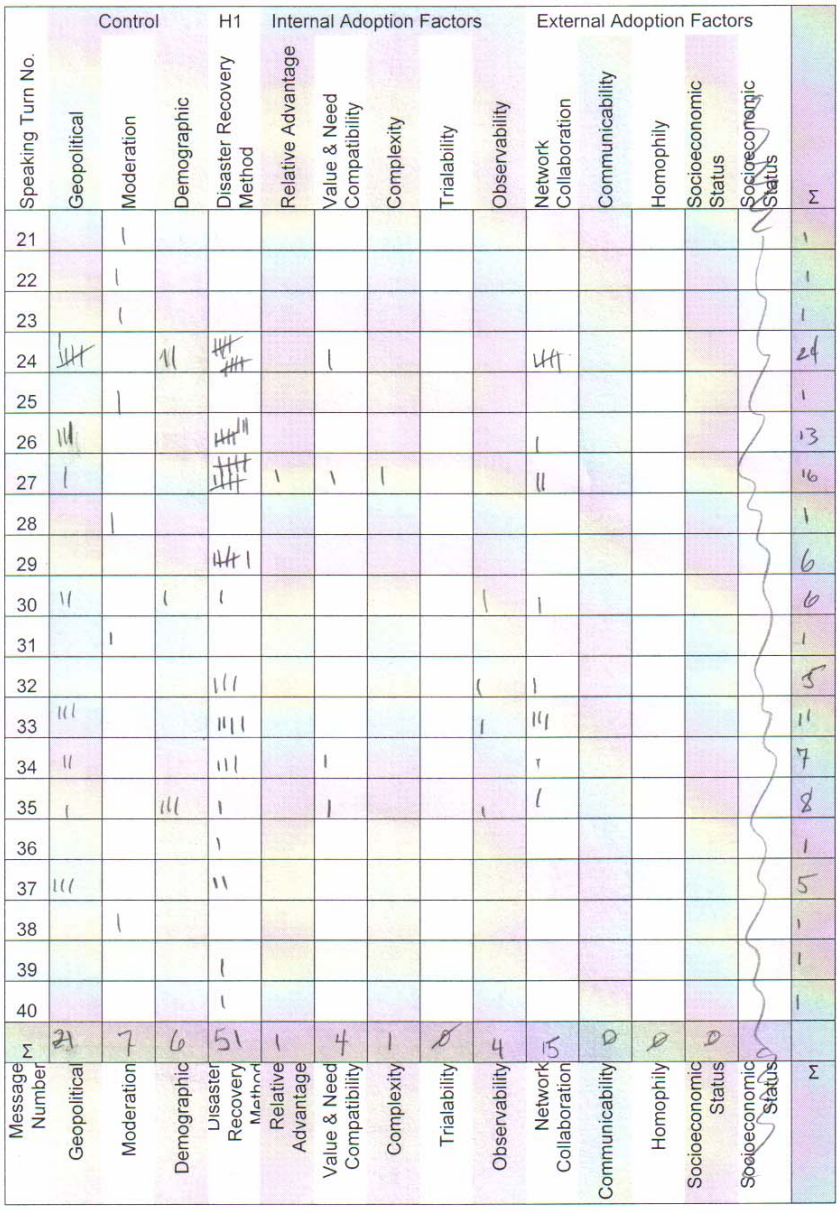
A coding form was developed so that the variables can be measured in a proper and orderly manner. The coding form reflected the manner in which the conceptualized variables were measured in the data, providing space for variables to be tabulated from the context. An example of the coding form and the tabulation are shown in Figure 4a. This example is from the initial focus group by the first coder.

Step 5: Sampling

The transcriptions comprise the complete data set under analysis; thereby enabling an analysis of the census of data, precluding the need for random sampling to achieve a representative sample of the data. Appendix D provides a full transcript of the focus group participants' discussion.

Coder: BC
Date: 1/17/08

Initial Focus Group Data Code Form



PAGE 2

Figure 4a. Code Form Example

Step 6: Training and Initial Reliability

Data were coded by two individual coders according to the protocol of the codebook and coding form. The first coder was the author and primary investigator of this research. The second coder was selected on criteria of having no prior involvement, knowledge, or bias to this research or the procedures used. This coder did not attend any meeting or focus group, read any relevant manuscripts, publications, or communiqués of this research. In this manner, the second coder's perceptions could be shaped during training sessions in which sample data were coded and compared among the coders. After approximately 4 hours of non-continuous training, the coders attained a similar understanding of the method by which the data were to be coded.

After attaining a comfortable level of agreement, a subset of data was independently coded. The data subset were the first half the initial focus group. The coders reached an almost perfect level of agreement, indicated by Krippendorff's α coefficient value of 0.9572. The use of more than two coders would lead to more precise reliability measures; however, the large magnitude of time, effort, and resources of the coding process precluding using more than two coders.

Step 7: Coding

Next, the complete data set were coded according to the categories specified by the codebook. Each coder independently completed the code forms for the entire data set, thus overlapping each other by 100%. The time spent coding among coders totaled nearly 18 hours. From the completed coding forms, the totals were tabulated and reliability measures were calculated as presented in the next section.

Step 8: Final Reliability

Krippendorff's α was calculated for the intra-rater and inter-rater reliability for the data from the initial focus group. The first coder coded the initial focus group twice, with approximately 3 months in between attempts. The considerable lapse of time between attempts allows for the re-coding effort to be genuine and not merely a repetition of coding from the first attempt. This coding effort took place prior to the training session between the two coders. Table 4b presents the frequencies of these coding attempts.

The intra-rater reliability across all of the variables of the initial focus group as measured by Krippendorff's α was 0.9023, indicating an acceptable strength of agreement between the first and second coding attempts of the first coder. The 95% confidence intervals for this measure ranged from 0.7387 to 0.9969. These values are evidence that the stability of the coding did not deteriorate over time. For the remainder of the analysis, the values obtained from the second coding effort were used. These values were used instead of using either the first effort or an average of the two coding efforts because only the second coding effort occurred after the training session, clarification, and initial reliability were conducted between the independent coders.

The coded values were from the first coder were then compared to coded values of the second coder. The inter-rater reliability measure of Krippendorff's α for the initial focus group was 0.9812. This value indicates an acceptable strength of agreement between the coders. Table 4b presents the frequencies of these coding attempts.

Table 4b

Initial Focus Group Coding Results

Variable	First Coder, First Attempt	First Coder, Second Attempt	Second Coder
Disaster Recovery Methods	172	186	193
Relative Advantage	47	37	30
Value & Need Compatibility	66	34	17
Complexity	5	5	0
Trialability	0	1	0
Observability	1	6	0
Flexible Communication	166	86	117
Network Collaboration	0	0	0
Homophily	0	0	0
Socioeconomic Status	0	0	0
Total	457	355	357

Step 9: Tabulation and Reporting

This section reports the results of content analysis of the data from the initial focus group. The relative importance of each variable was determined by the average coded frequencies and percentage of the total average coded frequency. In total, an average of 356 propositional coding units was coded from the data. The results are read, for example, as follows: two independent coders counted an average of 101.5 occurrences of the variable, network collaboration, in the data of the initial focus group. This value represented 28.51% of the 356 average total propositional coding units. Table 4c lists the average frequencies and percentages per variable.

Table 4c

Initial Focus Group Content Analysis Results

Variable	Average Frequency[a]	Percentage
Disaster Recovery Method	189.5	53.23
Relative Advantage	33.5	9.41
Value and Need Compatibility	25.5	7.16
Complexity	2.5	0.70
Trialability	0.5	0.14
Observability	3	0.84
Network Collaboration	101.5	28.51
Communicability	0	0.00
Homophily	0	0.00
Socioeconomic Status	0	0.00
Total	356	99.99[b]

[a]Average coded frequency of two coders, [b]Values do not add to 100 due to rounding

Summary of the Application of the Research Design on the Initial Focus Group Data

This chapter described the application of the research design on the data form the initial focus group. First, the theory and rationale for analyzing the content were given. These included the economic importance and the historical experience of the coastal communities represented by the focus group participants. Approximately 71 minutes of discussion were transcribed and analyzed. The variables of interest from the data were previously identified, conceptualized, and operationalized in the course of developing the research model and hypotheses.

Initial, computer-assisted keyword and key phrase analysis determined the operationalized measures to be mutually exclusive and exhaustive. Data were chosen to be coded as propositional coding units which are best identified by human coders. The coding schemes were then developed and included a codebook and form that reflected the previous work to identify, conceptualize, and operationalize the variables of interest.

A census of the data was analyzed by two coders who trained together, at first, and then independently. An initial reliability coefficient, Krippendorff's α, was calculated ($\alpha = 0.9572$) and supported the reliability between the coders. The remaining data were then coded and final reliability coefficients were calculated. The coded data were stable over time (intra-rater, $\alpha = 0.9023$) and reproducible (inter-rater, $\alpha = 0.9812$). Finally, the average frequency and percentage were reported per variable. The next chapter describes the application of the research design on data from the confirmatory focus group.

CHAPTER 5: APPLICATION OF RESEARCH DESIGN ON DATA FROM THE CONFIRMATORY FOCUS GROUP

This chapter describes the application of the research design to the data from the confirmatory focus group. At the completion of the analysis of data from the initial focus group, a second, confirmatory focus group was conducted. A content analysis was conducted on data from the confirmatory focus group in the same manner as the analysis of data from the initial focus group was conducted. The steps of this application of the research design are described in the following sections; however, the sections of this analysis are that are identical to those described in Chapter 4 are omitted. This chapter begins with a discussion of the theory and rationale for the confirmatory focus group. This is followed by a section that describes the primary difference, assessing the validity of the research design, in the content analysis steps 2 through 6 for this application of the research design. Next, the final reliability and the results are reported. This chapter concludes with a summary of the application of the research design to the data from the confirmatory focus group

Step 1: Theory and Rationale

The research design was applied to analyzed transcribed discussions from a focus group among community stakeholders from Orange Beach, Alabama and Gulf Shores, Alabama held on November 30, 2007 in Gulf Shores. The justification for this content was identical to the justification for the initial focus group: the growing population of

coastal areas, the economic importance of these communities, and the negative effect of disasters. The discussion of these will not be repeated. The following section, however, is remarkably different from the initial focus group.

Content to be Analyzed

The confirmatory focus group was held at the City of Gulf Shores City Hall in Gulf Shores, Alabama. This location was selected for its geographical proximity for participants. This meeting was held on November 30, 2007, and lasted from 12:00 p.m. until approximately 2:30 p.m. The audio recording of the discussion was approximately 85 minutes long. The disparity between the duration of the focus group and the length of discussion is explained by additional time for greetings, lunch, and breaks. The complete transcript of the confirmatory focus group is available in Appendix F.

Based upon the results from the initial focus group, the participants of this focus group were identified among municipal government officials from both Orange Beach and Gulf Shores, Alabama. The decision to include city officials for the confirmatory focus group was made among the researchers and the key informant involved with this study. Eight people participated in the confirmatory focus group alongside three researchers from Auburn University. The participants were presented with results of the initial focus group and discussed these results and their implications.

A demographic questionnaire was distributed to the participants; however, few were completed because the focus group discussion lasted longer than expected, causing many participants to leave abruptly for prior commitments at the conclusion. Nevertheless, some information was gathered. Six of the eight participants were city

officials; four from the City of Orange Beach and two from the City of Gulf Shores. Their titles were City Manager, Director of Engineering and Environmental Services, Special Projects Coordinator, Building Official and Floodplain Administrator, retired Public Works Director, and Public Works Inspector. The two other participants were the key informant, representing the economic development alliance, and a representative from the Alabama County Extension Services. Of these eight participants, the retired Public Works Director and key informant were present at both the initial and confirmatory focus groups. These individuals acted as liaisons from the initial focus group, verifying the results presented by the researchers and engaging in the confirmatory focus group discussion.

Step 2 through Step 7

Steps 2 through 6 of the application of the research design to the data from the confirmatory focus group are nearly identical to those applied to the initial focus group. This section notes and describes the differences of the application of the research design. There is no difference for *Step 2: Conceptualization Decisions*. The primary difference is from *Step 3: Operationalization Measures* and pertains to assessing the validity of the research design. Apart from assessing the validity, the following steps were conducted in the same manner as earlier: *Step 4: Coding Schemes*, *Step 5: Sampling*, *Step 6: Training and Initial Reliability*, and *Step 7: Coding*. One final note of difference is that additional training and calculations of initial reliability did not occur. The training and favorable assessment of both initial and final reliability from the analysis of data from the initial focus group precluded the need to conduct additional training or reliability assessments.

Validity

Part of *Step 3: Operationalization Measures* in the content analysis process is to assess the validity, and thus a research design needs to include a validation mechanism (Stemler, 2001). This research and analysis procedure included two such mechanisms. The first was the means by which data are gathered. The use of focus groups contributes to the face validity of the data inasmuch as the participants are experts and appropriate to address the research question. Data from focus groups provided a high realism of context.

The second mechanism of validity was accomplished by conducting a second focus group in which participants directly responded to the results of the analysis of the first initial group. Presenting the results for response to a group with expertise on the issues verifies the validity of the results so long as the results are well-received. The data from the confirmatory focus group were reviewed for this purpose. The frequency of participants' explicit agreement with the results of the initial focus group was tabulated. The data from the confirmatory focus group contained 153 of these explicit agreements to the finding of the initial focus group.

Step 8: Final Reliability

Krippendorff's α was calculated for the inter-rater reliability for the data from the confirmatory focus group. The data were independently coded by two coders. The results of the coding efforts are presented in Table 5a. Intra-rater reliability was not assessed because not enough time lapsed from the first coding attempt for either coder.

The coded values were from the first coder were then compared to coded values of the second coder. The inter-rater reliability measure of Krippendorff's α for the confirmatory focus group was 0.9455. This value indicates a strength of agreement between the coders.

Table 5a

Confirmatory Focus Group Coding Results

Variable	First Coder	Second Coder
Disaster Recovery Methods	230	262
Relative Advantage	43	10
Value & Need Compatibility	69	4
Complexity	7	0
Trialability	2	0
Observability	4	0
Flexible Communication	134	112
Network Collaboration	1	0
Homophily	0	0
Socioeconomic Status	2	0
Total	492	388

Step 9: Tabulation and Reporting

This section reports the results of content analysis of the data from the confirmatory focus group. The relative importance of each variable was determined by the average coded frequencies and percentage of the total average coded frequency. In total, an average of 440 propositional coding units was coded from the data. The results

are read, for example, as follows: two independent coders counted an average of 123 occurrences of the variable network collaboration in the data of the initial focus group. This value represented 27.95 % of the 440 average total propositional coding units. Table 5b lists the average frequencies and percentages per variable.

Table 5b

Confirmatory Focus Group Content Analysis Results

Variable	Average Frequency	Percent
Disaster Recovery Method	246	55.91
Relative Advantage	26.5	6.02
Value and Need Compatibility	36.5	8.30
Complexity	3.5	0.80
Trialability	1	0.23
Observability	2	0.45
Network Collaboration	123	27.95
Flexible Communication	0.5	0.11
Homophily	0	0.00
Socioeconomic Status	1	0.50
Total	440	100.27

Summary of the Application of the Research Design on the Confirmatory Focus Group Data

This chapter described the application of the research design on the data form the confirmatory focus group. The steps of this research design were identical to those performed for the data from the initial focus group unless otherwise noted. The

description and justification for analyzing the content for a confirmatory focus group were given. The results of the content analysis were found to be reproducible (inter-rater, $\alpha = 0.9455$). Finally, the average frequency and percentage were reported per variable. The next chapter discusses the results of the application of the research design on data from both the initial and confirmatory focus groups.

CHAPTER 6: DISCUSSION OF RESULTS

The results of applying the research design and analysis procedures on the data from the initial and confirmatory focus groups were reported in Chapters 4 and 5, respectively. In this chapter, the results are discussed as they pertain to each of the hypotheses. Together, the frequency of propositional coding units (averaged over both coders) from the two focus groups equaled 796. Table 6a reports the combined results from both analyses. This chapter proceeds with a discussion of the results based upon the combined values in this table and beginning with the hypotheses that were supported. A summary of these at the end of the chapter includes a revised research model based upon the results of the hypotheses.

Supported Hypotheses

Four of the 10 hypotheses were supported. These are represented in Table 6a by the variables that were most frequently coded from the data. The hypothesis number and the corresponding variable, listed in descending order of importance are as follows: (a) H1, disaster recovery methods; (b) H7, network collaboration; (c) H3, value and need compatibility; and (d) H2, relative advantage. Together, these four variables represent 782, or 98.24%, of the coded data. Each hypothesis is discussed in order of importance.

Table 6a

Aggregate Content Analysis Results

Hypothesis Number	Variable	Frequency	Percentage
	Supported Hypotheses		
1	Disaster Recovery Methods	435.5	54.71
7	Network Collaboration	224.5	28.20
3	Value & Need Compatibility	62	7.79
2	Relative Advantage	60	7.54
	Sub-Total	782	98.24
	Unsupported Hypotheses		
4	Complexity	6	0.75
6	Observability	5	0.63
5	Trialability	1.5	0.19
10	Socioeconomic Status	1	0.13
8	Communication Behavior	0.5	0.06
9	Homophily	0	0.00
	Sub-Total	14	1.76
	Total	796	100

Hypothesis 1. Disaster Recovery Methods

The first research hypothesis is that the extent of adoption of IT disaster recovery methods leads to perceived successful recovery after a disaster. The most frequently occurring coding unit in the data is disaster recovery methods, representing 54.71%, or 435.5 coding units of the data. Data were coded for disaster recovery methods when the

focus group participants identified specific methods and how their adoption had led and will continue to lead to successful post-disaster recovery. The nature of the disaster recovery methods that were revealed during the analyses of the focus groups reflected those identified by reviewing the literature and conducting a Delphi study, providing a level of assurance that the disaster recovery methods discussed among focus group participants are comprehensive. The prominence of occurrence of disaster recovery methods from the analysis indicates support for the hypothesis that the extent of adoption of these methods leads to perceived successful recovery after a disaster.

Hypothesis 7. Network Collaboration

Network collaboration was hypothesized to be positively related to the extent of adoption of IT disaster recovery methods. Evidence supporting this relationship was found among the data, with 28.20% of the data being coded for this variable. This was the single most important factor relating to disaster recovery method adoption and therefore this hypothesis was supported by the data.

Hypothesis 3. Value & Need Compatibility

Value and need compatibility was hypothesized to be positively related to the extent of adoption of IT disaster recovery methods. Evidence supporting this relationship was found among the data, with 7.79% of the data being coded for this variable. Value and need compatibility ranked third of all identified variables; thus, the third hypothesis is supported and was considered to be an important factor in the decision to adopt disaster recovery methods.

Hypothesis 2. Relative Advantage

Relative advantage was hypothesized to be positively related to the extent of adoption of IT disaster recovery methods. Evidence supporting this relationship was found among the data, with 7.54% of the data being coded for this variable. Of the four supported variables, relative advantage ranked fourth. While significant, relative advantage was least prominent among the factors that relate to the adoption of IT disaster recovery methods.

Unsupported Hypotheses

The remaining six hypotheses were unsupported as listed in Table 6a. The corresponding variables to the unsupported hypotheses are as follows: (a) complexity, (b) observability, (c) trialability, (d) socioeconomic status, (e) communication behavior, and (f) homophily. Together, these six variables accounted for 1.76%, or 14 times, of the coded data. Individually, no variable accounted for more than 1% of the data. Each of these hypotheses will be discussed in the following sections.

Hypothesis 4. Complexity

The extent of adoption of IT disaster recovery methods was hypothesized to negatively relate to the complexity of disaster recovery methods. Although this factor was present in the data, it represented 0.75% of the data. Complexity, therefore, was not considered to be an important factor by the focus group participants and the third hypothesis was not supported by this data.

Hypothesis 6. Observability

The extent of adoption of IT disaster recovery methods was hypothesized to positively relate to the observability of disaster recovery methods. This factor was marginally present in the data, representing 0.63% of the data. Observability, therefore, was not considered to be an important factor by the focus group participants and the sixth hypothesis was not supported by this data.

Hypothesis 5. Trialability

The extent of adoption of IT disaster recovery methods was hypothesized to positively relate to the trialability of disaster recovery methods. This factor was marginally present in the data, representing 0.19% of the data. Trialability, therefore, was not considered to be an important factor by the focus group participants and the fifth hypothesis was not supported by this data.

Hypothesis 10. Socioeconomic Status

The extent of adoption of IT disaster recovery methods was hypothesized to positively relate to the socioeconomic status of disaster recovery methods. This factor was marginally present in the data, representing 0.13% of the data. Socioeconomic status, therefore, was not considered to be an important factor by the focus group participants and the ninth hypothesis was not supported by this data.

Hypothesis 8. Communication Behavior

The extent of adoption of IT disaster recovery methods was hypothesized to positively relate to the communication behavior of disaster recovery methods. This factor was marginally present in the data, representing 0.06% of the data.

Communication behavior, therefore, was not considered to be an important factor by the focus group participants and the eighth hypothesis was not supported by this data.

Hypothesis 9. Homophily

The extent of adoption of IT disaster recovery methods was hypothesized to positively relate to the homophily of disaster recovery methods. This factor was not present in the data, representing 0.00% of the data. Homophily, therefore, was not considered to be an important factor by the focus group participants and the ninth hypothesis was not supported by this data.

Table 6b

Supported and Unsupported Hypotheses

Hypothesis Number	Variable	Supported
1	Disaster Recovery Methods	**Yes**
2	Relative Advantage	**Yes**
3	Value & Need Compatibility	**Yes**
4	Complexity	No
5	Trialability	No
6	Observability	No
7	Flexible Communication	No
8	Network Collaboration	**Yes**
9	Homophily	No
10	Socioeconomic Status	No

Summary of the Discussion of Results

Of the 10 hypotheses presented in this research, four were supported by the data while six were not. Table 6b summarizes the supported and unsupported hypotheses. The four supported hypotheses represented four variables – disaster recovery methods, relative advantage, value and need compatibility, and network collaboration – and represented 98.24% of the data. The remaining six – complexity, observability, trialability, socioeconomic status, communication behavior, and homophily – represented a drastically lower 1.76%.

Of the four supported hypotheses, three were factors that related to the decision to adopt disaster recovery methods. The remaining supported hypothesis related to the extent of adoption of IT disaster recovery methods that leads to perceived successful recovery after a disaster. The remaining three hypotheses relate to factors that affect the adoption. The order of importance of these by percentage was: network collaboration (28.20%), value and need compatibility (7.79%), and relative advantage (7.54%). Figure 6a shows these factors in a revised research model. The next chapter discusses the implications of these results within the context of the research design.

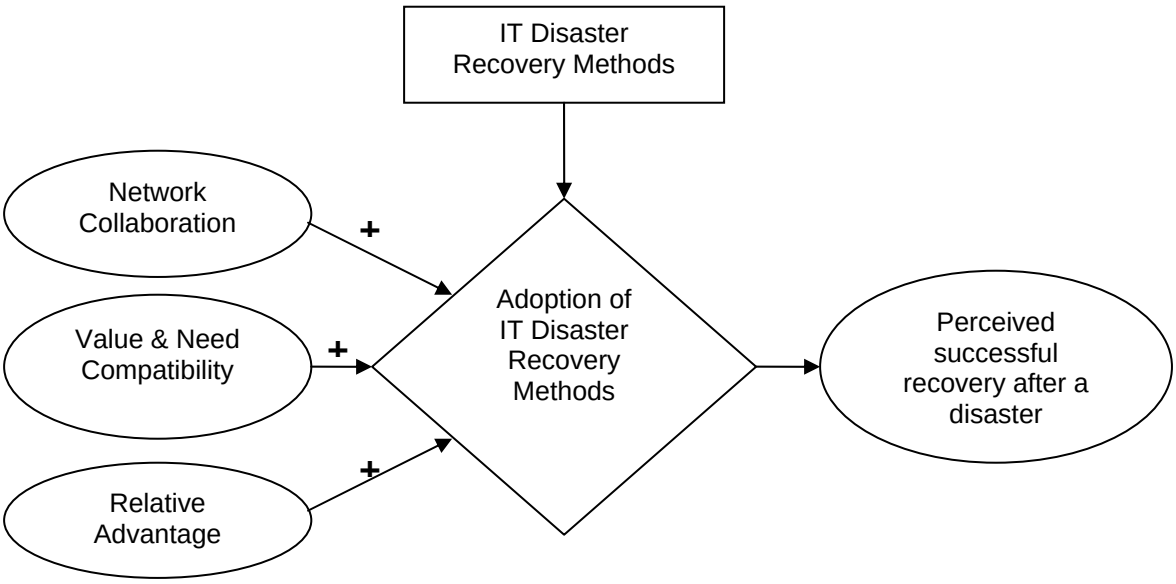


Figure 6a. Revised Research Model

CHAPTER 7: ANALYSIS OF RESULTS

The results of content analyses of the focus group discussions led to a revised research model. An additional benefit of the focus group research methodology beyond quantitative analyses is the inherent qualitative nature of the data. The data were coded as propositional coding units, which consider the context behind the qualitative counts. This chapter examines and discusses the results of the analyses in consideration of the underlying context and reveals six major findings: (a) the critical role of infrastructure data, (b) the dispersion of data across a network of stakeholders, (c) the different values placed on critical data among the stakeholders, (d) how past disasters influenced stakeholders' actions, (e) the likelihood that relative advantage does not play a strong role in disaster recovery, and (f) the reasons why many factors were not perceived to be important.

The Critical Role of Infrastructure Data

The most frequently coded factor in the analysis was disaster recovery methods, accounting for 54.71% of the data. Further investigation of this data revealed that 113 out of the 246 average coded data points for disaster recovery methods directly relate to the identification of critical data sources. During the course of reviewing disaster recovery methods from the literature, a compiled list of data source examples pointed to traditional data sources such as inventory records, personnel information, orders, invoices, payroll, customer databases, financial documents, mailing lists, and electronic

data interchange forms from vendors and customers, social security numbers, and customer credit card numbers. The discussants did specifically address these types of data, referring to data from approximately 14,000 customers, billing software, databases, and e-mail servers. Certainly, these data are critical and, if lost, the effort required to recreate them is potentially fatal to an organization and will detract from community stability. However, although they considered them critical, these data were not the major concern among the focus group discussants. Instead, they overwhelmingly identified the entire range of infrastructure data that is generated during construction, modification, and reconstruction of physical facilities as the most important priority for their community's recovery after a major disaster.

For the tourist-based economies in the Gulf Shores region, the physical facilities of high-rise condominiums and other rental properties are essential to accommodate travelers who, in turn, generate revenue for the community. The range of infrastructure data therefore includes "as-built" drawings of the original building properties, drawings of structural and property modifications, surveys of property lines, locations of structures such as fences and swimming pools, locations of sub-concrete utility access (water, sewer, telecommunications, electrical), and electrical plans. These data and any other information that is generated at any stage of construction or maintenance of real estate rental property are highly customized for each property and are typically stored as rolled drawings or in other physical forms. After the damage that inevitably follows a hurricane, having this data readily available greatly facilitates the restoration of damaged properties. However, despite the importance attached to these data by the focus group

discussants, at present the data are seldom available during reconstruction. Several times during the focus group, discussants identified cases in which organizations lost their entire infrastructure archive and had to recreate their records from scratch. On reviewing this finding, the executive director of the Baldwin County Economic Development Alliance commented:

> The focus group participants focused on the critical path data; if infrastructure data is not available and reconstruction cannot happen quickly, speedy data recovery by businesses in the coastal communities is irrelevant. They have no place to operate and no customers to cater to (from Appendix D).

Based upon these findings, the needs of a community are first to have the availability of critical infrastructure data to facilitate recovery and reconstruction. Only afterward do traditional data sources become meaningful to community stakeholders who are dependent on a location, such as the tourist-heavy beaches of Baldwin County.

Dispersion of Data across a Network of Stakeholders

According to the content analysis, the most important factor relating to the extent of adoption of IT related disaster recovery is network collaboration, which occurred 224.5 times on average (28.20%). This factor not only outweighed all the other adoption factors but also surpassed the next two most important factors combined (value and need compatibility and relative advantage, which combined to equal 15.33%). Network collaboration refers to an organization's level of involvement with the external environment, including competitors, customers, vendors, and regulatory agencies. The preeminence of this one factor indicates that the data that need to be backed up and

recovered cannot necessarily be assembled in isolation by a single stakeholder but must be coordinated and performed by a network of stakeholders.

From the focus group discussion, the network of stakeholders were identified as consisting of the real estate rental industry (e.g. property owners and managers, condominium association presidents and boards), the construction industry (e.g. builders, electricians, surveyors, inspectors, engineers, architects), local and state governments and organizations (e.g. city building departments and engineers, utility service providers), and the insurance industry (e.g. adjustors and providers). When the problem of restoring the viability of a community after a disaster is considered within the context of a network of related but independent actors, the problem becomes considerably more complex and the issue of who owns the infrastructure data arises.

Over time, the full range of infrastructure documentation that is generated during construction, modification, or reconstruction of buildings and condominiums becomes dispersed throughout the network of stakeholders. The actual construction of a property such as the one described by one of the focus group participants as an "18 million dollar condo on my two acre site" involves many sub-contractors and consultants, including architects, surveyors, and engineers. The data that they generate as they provide their services is generally passed on to another stakeholder in the network – for example, architectural drawings get passed on to the builder. The service provider, in this example the architectural firm, may keep copies of this data but usually stores them locally and there is no guarantee either of their survival or the ability to access to them in a timely

manner after a hurricane. The builder who hired the architect may no longer be in the region and the data is therefore lost to the remaining stakeholders.

As data are generated at each step in the construction process and in turn passed to the next stakeholder, municipal government officials in the city building department monitor the process by requiring periodic inspections and issuing permits based upon the submission and approval of certain plan documents. However, like local service providers, the city building department is not a guarantor of the long-term accessibility and preservation of this data. City officials in the focus group discussed how they had only recently converted this data into a digital format that is now stored on optical media. In the event of a hurricane, the digital storage archive can now be more easily moved to a safer location. Thus, while not embracing the full reach of available disaster recovery methods, the city building department is taking steps toward preserving this data. Unfortunately, despite these efforts property owners seeking a quick repair for their damaged condominium cannot rely on quickly retrieving the documentation from the city. The storage media that was moved for safekeeping might not soon be returned, and the city building department facilities themselves might be damaged. In addition to facing their own challenges of recovery, the city building department must attend to more pressing matters before approving permits and documentation for condominium repairs: tasks such as rebuilding roads and hospitals, restoring electrical power, and other infrastructure damage must take precedence over commercial interests. Compounding the problem of providing accessibility to data stored by the city is the sudden increase of

demand that the city building department, which is likely to be short-staffed, is not equipped to handle after a disaster.

Even in the event that the city was able to provide documentation in a timely manner, the data will not necessarily be either current or complete. Data reflecting modifications or reconstruction to a building and a property are not always required by the city or may not be detailed enough to be of any use. One participant's comments illustrate this problem:

> Electrical outfits have to be individually designed based on the building. Now, to have the plan to reconstruct the electrical fixtures for that condominium is a very sophisticated thing. I know for [the city water and sewer utility]…every lift station had a wiring mechanism that's different and so we had to take a design and have it reconfigured [after Hurricane Ivan] (from Appendix D).

The electrical plans are not required to be filed with the city and even if a condominium owner or group of owners elects to preserve these plans of their own accord, they still face challenges. Another member of the focus group, a current condominium association president, related his experience and viewpoint:

> It was by the grace of God that we found some plans for the building that we had. That helped tremendously in getting it rebuilt after the fact. The condo association and homeowners association are the same way, you have a file cabinet full of stuff or a briefcase full of stuff and it gets passed on to the next president or the next treasurer and the next one and somewhere along the way and they say what happened to the stuff three years ago and they said oh I don't know Sandy

> has it over there somewhere. Well Sandy's long since passed away, so now what do you do (from Appendix D)?

Data are dispersed along the network of actors, ownership and accessibility is ill-defined, and data is lost during frequent transitions between and within organizations. Individual property owners and the community at-large are interested in overall economic stability and sustainability. It would be equitable, then, for the burden of a post-disaster restoration to be carried by the owners and community, when in actuality insurance companies incur the restoration cost for the properties they provide insurance for. As one participant explained:

> It seems to me like the insurance companies really should keep copies of these plans. They're the ones that have to foot the bill for restoration. In the past they've really relied on the municipality to provide them with the plan (from Appendix D).

However, the proposed solution of having the insurance industry retain and be responsible for infrastructure data encounters the same problem of transition that the condominium associations face. The condominium association president pointed this out, saying, "Our insurance carrier changes all the time and the agent may even change from time to time simply because that's so hard to come by anyway." Several other group members noted that insurance companies will not store the data as a matter of incompatibility with their mission, which consequently was the next most identified discussion point.

Different Value of Critical Data to Different Stakeholders

Value and need compatibility was discussed most among the individual categorized factors (7.79%). Two stakeholders, namely the insurance industry and builders, were identified as having values that often run counter to efforts to preserve infrastructure data. Insurance companies "can potentially pay less" if, for example, outdated engineering documentation does not reflect recent property improvements such as the construction of a retaining wall or updating fixtures within the property. Similarly, builders are compensated not by the data they produce, but by the physical products they build. "[The builder is] not going to spend as much money up front as he probably should for the [owner's] sake because he's going to turn the keys over and walk away." Clearly, efforts to preserve engineering data that is dispersed over a network are often compromised by the contrary values of those stakeholders who have no vested interest in retaining the longevity of the data.

This factor also includes other sub-factors, namely a cue-to-action event, experience, previous practice, and felt needs. From the literature review, a cue-to-action event may trigger the perceived need for identifying and possibly adopting a particular innovation (Rogers, 2003). For Baldwin county, cue-to-action events are unfortunately plentiful. Discussants frequently spoke of hurricanes: Camille (1969), Frederic (1979), Danny (1985), Georges (1998), Ivan (2004), Dennis (2005), and Katrina (2005). These Atlantic hurricanes varied in force and impact on the region, but it was apparent that the focus group participants have these storms in mind when making managerial decisions.

The discussion also included not just personal experiences of hurricanes, but also what had been observed from within the community and nearby communities. Examples of specific large companies, including electric power providers and hospitals, that lost both physical facilities and their entire historical collection of records including valuable infrastructure documentation were described by participants. When speaking of the lasting damage caused by Hurricane Katrina and why some communities were unprepared despite the cue-to-action event of Hurricane Ivan only a year earlier, one discussant said that "they kind of ignored Ivan like it was not an event in [their] world." In light of the importance of a cue-to-action event in triggering the adoption of a particular innovation, this was an interesting and unexpected observation concerning cue-to-action events that occur nearby.

Stakeholders' Actions Differ on Potential Hurricane Warnings

When the cue-to-action event, in this case a hurricane, occurs directly within a community but only marginally disrupts business continuity and economic stability a false sense of security or complacency can ensue. As one discussant said of these near-misses, "we all survived Camille, surely there is no problem with [needing] any more protection." The others indicated their agreement: Hurricane Camille, some 38 years earlier, was still influencing people's thinking. Although much had changed since then, complacency and a false sense of security apparently dulled the readiness that might have otherwise stirred community leaders into action to preserve their businesses and community interests.

This mentality that remembers past successes and refuses to introduce radical new innovations when threatened by a cue-to-action supports the findings of the classical study by Tversky and Kahneman (1986). If Camille had not occurred, then perhaps the region would have been better prepared for Katrina after observing the damage caused by Hurricane Ivan. Ultimately, although cue-to-action events are an important driver for recognizing the need for disaster recovery methods, they can also induce complacency and a false sense of security. This finding shows that the sub-factors comprising value and need compatibility appear to be more nuanced than previously believed.

Relative Advantage Might Not Play a Strong Role in Disaster Recovery

Given the multiple stakeholders involved in creating, storing, and recreating the infrastructure data in a community, many of the discussants suggested that backing up and storing these data should be mandated by a city ordinance. These remarks were offered by the focus group members reluctantly because they were acutely aware of the sizable effort needed to formulate, enact, and enforce such an ordinance. To have the capability and knowledge to store, preserve, and provide access to infrastructure engineering documents on the scale needed in order to be effective is cost prohibitive. Cost is a sub-factor of the next most identified factor, relative advantage.

The need for efficacious preservation of infrastructure data was recognized by the focus group members, who next turned to evaluating the advantages of adopting disaster recovery methods compared to not adopting them. Relative advantage accounted for 7.54% of the data and was the last of the three factors found to be important in this study. This contrasts with the dated but often cited results of the Tornatzky and Klein's (1982)

meta-analysis that indicated relative advantage to be the single most important factor affecting the decision to adopt an IT related innovation. One possible explanation for why value and need compatibility eclipsed relative advantage as the prominent factor related to the decision to adopt disaster recovery methods here is the context of the present study. The frequency of coastal storms and the severity of their effect on the Gulf Shores region are never far from the thoughts of decision makers in the community. It is possible that the order of importance for these factors would be markedly different in a region more insulated from community-wide natural disasters. Without frequent reminders, a cost/benefit analysis might be a more pressing concern for decision makers. This is not to say that the decision makers in this study did not consider the relative advantage of adopting disaster recovery methods. As one participant stated about the constraints involved in achieving an ideal recovery solution:

> Probably the initial startup cost. Applying the scanning and digitizing equipment and the time it takes to scan and digitize all of your existing records. But once you do that, it's so much cheaper to actually store that electronically than to rent warehouse space to store your records (from Appendix D).

This statement illustrates how although costs are incurred, they create value that is greater than the initial cost. This group member also went into detail about the advantages that could be gained by protecting infrastructure data:

> One of the biggest issues with these commercial businesses, mostly condominiums, we have on our coast is the downtime and loss of rental income. So when you have to stop and have certain structural issues redesigned, the roof

> system redesigned, you have downtime and loss of rental income. As far as actual reconstruction goes, you are dealing usually with below grade utilities and things like that. That's where you really suffer when you don't have as-built type drawings. You lose your survey of the building and you don't know where to build your fence back and where to put the pool. Surveyors after these storms are in such high demand you can wait six months for a survey. So I'd say the largest financial impact is loss of use of the facility, that's the length of time it takes to restore the property (from Appendix D).

Still another participant estimated that the cost of reconstruction (not taking into account the loss of revenue) is more than double when infrastructure data is not available. Overall, the group felt that it was essential that this data be available electronically since the architectural and engineering fees to redesign the structure, depending on the size of the structure can be anywhere from 3% to 20% of the cost of the structure.

Theoretically, disaster recovery is classified as a preventative innovation, i.e. one that is adopted to reduce the likelihood of an unwanted event in the future. However, the time that elapses between adopting an innovation and experiencing the results of the innovation can be long and this can obscure the value of the initial adoption. The focus group members had overcome this potential constraint and clearly articulated the significant advantages to be gained by adopting disaster recovery practices over not adopting them. In this case, the frequency of coastal storms in the region renders the time lag characteristic to a preventative innovation irrelevant.

Non-Contributory Factors

Another theoretical factor that could explain the inaction of coastal communities is the perceived observability of adopting disaster recovery methods, which describes the degree to which an innovation is visible to others and can encourage its adoption. This factor was not identified to be significant, consistent with the earlier finding that stakeholders' actions differ after observing a disaster such as Hurricane Ivan. Could it be that observation does incite action but that disaster recovery of infrastructure data held by multiple stakeholders is too complex to implement? Not according to the focus group discussion in which complexity was voiced as a non-issue in comparison to issues of ownership of infrastructure data across a network. One participant expressed this as he sidestepped a direct question about technical complexity, "I think we've talked about the technology, that's pretty straightforward." The decision makers among the focus group were aware of third-party service providers, specialized IT staff, and university student interns as resources that could be utilized to diffuse the complexity of the process and preferred to discuss what they perceived to be greater problems.

Summary of Analysis of Results

Six findings from the results were discussed in this chapter: (a) the critical role of infrastructure data, (b) the dispersion of data across a network of stakeholders, (c) the different values placed on critical data among the stakeholders, (d) how past disasters influenced stakeholders' actions, (e) the likelihood that relative advantage does not play a strong role in disaster recovery, and (f) the reasons why many factors were not perceived to be important. These implications imply that the issue of adopting IT disaster recovery

methods is largely a problem external to an adopter, dependent on the interaction with others in a network. Data are dispersed among stakeholders with varying perspectives on the value of the data and who react differently to the threat of disasters.

CHAPTER 8: RESEARCH LIMITATIONS AND FUTURE RESEARCH

This chapter acknowledges and discusses the limitations of this research. No study is without limitations and recognizing these allow for the results to be taken in the proper context and not extrapolated beyond the intended scope. These limitations present areas that can be addressed by future research efforts. Along with addressing these limitations, other specific areas of future research are discussed in this chapter. These areas are intended to establish a program of research that will contribute to the greater understanding of disaster recovery, business continuity, and community sustainability.

Research Limitations

This research began by identifying related problems of business failure, data and information loss, extreme disasters, and sustainability of the overall community. These problems were looked at from theoretical and practitioner literature which led to the development of a research model and hypotheses. These were, in turn, tested by a research design that featured data from two focus groups and a content analysis technique with independent coding from an *a priori* specified codebook. The results of this process were reported, discussed, and interpreted within the context of this study. Each of these steps were purposefully taken so that this research would address a relevant and important problem in a scientifically rigorous manner. Despite the precautions taken to ensure rigor, there are certain limitations inherent to this research in the background, methodology, and results.

Research Background Limitations

The importance of this study was partially based upon statistics of reported business failure after both significant loss of data and disasters in addition to lack of continuity planning among organizations. These findings from previous studies were found to be commonly cited among literature in this research area; however, they were neither necessarily directly related to the research context of this study nor subject to scrutiny. These claims, therefore, were treated as assumptions of this research and this research is therefore limited to the degree that these assumptions are not applicable or not accurate; however, during the course of this research, no evidence contrary to these assumptions was discovered.

A related limitation is the non-precise estimate of the financial impact of disasters, for example, Hurricane Ivan caused an estimate $13 billion damages in the U.S. This estimate is not specific to the magnitude of financial loss that is attributed directly to the loss/unavailability of data and information. A precise measure of this loss would accurately gauge the scope of this research problem.

Another limitation of the justification of this research pertains to the literature and theoretical background from which the research model and hypotheses were developed. Literature was primarily identified from a search of the ABI/INFORMS database on several keywords related to disaster recovery. The results from this search were either included or excluded based upon reviews of their abstracts or examination of their text. This study is limited by the literature that provided its research and theoretical backgrounds.

Research Methodology Limitations

This research utilized the focus group and content analysis techniques. While these choices provided a realistic context to this study, they also limited the generalizability of the results and findings. The results may be applicable to other regions or similar participants; however, this study provides no support for these claims. The choice to limit the scope of this study made this study feasible but limits the results and implications to the participants and the region.

The content analysis is precise, but somewhat limited by the data generated by the focus group research method. Certain precise statistical techniques such as hierarchical regression, analysis of variance, structured equation modeling, and the like were not possible to use because the number of coders, hence observations, were only two. This limitation was imposed by the large magnitude of time and effort required by each coder to code the data set.

Another limitation is the method by which the codebook was derived. Even though the development of the codebook used for content analyses is up to the researcher so long as it is based upon theory and other rationale, it is limited by reflecting the perspective of just one researcher. The codebook was based upon past literature but not subject to external scrutiny.

The coding of the data is likewise limited by the constraint of the researcher's perspective. This limitation is controlled for by having independent coding and calculating reliability statistics. Reliability would be more precise by any of the following methods: (a) increasing the number of independent coders, (b) recruiting

coders from different disciplines, (c) including the participants of the focus group code as coders, (d) recruiting coders from both industry and academia, and/or (e) recruiting coders who differ on other potentially salient attributes.

Furthermore, the data collected from identified experts was self-reported. No corroborating evidence was collected as to the validity of their claims of the extent of adoption of IT disaster recovery methods.

Reliability measures were limited by not completing intra-rater, or stability, measures for the second coder for the initial focus group and for both coders for the confirmatory focus group.

Results Limitations

Any and all of the previously identified limitations to this research potentially limit the results. The results are limited by the context of the study including the region and number of participants.

Future Research

Despite the recognized limitations, the results of this research study lead to many areas of future research. Firstly, future research in this area can begin by addressing the limitations identified in the previously section. For example, the data analyzed in this or future studies can be done by more than two coders. In this manner, the reliability measures would be stronger even if the attained results are not significantly different. Beyond addressing the limitations inherent to this study, the following specific areas of future research are identified: (a) replication varied by region, (b) replication varied by

group, (c) replication varied by time, (d) vary the research method, and (e) revisit the theoretical perspectives of this research.

Replication Varied by Region

The results of this research study were limited by its narrow geographical focus. The coastal communities selected for this study were chosen in part due to their apparent needs after hurricanes and their willingness to participate. The research model and method aimed to study this region in depth but left questions that were beyond the scope of this study. Would results differ in non-coastal communities, in regions with a greater population, in rural or metropolitan areas, by economic makeup, and so forth? These questions of interest can be addressed by conducting similar research studies in other regions.

Studies of this nature face an obstacle of access to the community stakeholders including the burdens of identifying, recruiting, and scheduling focus group participants. Travel and expenses also can hinder employing the focus group research methods.

Replication Varied by Group

Two focus groups were held in the course of this research. Each group represented a niche of community stakeholders and decision makers. A community has many niches and future research in this area can identify and target other groups. The course of this research identified other possibly relevant groups including the insurance industry and condominium owners and managers.

Replication Varied by Time

A third way by which this study could be replicated is to keep the same region and participants but vary the duration of time lapsed between studies. Replication in this manner would create a longitudinal study to detect differences in the group after a given lapse of time. For this study, the nature of the difference should be theory-based and hypotheses should specify what variables would affect differences over time.

Alternative Research Methods

Still another area for future research in this area involves the use of research and analysis methods other than focus groups and content analyses. The survey research methodology can potentially collect data from a large population sample and be analyzed with precise statistical methods. The results could then be generalizable to a population larger than the one in this research study. The results of this study provide an empirical basis to develop such a survey. A draft of what this survey might look like has been completed and distributed for feedback. This survey is available in Appendix F.

Another alternative research method is to conduct a triangulation study in which focus group data that indicates the level of adoption among a group could be examined and correlated with financial metrics such as profits, revenues, and expenses. These two dimensions, adoption and financial metrics, measured over time would provide a third dimension that will contribute to the understanding the relationships between adoption of IT disaster recovery and successful recovery as indicated by financial performance.

Alternative Theoretical Perspectives

The results of this study indicate that the external factor, network collaboration, was most important in the extent of adoption of IT disaster recovery methods. This result was obtained after developing a research model based upon innovation diffusion theory. Perhaps alternative theories that are geared toward a social network perspective, such as the Actor-Network Theory, could contribute additional insight to this research area (Walsham, 1997).

Along the lines of looking at this research area from different research perspectives, the theoretical constructs could also be the subject of future research. For example, this study found a mixed reaction to disaster events: some were incited into action while others were lulled into complacency by past disasters. Further research into the value and need compatibility construct needs to address this construct's dichotomous nature. Disaster recovery methods, too, can be the focus of future research. Many varied methods were identified by this research, classified by recovery time objective and cost. It is likely that there are other possible important characteristics such as the complexity of the information technologies and systems that are being protected, the degree of integration between systems, and the degree of network collaboration among vendors, suppliers, partners, and customers.

Further Development of the Research Method

A final identified area of future research is further development of the research method. The coding for the content analysis was performed manually in order to capture the substance of the propositional coding units. Converting this process to a computer-

based coding scheme can greatly reduce the time spent coding, thus allowing for more text and transcribed discussion to be analyzed. Some computer programs available for use are *Diction 5.0*, *SphinxSurvey Lexica*, and *Nud*st 5* (Bashor, 2004).

Summary of Research Limitations and Future Research

This chapter acknowledged certain limitations in this study and presented several directions for further research. The limitations apply to the research background, methodology, and results; however, they do not necessarily detract from the results but merely restrict the applicability and interpretation of the results. Any of the limitations are also areas that can be improved upon in future research.

Areas of future research that were presented included replication by region, group, and time as well as alternative research methods and/or theoretical research perspectives. Addressing any one or many of these areas will extend the understanding in this research area.

CHAPTER 9: CONTRIBUTIONS & CONCLUSION

Notwithstanding the research limitations and research areas yet to be explored, this dissertation contributes to the academic research in information security, to disaster recovery practice, and to policy research. These contributions are discussed and followed by a conclusion which summarizes this dissertation.

Contribution to Academic Research

The contributions of this dissertation for academicians is that a theoretically derived and empirically validated research model (see Figure 9a) has been developed for further examination and development in the area of information security research. Such a model has not been identified in the past literature. This model could form the basis of future research opportunities for academicians. Another contribution is the development of the codebook to interpret focus group results. Further research can be performed to computerize the codebook.

Contribution to Disaster Recovery Practice

The findings from this dissertation are grounded in a realistic context and thus contribute to disaster recovery practice. Foremost, community stakeholders ought to consider disaster recovery not in isolation but from a holistic, interdependent network perspective. Knowing that successful recovery of an organization is precipitated by the successful recovery of critical community infrastructure, proactive managers can take steps to encourage faster recovery after a community-wide disaster. Community

stakeholders can procure engineering documentation regarding their facilities and the interfaces with public and private utilities and infrastructure. For example, community stakeholders can collect architectural drawings during facility construction and prior to a disaster. This information can be digitized and stored by the organization by IT disaster recovery methods. Taking ownership of data that traditionally is not the focus of organizational disaster recovery planning efforts will facilitate post-disaster inspections, insurance settlements, reconstruction, and resumption of business operations. Without a proactive strategy this information needs to be recreated at considerable cost and time spent before operations can resume. Consider the following statement from a focus group participant:

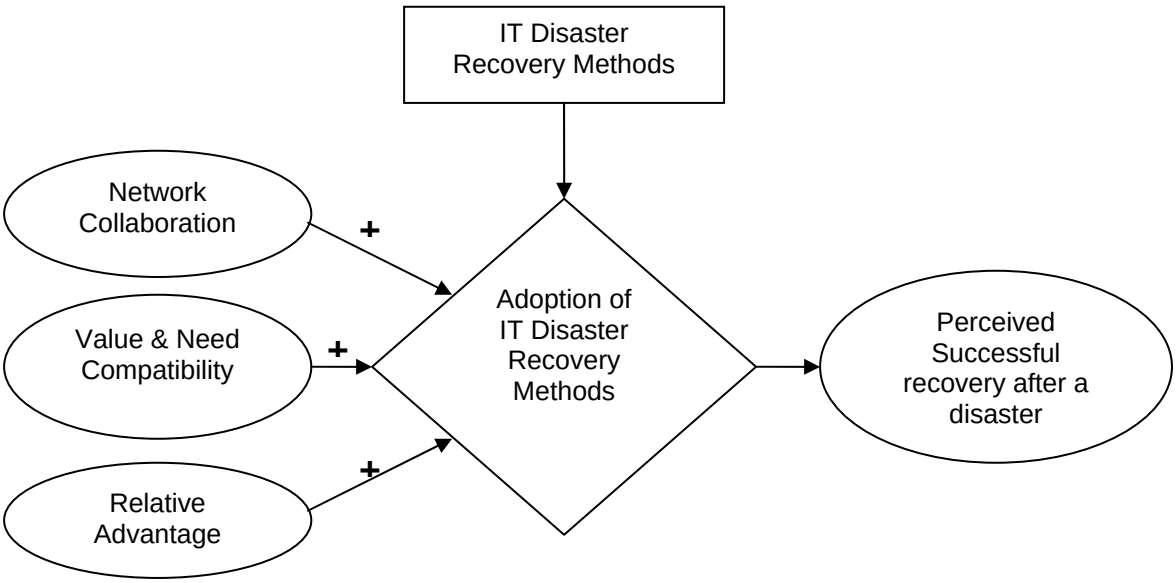


Figure 9a. Re-Presentation of Revised Research Model

> You also have the cost of going in there with jack hammers if necessary, or surveying and testing so that you can locate the utility lines with your sonar or whatever. Non-destructive/destructive testing to locate utilities is one of the most expensive items. The actual engineering and architectural cost of reconstruction is more than double the cost of the original building. You've got to know where the pilings are and none of these things are visible; they all have to be fleshed out to be determined to be where they are. So it could cost if you have a severe loss. In all probability, you're better off just to bulldoze it and start it over brand new, which would probably cost you less money than trying to find the substructures on what you already have. If you have the digital plans it's a different story; you know where to look (from Appendix D).

Another implication for managers who take a holistic and networked view of disaster recovery is the return of people – employees, service workers, and customers – to the community. Even when physical facilities can be promptly restored, employees may not be able to return to work if their homes were damaged. Furthermore, employees are dependent on many service providers such as child care, health care, and schools. Without the recovery of the many interdependent stakeholders in the community, an organization may not have employees who are able to return to work. For this reason, community stakeholders ought to consider their role within the community and collaborate with each other to address the recovery of areas of the community that they are dependent upon. Recognizing the deep interdependencies of an organization and its

community may contribute to holistic strategies that lead to a more graceful recovery after a disaster.

Contribution to Policy Research

This dissertation also contributes to those who are most closely concerned with the problem of the recovery of a community after a disaster, namely, municipal government officials. The first focus group participants, in recognition of the vast scope of the network interdependent view of disaster recovery, continually suggested that a policy or ordinance mandated by the city or state governments that would require critical infrastructure data to be stored and backed up as new buildings, roads, and utilities are installed in the region and to have a disaster recovery policy and implementation plan so that the data can be restored quickly after a disaster. The discussions highlighted the need for digitization and use of global positioning system (GPS) coordinates and geographical information systems (GIS) to locate infrastructure elements after a disaster.

Efforts to formulate, enact, and enforce an ordinance of this type that affects many network stakeholders is a massive undertaking. The city officials who participated in the confirmatory focus group agreed that a regulatory mandate is needed but recognized that doing so is not a matter of usual business.

Economist Pietra Rivoli (2005) asserts that U.S. cotton farmers have enjoyed a comparative advantage over farmers in other regions, in part because of the virtuous circle between the farmers, private companies, universities, and the U.S. government. The relationships between each network actor are symbiotic, leading to mutual benefits while insulating farmers from risks inherent in the market. This same notion of a

virtuous circle was expressed by focus group participants, if not necessarily in those words. To accomplish the task of collecting, protecting, and effectively using critical infrastructure data in the interest of post-disaster recovery, external relationships with mutual benefits need to be forged. Insulating communities from the effects of disasters involves various institutions: universities, local and federal governments, and private companies. Those communities that exercise entrepreneurial behavior to best identify and forge symbiotic relationships will presumably experience more successful post-disaster recoveries. Otherwise, such a complex task is difficult to accomplish under the usual trappings of a tax-funded, political organization.

In the case of the communities under study, a virtuous circle is already being assembled. Auburn University faculty and students are involved in building the business case and technical specifications for a GIS that will alleviate the hurdles of adopting IT disaster recovery methods such as dispersion of data across a network and varied responses to disaster warnings. These steps will lead to a pilot program that will in turn build a case for funding of a production scale system. At each step, the community benefits but so do other involved agencies: university students gain real-world experience, faculty gain research and service opportunities, communities obtain relevant information at minimal cost, while funding agencies pay for preventative solutions to disaster recovery that will ultimately reduce the total expenses for these efforts. In effect, the virtuous circle overcomes barriers that exist when organizations formulate disaster recovery plans in isolation from one another.

Conclusion

This dissertation addressed the interrelated problems of business failure and data and information loss when communities experience extreme disasters. The question of what factors are important to community decision makers regarding the adoption of IT related disaster recovery methods was posed and addressed to contribute to the understanding of the identified problems. A research model was derived from which 10 hypotheses were developed. A research design and analysis procedures were devised and enacted. Data were gathered from two independent focus groups with identified experts and stakeholders of two neighboring coastal communities. The data were analyzed by the content analysis technique with independent coding from an *a priori* specified codebook. The results of this process were reported, discussed, and interpreted within the context of this study.

The results of content analyses of two focus groups among community stakeholders in coastal communities indicated that network collaboration was the most important factor related to the extent of adoption of IT disaster recovery methods. From this and other results, this research study concluded that communities interested in recovery and sustainability after a disaster should attempt to form relationships with external institutions and organizations to accomplish an otherwise overly difficult task. The difficult task is to facilitate post-disaster recovery by collecting and preserving all critical data that are useful in recovery efforts. These data include the full range of infrastructure data that tend to be dispersed across a network of actors who possess varied values on critical data and react differently to disaster warnings.

The contributions of this dissertation include a theoretically derived and empirically validated research model that is a platform for future and more comprehensive research in this area. Community stakeholders and especially those involved in public policy are advised from the results to recognize the deep interdependencies of organizations and the community as well as the value of engaging in relationships to overcome the task of collecting, protecting, and effectively using critical infrastructure data in the interest of post-disaster recovery. The culmination of these efforts can extend the sustainability of communities. Disaster can strike without warning; however, a graceful recovery is possible so long as community decision makers purposefully seek to understand the collaborative efforts necessary to overcome the complexities of community disaster recovery planning, such as those advanced by this dissertation.

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APPENDIX A. COMPLETE LIST OF DISASTER RECOVERY METHODS IDENTIFIED BY DELPHI PARTICIPANTS

Provide remote access to data and e-mail via the Internet

Maintain all pertinent data on servers, not desktops or laptops

Ensure technical IT expertise to perform actual practices

Test restoring data to ensure accuracy

Set up communications alternative to phones for contact with vendors and support

Devise a comprehensive recovery plan for daily to large scale emergencies

Designate roles and responsibilities

Plan to restore data

Establish a single communication touch-point for employees

Perform a risk analysis to identify real threats

Store digital media (e.g. magnetic tape) off site

Unplug all electronics

Move computers away from windows and off the floor

Plan for continued access to facilities

Select geographically diverse service providers (e.g. web hosts and data centers)

Prepare a public relations statement to inform the press and public

Pre-arrange stand-by power with ample fuel and access to re-supply

Update a website for communication with partners

Access to facilities (esp. leased, pass/fee for reentry)

Perform daily backups of server data onto storage media

Backup desktop data as needed

Test restoration using alternative hardware

Cover unplugged electronic equipment with plastic sheeting

Remove hardware from facilities

Ensure business IT expertise to assess value of data

Plan to rebuild servers

Simulate an emergency

Purchase business disruption insurance

Use of geographically diverse data center over the Internet

Store at a nearby facility for fast access

Store a geographically diverse location to minimize risk

Locate servers in a secure room

Relocate hardware to a dedicated hosting center

Plan for continuous power (electricity preparedness)

Establish a line of credit with a bank to ensure cash flow

Use of Internet-based e-mail (e.g. Google's Gmail)

Establish a toll-free number for communication with employees

Logoff from and shutdown computers

Charged laptop batteries

Use battery backup for hardware

APPENDIX B. THEORETICAL PERSPECTIVES REVIEWED FOR THE RESEARCH MODEL

The theoretical perspective of innovation diffusion has proven to be useful in explaining a wide variety of phenomena over many years and across many different disciplines. Rogers (2003) provides an extensive review and synthesis of innovation diffusion theory, tracing the research tradition from its origins in rural sociology in the 1940s to its current application in major research areas. It is well-grounded in logic and practice as well as transferable across a wide spectrum of disciplines, cultures, and artifacts. IS researchers frequently cite Rogers' (2003) work, adapting many tenets of innovation diffusion to study the phenomena of adoption and implementation of IS. For example, studies by Cooper and Zmud (1990) on the implementation of Material Resource Planning enterprise software; Hu, Saunders, and Gebelt (1997) on IS outsourcing; Agarwal and Prasad (1997) on the adoption of the World Wide Web; Pathasarathy and Bhattercherjee (1998) on online service use; Karahanna, Straub, and Chervany (1999) on contingent adoption of the Windows 3.1 operating system in a large financial organization; Purvis, Sambamurthy, and Zmud (2002) on the assimilation of computer-aided software engineering technology; Sharma & Rai (2003) on the adoption of computer-aided software engineering; and Yi, Jackson, Park, and Probst (2006) on the acceptance of personal data assistants among healthcare professionals, share this common approach.

Cooper and Zmud (1990) posit six stages of IS implementation that are connected to IS adoption, namely initiation, adoption, adaptation, acceptance, routinizaiton, and infusion (Sharma & Rai, 2003). The last of these, infusion, is similar to concept of assimilation in Purvis, et al. (2002) study of knowledge platforms. The six stages of adoption and assimilation concept corroborate the innovation-decision model, as depicted in Figure 2-4.

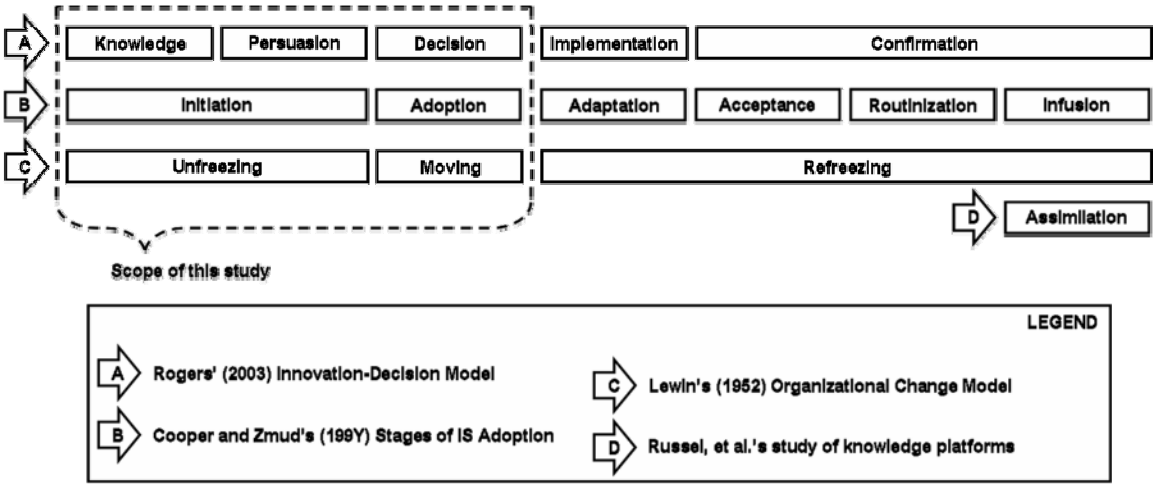

Figure B1. Synthesis of Alternative Innovation Models

Another theoretical perspective that has been applied to innovation is that of Lewin's (1952) organizational change, which involves the processes of unfreezing, moving, and refreezing (Prekumar, Ramamurthy, & Nilkanta, 1994). These stages can also be mapped onto the innovation-decision model of innovation diffusion theory: unfreezing involves accumulating knowledge and being persuaded about the change, moving involves enacting and implementing the change, and refreezing involves confirming the change in an organization.

Upon establishing the alignment of innovation diffusion theory with other prominent theoretical perspectives, the factors relevant adoption are of interest. Cooper and Zmud (1990) describe rational and political forces that affect enterprise-wide system implementation; Karhanna et al.'s (1999) view of innovation diffusion theory includes perceived attributes, communications in the social environment, and individual attitudes and beliefs; and Hu, et al. (1997) recognize that outsourcing choices hinge on internal and external choices. The technology, organization, and environment framework (TOE, Tornatzky & Fleisher, 1990) has been used to classify the factors of innovation diffusion (Sharma & Rai, 2003).

Table A1 synthesizes the categories of factors from previous studies as either internal and external to aid in understanding the factors affecting the adoption of disaster recovery methods for small businesses.

Table B1

Summary and Classification of Reviewed Factors Affecting Adoption

Internal Factors	Source
Rational	Cooper & Zmud, 1990
Perceived	Rogers, 2003
Perceived attributes	Karahanna, Straub & Chervany, 1999
Technology perceptions	Tornatzky & Fleisher, 1990
Internal	Hu, Saunders, & Gebelt, 1997

External Factors	Source
Political	Cooper & Zmud, 1990
Social environment communication	Karahanna, Straub & Chervany, 1999
Environment	Tornatzky & Fleisher, 1990
Cultural attitudes/beliefs	Karahanna, Straub & Chervany, 1999
Organization	Tornatzky & Fleisher, 1990
External	Hu, Saunders, & Gebelt, 1997

APPENDIX C. FOCUS GROUP DEMOGRAPHIC SURVEY

AETAP Disaster Recovery Focus Group
2 February 2007

Statement of Confidentiality

All information obtained in connection with this study will be held in strict CONFIDENTIALITY as mandated Auburn University's Institutional Review Board. All information obtained in this study will be used in aggregate and individual responses will be UNIDENTIFIABLE. Upon conclusion of the study, all identifiable data will be destroyed.

Information collected through your participation may be used to fulfill an educational requirement, published in a professional journal, and/or presented at a professional meeting. You may withdraw from participation at any time.

Your decision whether or not to participate will not jeopardize your future relations with Auburn University or Alabama Cooperative Extension Services or the Baldwin Chamber of Commerce.

If you have any questions we invite you to ask them at any time.

Demographic Information

1. What is the name of the organization?

2. What goods or services does this organization produce?

3. How long has this organization been in business?

4. What is your job title?

5. Approximately how many years have you been employed at this organization?

6. How many people are employed in the organization?

Provide a specific number:	***OR***	*Check one of the following categories:*
		☐ 1 to 5 employees

— _____			☐ 6 to 25 employees ☐ 26 to 50 employees ☐ 51 to 100 employees ☐ More than 100 employees

7. What are the organization's annual revenues?

Provide a specific dollar amount:	***OR***	*Check one of the following categories:*
$_____		___ $0 to $50,000 ___ $50,000 to $100,000 ___ $100,000 to $200,000 ___ $200,000 to $500,000 ___ $500,000 to $1,000,000 ___ $1,000,000 to $2,000,000 ___ $2,000,000 to $5,000,000 ___ Greater than $5,000,000

Organization Structure

8. Is this organization independently / privately owned?

Circle one: YES NO DON'T KNOW

9. Is this organization family owned?

Circle one: YES NO DON'T KNOW

10. Are the organization's owners involved in managing daily operations?

Circle one: YES NO DON'T KNOW

11. Do most of the employees work at a single location?

Circle one: YES NO DON'T KNOW

12. At what level in your organization are decisions about Information Technology (IT) made?

Circle one: OPERTATIONAL MANAGERIAL DON'T KNOW

13. Does this organization have formal IT positions?

Circle one: YES NO DON'T KNOW

14. How many employees are designated as IT staff?

Provide a specific number:	***OR***	*Check one of the following categories:*
_____		___ 1 to 5 employees
		___ 6 to 25 employees
		___ 26 to 50 employees
		___ 51 to 100 employees
		___ More than 100 employees

APPENDIX D. INITIAL FOCUS GROUP TRANSCRIPT

Speaking Turn Report

Turn No.	Speaker	Start Time	Text
1	BF	00:00:21	I'm Brandon Franklin, Building Official for the City of Gulf Shores.
2	CH	00:00:26	My name is Chuck Hamilton, I'm the past Public Works Director for 20 years for Gulf Shores, AL. I am a registered [Public Engineer], Alabama
3	DS	00:00:35	David Sharp for C-Sharp Company. We are a licensed general contractor specializing in commercial building restoration.
4	BH	00:00:43	I'm Bob Higgins with the Baldwin County Economic Development Alliance, and maybe bring another add to this too as also the view of a Condo Association President on the beach after this hurricane [Hurricane Katrina].
5	RH	00:00:56	Richie Heard, Thompson Engineering. I, Lou and Mark are active in Baldwin County. I spent [2004] [hurricane] season and [2005] [hurricane] seasons working for FEMA and the hurricane recovery efforts.
6	CJ	00:01:13	I'm Clifford Johnson, General Manager of the Utility Board for Gulf Shores in this area, mainly providing water and sewer service.
7	BS	00:01:21	I'm Bob Steiskal. I'm a fairly long time and a resident of Gulf Shores over 22 years. Since residing here shortly thereafter began working with the Planning Commission in the 5th Ward in Gulf Shores currently for the past 3 years and Chairman of the Planning Commission in Gulf Shores. Prior to that I was in structural engineering, in manufacturing and in northern communities, Chicago, Illinois.
8	RL	00:01:49	I'm Roger (inaudible), Chief Inspector in the City of Orange Beach pinch hitting for Landon Smith.
9	LN	00:01:56	I'm Lewis Neuman, I'm a registered roof consultant, I'm with Thompson Engineering. I've been there 15 years. Primarily working here in the Gulf and was involved in about 400 inspections after both Ivan and Katrina.
10	MS	00:02:20	My name is Mark Saunders I'm a Civil Engineer with Thompson Engineering and along with Lou. I've been doing a number of forensic investigations and storm damage due to the past hurricane
11	BC	00:02:33	My name is Barry Cumbie. I'm a Ph.D. student in Management Information Systems. I'm studying Electronic Data & Computer Systems especially in small businesses and how they recover after a hurricane.

Turn No.	Speaker	Start Time	Text
12	RM	00:02:48	I'm Raj Mohan, Professor of Sociology at Auburn.
13	DB	00:02:52	David Beale, Professor of Mechanical Engineering at Auburn.
14	CS	00:03:59	I'm Chetan Sankar, I'm a Professor of Information Systems in the College of Business at Auburn.
15	PR	00:04:01	Okay, thank you all and I'll give you a brief outline of what we do at the Auburn Engineering Technical Assistance Program. The idea here is first I will give you an introduction of myself. Then Dr. Beal and then Barry, and then a few minutes of discussion and then probably have lunch, then start your focus group. We'll make this very informal so please stop me at anytime. [Presentation of AETAP continues until 15:55]
16	CS	00:15:56	Okay, I think as Dr. Raju said, you heard the formal presentation and here we want you to talk. I think I was telling most of you when you walked in we are all academicians we can all tell you the great things we can do but really we want to listen to what problems you have and given our expertise. We have two major things we are looking for Dr. Beale, he works in the mechanical engineering department and one issue that is there, he is talking about how to secure the equipment and installation of equipment around buildings you know like when a hurricane hits and I think he is going to ask you more questions that will lead to discussion. And the one other area which I am involved in which Barry Cumbie here, a PhD student, is doing his dissertation. He's interested in information systems, what happens when a hurricane hits. If you do not back up your system and your computers go all washed out full of water. Or people you know about what happens. How do they take care of their disasters. And most of the time when we have a real disaster we want to get out with life. We are not worried with systems. But later on that becomes an issue. So those are the two areas that we want to have a discussion. Barry is going to lead that discussion. So that's what it is and I think I will leave it to…Barry are you going to start first.
17	BC	00:17:39	Okay, I think if you move to the next slide.
18	CS	00:17:39	When are we going to get to lunch, what's the plan. [laughter] I can tell you we all have different things around a business faculty, sociology – he is the guy who runs the focus group – so he is our moderator so whatever he…
19	RM	00:18:00	Once Barry is done, and we can get the discussion going, anybody can pick up food and start eating and we can talk, we can eat at the same time.[agreement]

Turn No.	Speaker	Start Time	Text
20	CS	00:18:12	Is that okay with all of you?
21	CH	00:18:13	I told them by the way I was impressed with an engineer, a sociology guy and a business management guy all managed to make it down in one piece in the car. [laughter]
22	BC	00:18:29	I guess I'll get this discussion started off. I'll give you a few topics to think about. I'm really looking the problem of inclement weather, hurricanes, disasters, as it relates to information systems. I know most of your background is in facilities and construction so if you don't have extended experience, that's okay. but I'd like to know the personal experience in your company, or anecdotal evidence, or anything that you might have might that relates. (00:19:10): And we looked at the problem and why I'm focusing on this In my dissertation research we're really looking at small business. Those are the ones with 500 or less employees and then we narrow that to very small business, those with a hundred employees or less. Because the nature of Information Technology is the big technologies that have been reserved in the past to big corporations kind of trickled down to the consumers and smaller businesses. But with that trickling down the numbers kind of suggest that they haven't had the same expertise or vigilance to enact disaster recovery plans at the same time. (00:00:00): If you look at these statistics and you note there is a high number of businesses that fail immediately following a disaster. And then afterwards, in the next year, 23% of those that survived fail. And Then the big one that hit me was a survey that indicated that 93% of businesses, and this is after a 5 year span, fail due to a significant data loss. So that could be spilled coffee, tripped over a wire, flood, or somebody who push a wrong button. So after that data loss that was a driving force as to business failure. (00:02:24): And then looking on top of this is a Gartner survey said most of these small firms don't have a disaster recovery plan in place. So taking these elements together there is an opportunity that these small businesses (inaudible) try to get past the first five years to get up on their feet and survive, so they can have a long term sustainability, especially in areas such as Baldwin County or all areas of the nation are affected by some form of natural disaster. We have recent memory of the types of events that can happen. (00:02:07): Our first topic will be your experience and to discuss the most common data losses that you have observed after hurricanes and consider the financial loss caused by that lost data. Keep in mind what are those critical data sources, what data do you have to have to make sure you operate tomorrow or maybe a week form now or maybe three weeks from now. So if anybody wants to kick us off.

Turn No.	Speaker	Start Time	Text
23	RM	00:21:30	And I might add as some of you are involved in business and some of have personal computer at home, What do you do when you just lose all your data. You know, when hurricanes come, you are just getting away from it and leave everything behind. So what are the safeguards? What do we do?

Turn No.	Speaker	Start Time	Text
24	CH	00:21:51	Well, Let me just say from the City of Gulf Shore's standpoint is obviously the thing is make sure you don't lose your data from the beginning. In other words, we have servers, what are we doing right now, let me give this gentlemen someone's name, Diane Brown. She is a graduate of electrical engineer, and was vice president of a wireless company. We were lucky to get her. We now have her employed with us; she's out IT and she is working on this right now. The key is to get your servers up, get them out of flood plane and get them up on the second floor, make sure they are in buildings that will at least sustain a 120 mile per hour winds if not 200 miles per hour winds and at the same time when the hurricane hits, one of the city procedures that we have is that we cover all of our computers with plastic bags. A procedure we do before we leave the building or even while we're in the building we cover all our computers with plastic bags and of course our servers get covered as well and the servers are in large equipment cabinets. We are currently working on this very thing to make sure that even when and if we build our 200 mph [facility] which is really going to be City Hall. And the plans for City Hall will be to get our computers upstairs and we get the servers in a place where the Hurricanes simply cannot get at them with Wind or Water. A fact that a gentleman who runs this building [Herb Malone] doesn't like to hear me talk about this too much is the tourism here. I know Bob might be able to identify with it. The truth is you have a category 5 hurricane on the Alabama, Mississippi state line in high tide. The entire pleasure island will be under water with the exception of a small segment up there near Ft. Morgan Road, a whole lot. That's how bad the storm surge is going to be, and you think in those terms we had a very good coastal engineer estimate that we could have as much as 8 feet of water by the Adult Activity center which is like two buildings down from City Hall. That's the worse case scenario risk assessment on that is probably one-one hundredth of one percent (00:24:10). I don't know what it is, It's very slim but it could happen. You have a category 5 hurricane with a 200 mph sustained wind in Biloxi, MS in 1969 – Hurricane Camille. So those are the actualities, so to answer your question short term, you get the electronic gear up get it on the second floor your servers. Cover your computers and try to make you WAN – wide are network which means the wires need to go underground. Now if you talk about Gulf Shores, most of your fiber optic trunk cables – Gulf Telco, Southern Light – your DSSI, they've got most of their trunk cables underground; some of them are on poles but not a lot of them. So the objective should be to get the trunk cable underground, get the power underground and that's something we're doing in Gulf Shores; we're trying to get all of our power underground in the next 10-15 years. But get this stuff

Turn No.	Speaker	Start Time	Text
			underground so hurricanes can't get out unless it's storm surge down the beach which is another issues probably better off overhead, but you might lose it anyway but you can put it back up a lot faster. You don't want the storm surge to get into it.
25	BC	00:25:35	How does that resonate with anybody else with what's going on in your company?
26	LN	00:25:46	We'll go from a corporate standpoint. We're moving all of our servers into our original location in Mobile which is a firmly in place concrete cast building and everything will goes there providing secondary back-up power there so that it can continue to operate. And of course every [inaudible] Baldwin County and elsewhere in the nation are all being downloaded to mainframes and servers there they tell me on a daily basis; I don't know. I'm sitting there watching the computer and all of a sudden somebody else has control of it. It's like for a few seconds so that's the way we do things, of course, backing up everything so that you can have the ability to switch our controls from Mobile to our offices in Tennessee or someplace like that during hurricanes so that we can continue to operate. We've also instituted a policy where we have a phone number to call in case we're down and they tell us what to do and that's some type of service provided not within our company. But somehow we need to get back to this magic phone number that we're suppose to keep in our wallets.
27	DS	00:27:20	Our company is local, our primary office is here in Orange Beach and we have a method of doing a back-up electronically of all of our mainframe systems on a daily basis. There are actually companies out there that provide that service for small businesses that can do an automatic run daily back up. So you have electronic back-up issues and then some things are just physical documentation that are not cost effective to record those data electronically. And in our case we have to physically move a lot of building plans and blueprints and things like that that we actually use to restore existing buildings and we have lost some of those in the past due to rising flood waters when those were stored at the actual site that needed restoration. It sounds like an easy lesson but it's harder than you think. A lot of the businesses that operate on the coast, commercial businesses, they actually store all of their as built documents; things like that are hard to transfer to electronic files, they store them on site which is obviously an issue that should be addressed.
28	BC	00:28:24	So your saying you use a third-party company or you do everything internally?

Turn No.	Speaker	Start Time	Text
29	DS	00:28:35	I don't handle that function in our business, I think it's done internally. Our system at a certain time in the p.m. run an automatic back-up that is obviously stored on a mainframe inland. So if our physical hardware is damaged we can just have a second set of hardware and start operations the very next day. That's how our company deals with that.
30	LN	00:29:01	One thing that you will notice during the inspections after Ivan in Orange Beach and Gulf Shores is that a large number of condos that were inundated lost records that were on their first floor office areas.
31	RH	00:29:21	[Did you say] condos?
32	LN	00:29:22	Yeah. Condos, You know you had an on-site advantage. For some reason those were on the first level. First level kind of got a little damaged during Ivan. Four feet in some cases or more.
33	MS	00:29:40	But that's not just condos and small businesses. David mentioned flat files and rolled drawings. Alabama Power is a prime example in Mobile. Alabama Power has been there for 150 years and all of their documents from 150 years were, guess where? [laughter] [agreeable murmurs] (00:29:54): In the basement. And what happened to the basement that's on Royal Street or St. Joseph Street; not only did the waters come in but basically the river and the mud that came with it.
34	LN	00:30:08	We had the same problem at the hospital in Keesler over in Biloxi. All of their engineering records were on the first floor. There are no engineering records there had to re-create the entire documentation of that whole hospital.
35	MS	00:30:26	The same thing happened with the municipalities over three on the Gulf Coast. During our forensic investigation we asked the city building department and city engineer if we could see the drawings of this such-and-such building. They say, "No. no more drawings, they're gone".
36	RH	00:30:39	They're all gone.
37	MS	00:30:40	Long Beach, Biloxi, Gulf Port all their engineering records are all gone.
38	BC	00:30:44	So do you have to retroactively recreate those or…
39	CH	00:30:49	You have to take a wild guess.
40	DS	00:60:51	Well, probably not because a lot of that has been added on the as-builts if there ever were as-builts are gone.

Turn No.	Speaker	Start Time	Text
41	CH	00:30:58	You go to the Mississippi Coast and you see nothing but slab, slab, slab, and you want to know what used to be there, there is no record.
42	DS	00:31:04	It's a huge impact on the restoration cost, especially with underground utilities and services. Some of those items are actually salvageable but they are damaged in the reconstruction process. You don't know where to dig or what you're looking for. So when you lose certain as-built documents, the cost of restoration goes up tremendously.
43	CH	00:31:25	How much if any of those documents were scanned before the hurricane? Did any of the municipalities have any scanning capability that they were actually pursuing?
44	BH	00:31:34	Not that I'm aware of. Long Beach, they said they had zero records. Same thing in Biloxi, maybe Gulf Port had done some
46	DS	00:31:44	I'd be surprised if they're already scanned over there unless there was a grant that was given after Ivan came through in [2004].
47	LN	00:31:52	They kind of ignored Ivan like it was not an event in our world and then Katrina brought lessons over there where Ivan brought lessons over here. That you need to do something that had not been done since Frederick. The changes.
48	BS	00:32:14	What about Mississippi communities who had experienced from the various storms, you know, you mention Camille…
49	LN	00:32:23	They never had one since Camille.
50	BS	00:32:25	Well, you know what happened was they were hanging on their laurels and whatever they had learned from Camille had gone by the wayside
51	CH	00:32:32	and a lot of people said, "Shoot, we all survived Camille, surely there is no problem with anymore protection [several agreement]
52	BS	00:32:38	Actually there were people in that area that knew the buildings that survived Camille and that's where they went during this event because they thought well the school survived or the bank vault survived and it didn't survive this one. It was well known in the sociology of the area, this building survived so it's a safe building.
53	BH	00:33:01	Cliff, how about utilities? What did you guys do for backup?

Turn No.	Speaker	Start Time	Text
54	CJ	00:33:04	Well, I mean, we do daily back-ups. We have a vault, concrete vault, which probably if we have 8 ft. of water all the way up to City Hall probably wouldn't help much on the vault. We, in addition to that, we usually have 3 back-up tapes. One stays in the vault and two goes with the individuals to wherever they may lead to. That way the most information that we would lose is one day of record-keeping. But the key to us would be having all of our customers back. As water andv sewer utility we had going on somewhere around 9,000 water customers and 5,000 sewer customers and just having those names, those addresses, and things of that nature and trying to recreate that would just create a tremendous amount of work not knowing who those individuals are. So we try to keep multiple back-ups and when the storm comes we move them with individuals that may go as far north as they can and also maintain in our vault. We put our file servers in our vault thinking about what Chuck said probably need to look at our vault system and try to make them watertight rather than just wind proof and rain proof. But from the data processing that is where the key to us. You can replace computers fairly easy, normally, and long as you have the mainframe and your tapes. We feel like we can re-create most of the information fairly quickly.
55	BC	00:35:01	Have you done that in the past? Have you had to or have you tested it?
56	CJ	00:35:04	We have. We've always had the situation where – well, really Ivan is the only storm that we really experienced any major storm around here with the size of our utilities. When Fredrick was here, I was in my 20s and I was not a part of the utility board. The system wasn't that big when Frederick came through. Only in the last 10 or 15 years have we really exploded in the number of customers we have. So you know to re-create that we have our programs as well as our data on the same tape. So that way you have all of it integrated. You have accounting software, you have billing software and some of our other software. All those are on one tape or multiple tapes that are backed up on a daily basis.
57	BC	00:36:00	Are those tapes, are you aware if the data is encrypted when they are sent off?
58	CJ	00:36:05	No they're not sent off no. They are with employees. They are not encrypted so that is a situation that could have some problems there but normally it is management personnel like myself as general managers. The manager of customer service, billing and that type of stuff. She would have one and we would have one in the vault so you try to limit that risk by the fiduciary responsibility into people that are controlling those tapes.

Turn No.	Speaker	Start Time	Text
59	DS	00:36:43	There are service providers who you can have a daily back-up, electronic back up with. I don't know what the security/how the security of those systems work or to what degree of security there is but there are companies that provide that service.
60	BH	00:36:56	Yes, we use that we have daily back-ups to Envelock a company in Mobile albeit I don't think that's were the servers are. The servers are remotely located from there and they just pull it in. I always am worried though, you hate to take the time but you should take the time to practice a restore to see what would happen if it had. Because, we've had experience in the past where servers failed and we thought, "Well, cool. We've got all these tapes, we'll just put them all back in." Well, it didn't work. [boisterous laughter] And so the only thing that saved us was that somebody had a replication of most of our files on a laptop. And you are able again to pull it back in from the laptop and recreate most of the stuff that is critical. But that's when we said let's take the outside service and they kind of guarantee through all that that all of the exchange data and database stuff would come back in.
61	CJ	00:37:45	Now periodically we have had to re-create some minor files that got – not from a storm but just information within the system had to go back into the tape system and re-pull some data out. That worked. Now that's very few…
62	BC	00:38:03	So now you kind of have a sample of …
63	CJ	00:38:06	Yeah, it has worked now, you never know into the future, you know, whether the information that is backed up is still going to be good or if something happens to the tape, that's why we try to always keep a new tape for every day. We don't back up the same tape over. We keep a 5-day rotation of tapes so if one tape is messed up you can go to day before and try that one. And realistically out of 5 tapes, I think the probability of every one of them being distorted or something wrong with them would reduce our probability of losing all of our information.
64	BH	00:38:48	There's another piece to this too. If you are big enough to have your own IT department or on IT person on staff then you have someone whose job it is to think about that and force you to and be the outside force to go through the recreation and tests and so forth. But most of the businesses in this county aren't that way. You know you've got to do it and you know it is important but it is not as urgent as the next sale or the next project or the next fire you've got to put out. Not that kind of fire but the next thing you are working on. So you may not get around to doing the testing and that type of stuff. And I suspect that puts an awful lot of our businesses at risk.

Turn No.	Speaker	Start Time	Text
65	CJ	00:39:24	Yeah, that's true, I mean, that's our situation. We are not big enough to hire one person as IT. Actually, that might not be a bad service to provide. Somebody provide an IT service where they could go around…
66	RH	00:39:43	I've got to chip in here, we offer computer service that does do exactly what. We do Baldwin County. I would be remiss and my boss would fire me if I did not throw a marketing ploy in here A lot of people have those problems and the tapes are bulky and cumbersome and someone has got to carry it in their car. Well, with technology as it is now we use a group and we also do this ourselves. We're sending this over the Internet. Every night there is a time capture of your data. It is set to, I think we are using a group in Utah right now. But we also offshore some of this. It's sent around the world and its backed up in 2 or 3 locations and you are given an E-mail every night that says "data successfully captured" or "call your administrator". That's one of the services we provide for small business. Doctor's offices, dentists.
67	BC	00:40:41	So you rely on a networ? As a hurricane approaches, I know…
68	RH	00:40:50	Network goes down.
69	BC	00:40:54	Is that something that…Do you guys have anything as a storm is coming through the Gulf Coast, any procedures you go through to make sure you that all of your data is secure last minute or just rely on your constant day to day backups?
70	DS	00:41:10	Most of the companies that have offices here or at least ours and some others we do business with have a written hurricane preparedness plan. Different individuals are assigned different tasks. Everything from loading the mainframe computer, certain shutdown time, loading documents and that type of thing.
71	BC	00:41:33	The next discussion topic…
72	CS	00:41:34	I have one question. I think one of you talked about the restoration cost of documents is very high. The one question I have is as I was coming in I saw that you have a lot of new buildings, you know, a lot more is happening in this area. I think what is there, the point is well-made. So if there is a problem and it is not backed up do you expect with the high growth of this area the restoration cost will increase if so what kind of magnitude. Is it millions? Is it hundreds of thousands dollars? What is this restoration cost we are talking about?
73	DS	00:42:11	Do you mean restoration of buildings or this document data

Turn No.	Speaker	Start Time	Text
74	CS	00:42:18	No, I think you are talking about the whole plans not being there, where they have to explore the buildings because the plans got out and you have got so many new buildings that they all may be in the first floor still so the question is what is the order of – I think you are the one who said – the restoration cost really increased. So, in what order of magnitude? Is it like hundreds of thousands? Millions? I am trying to get some idea
75	CH	00:42:43	The differential between having them and not having them.
76	CS	00:42:46	Yeah, that's exactly what
77	CH	00:42:47	That's a wide range depending on how much of the building was destroyed. If you have a slab, I think those probably can talk to this more [inaudible] than I can, but if you just have a slab [inaudible]. It might get really serious because if you if you literally do not know how to reconstruct that building because you have no plans you might even have to pay an architect to redraw it.
78	RH	00:43:10	It seems to me like the insurance companies really should keep copies of these plans. That they're the ones that have to foot the bill for restoration. In the past they've really relied on the municipality to provide them with the plan.
79	RS	00:43:24	Well, it also depends on if your surveyor's building was intact and he could easily get you a copy of your survey. Or if your consultant's building is intact. So, a lot of times, you hold your documents but then the engineer or the surveyor also holds them in his office. So on the scale of a Katrina catastrophe, if you're a local guy that uses local suppliers, everything's gone. Gulf shores may have some, we use people in Pensacola…
80	CS	00:43:53	So then are you talking about, like something like that, you're talking about millions of dollars for the recreation cost.
81	CH	00:44:00	On a [inaudible] worst case it would be whatever your – Dave, correct me if I am wrong here or jump in here if you think you want to add something to that. I say, probably, the architectural and engineering fees to redesign the structure. And those could be as up, depending on what size the structure is, anywhere from 3% to 20% of the cost.

Turn No.	Speaker	Start Time	Text
82	DS	00:44:20	It's hard to place an value, I understand your question, but you have one of the biggest issues with these commercial business, mostly condominiums we have on our coast, is the downtime and loss of rental income. So when you have to stop and have certain structural issues redesigned, the roof system redesigned, you have downtime loss of rental income. Most of the as. as far as actual reconstruction goes, your dealing usually below grade utilities and things like that. That's where you really suffer when you don't have as-built type drawings. You lose your survey of the property line and you don't know where to build your fence back. Surveyors after these storms are in such high demand you can wait six months for a survey. So I'd say the largest financial impact is loss of use of the facility that the length of time it takes to restore the property.
83	BH	00:45:09	For example,
84	CH	00:45:10	The redesign time and as he said, I don't think he fleshed out the fact, that if you don't, if your utilities are sub-slab and you've lost the drawings to tell you where they are then you got to do exploratory work to find them…
85	DS	00:45:23	Right, which slows down the process and costs money.
86	CH	00:45:24	...and is costly. You've got a little time which you've lost the business but you also have the cost of going in there with jack hammers if necessary, or surveying the construct testing so that you can locate the lines with your sonar or whatever. Non-destructive/destructive testing to locate utilities would be the …
87	LN	00:45:47	The actual engineering and architectural cost of reconstruction is more than double. [Others indicate agreement]. But you've got to figure out what you got. Like you say, it's not always easy. You've got to know where the file caps are the stress goes to the ground and none of these things are visible they all have to be fleshed out to be determined to be where they are. So it could cost if you have a severe loss, in all probability, you're better off just to bulldoze it and start it over brand new, which would probably cost you less money than trying to find the substructures on what you already have. If you have the plans its a different story; you know where to look. You know if they're there.
88	CS	00:46:35	That is very helpful, you know, when trying to figure out what we are saying. I now understand the magnitude of the problem.

Turn No.	Speaker	Start Time	Text
89	CH	00:46:43	But you're also have a problem with – not necessarily a problem – but you're faced with the cost of even before you can start doing this, you've got to get in there as is the case here - Chuck, jump in here – where your streets and things are buried under yards of sand.
90	RS	00:47:04	Seven foot on West Beach.
91	BF	00:47:05	You're in the middle of the Sahara and you are trying to find a building pad or something like that, or a water line. [some laughter].
92	BC	00:48:10	So, how difficulty or costly that is process of digitizing, say, those building plans, or to equip GIS with that…
94	CH	00:48:22	Well you scan…you don't digitize the plans; you scan the plans. You scan them in and get them in a data file and that data file obviously cheaper to store and also is weather impervious. CD Rom usually can survive water. So, your GIS you've got to go out there with your GIS locator and punch in all the water valves, the fire hydrants, the telephone poles and the property line, property corners. All of that can be put in a property database in layers and reused very effectively after hurricanes for recovery
95	BC	00:48:58	So what's preventing you from that digitization, or scanning, or that mapping?
96	BF	00:49:05	Probably that initial startup cost. Applying the scanning and digitizing equipment and the time it takes to scan and digitize all of your existing records. But once you do that, it's so much cheaper to actually store that electronically than to rent warehouse space to store your records.
97	RS	00:49:23	Yeah, it's also a commitment by the owner too. The owner has to commit up front we're going to build this 18 million dollar condo on my two acre site. And up front I'm going to digitize my information because we're going to have it and we're going to turn it over to the homeowner. See there's a firewall between these two. He's not going to spend as much money up front as he probably should for the homeowner's sake because he's going to turn the keys over and walk away.

Turn No.	Speaker	Start Time	Text
98	CH	00:47:15	Here's where GIS really pays off. In other words, in order to, the other thing, because you have that six or seven feet of sand over your highway, you do more damage to utilities – Cliff can tell you about that. He and I have had many quote/unquote active discussions over this – but your sand removers also remove water hydrants, water valves, they tear up telephone pedestals, they tear them out of the ground with front-end loaders trying to get sand. If you've gotten GIS located, you've go GIS coordinates in a GIS databank then you go right back there and put flags on them before the bulldozers come through or the front-end loaders come through to take that sand off. And you keep people down there; it's not just a one-day deal. You keep re-flagging, flag gets knocked down you re-flag. Still that's cheaper than having to replace all that stuff.
98	BC	00:49:49	So it's not his responsibility,[agreement] he's [agreement] The industry should do it, owner should do it, city should do it,
99	CJ	00:49:55	It's probably educational too. A lot of the people don't understand [agreement] your person that's your condo association president or people within that organization don't think abut those things. They don't understand that you have to have those plans in order to reconstruct something after a hurricane. I mean it's a problem a lot of the condos even experience with their electrical plans. Those things have to be individually designed based on the building [agreement]. Now, to have that plan to reconstruct that electrical outfit for that condominium is a very sophisticated thing. I know for us for even our lift stations you know every lift stations had a wiring mechanism that's different and so we have to take a design and have it reconfigured. What we did after Ivan, we lost 17 or 18 control panels on our lift station. It took us six months to get the last one in. After that with Dennis and Katrina we went in and took them out. We just took the panels completely off, unplugged them and everything, took them north of the bridge and put them in a building up there. Now, we had to deal with the downtime of the lift stations, we got pumps and some other equipment to operate them on a short term basis. But when the storm came back it was just a matter of taking the panels back, putting them back on and waiting for power to get back. We had our panels up and ready to go waiting for EMC to get power cuffs. But we didn't have a six month lead time to have them made; plus the cost of them. We're looking at 5, 6 hundred thousand dollars for those eighteen panels. Those are some things that we've learned that we are doing that the condominium association people don't/aren't educated on those things.
100	BC	00:51:56	I'm learning a lot right now. I never knew that.

Turn No.	Speaker	Start Time	Text
101	RM	00:52:01	What if the state had an ordinance or the city had an ordinance that required that you digitize all the plans? What are the costs?
102	BF	00:52:09	Well, right now, for our building department to issue plans or issue permits, we require the plans be brought in on disk and then prior to the issuance of certificate of completion or a certificate of occupancy, they provide us with the as-built drawings on plans. This past summer this was the process for the last five, six years or seven years used an Auburn student that come down for the summer and he took our commercial plans and actually scanned them so we have them.
103	RM	00:52:50	Where do we store all this information that we are now digitizing? You have a some place which you store it?
104	BF	00:53:00	We have that and boxes of discs that can easily be moved so hopefully, don't have to move it but if you do, load it up and go north of the bridge. [Inaudible] wind up some areas of the Gulf Coast where plans aren't available.
105	BC	00:53:20	Will that cover the modifications of the building or just the initial plan? [Disagreement by subsequent speaker] Is that a big concern?
106	BF	00:53:28	Depending on the extent of the modifying or alterations we did a case by cases basis on weather or not we require any of those plans to be brought in on disc.
107	CH	00:53:41	I think [inaudible interjection] if he were going to do a modification whereby he would expand the building I think he would scan those in. But if he is doing in car petition and this kind of stuff, no because that's not serious going to affect [inaudible].
108	BC	00:54:06	Well, that's very interesting. We never thought abut all the building plans and that as a source of data and how many people are going to go home and scan their plans? [some laughter] Alright, are there any…this next topic kind of the same thing we have been talking about, you know we've been all over the place and that's fine, the components of disaster recovery practices. What I heard a lot of people are using internal or getting another company, taking their data to another place and getting data backed up or something off site. I hear a lot of that - it makes sense. Is there any other critical data source that might not be as obvious. I typically think about things like customer databases or your financials. These blueprints are completely new to me. Would there be anything other than that that you think would be non-obvious data that you will need to operate tomorrow or next week?

Turn No.	Speaker	Start Time	Text
109	DS	00:55:11	We have, it sounds pretty simple, but we have pre-arranged contracts for building owners to do storm restoration. We have aerial photographs made of their property from all different directions. You'd be surprise at how many property owners don't remember was their swimming pool to the right or did it go to the left. [laughter] That pool was re-built in Hurricane George, Hurricane Danny and some of the other hurricanes. So the existing as-built drawings do not represent where the pool was or where the driveway was. So aerial photographs of the property is a good thing to maintain electronically.
110	LN	00:55:54	The other thing that we recommend through our CAI that's community association institute, where our property managers all belong to it or most of them do, is prior to every hurricane season we recommend they go throughout their property with a video camera. Just video camera the entire property covering everything on the grounds, the building, the roof, everything. You make 3 copies. You keep one in a safe and send the other two to board members who live in Michigan and Wisconsin. Their job is to keep that tape or disc or whatever it is until the next year. That way when the hurricane hits there is a visual record of that property that's good not only for restoration but for insurance settlements. You know the insurance company might say you didn't have a swimming pool. Yes we did here is the picture. There is a tremendous amounts of things that speed not the construction to get it back, but also the flow of cash from the insurance company which is absolutely crucial in reconstruction. If you have the documentation and the guy down the street doesn't, the adjuster is going to work on your claim first, get you your check first, get David and his company in there before everybody else because you've got money he can pay you. He takes a lot of money. [Laughter] David everybody is entitled to a fair profit. You certainly get your fair profit. [Boisterous laughter and joking]
111	CH	00:57:46	Going back to the, before we leave that, you talked the – from both these guys – the aerial photographs, GIS. The county, Baldwin County, produces a series of maps every year. They fly the entire county every year. So we get updated maps once a year but even those can get out-dated. David knows, these gentlemen know, how fast things get built on the beach. So your GIS database in addition to having individual aerial photograph and videos inside and outside the building you've got a general city of government homes with GIS data and map – a base map – that shows aerially where that swimming pool was, where that power pole was, where the building was in relation to the property line, so forth and so on. It doesn't have excruciating details but that's what the video is for.

Turn No.	Speaker	Start Time	Text
112	BC	00:57:37	So you really have a overall picture from all of these sources.
113	RM	00:58:47	Given today's technology, we have in this country access to satellites to map every nook and cranny if we want to. We can look at our house now through satellite probably.
114	CH	00:59:04	So can Uncle Sam. [Laughter]
115	RM	00:59:07	But I mean if we are really serious about mapping its not that we don't map…
116	CS	00:59:18	This discussion is very helpful. One of the things I learned from is I know GIS typically take these blueprints from all that. Our colleagues, you know, we talk about data backup, as Barry was saying we talk about data recovery from accounting. But I see in your areas the more, I mean like the blueprints, you say, where the roads are where the utilities are. I see a very important need for cooperation with our colleges. They go to your school to learn about how to do the blueprints and drawings, the need for backing up including GIS, I think that is a good educational thing we can talk about in our courses. So when the students get out of college they are aware of the issues we are talking about. Right now they can learn about blueprints and all of this stuff. So that's something we can take back and courses where I see as a value added
117	DS	01:00:20	There needs to be a larger general awareness of document control after a structure is built. [several agreements]
118	BC	01:00:31	So that's document control all those different [modifications], where they are going, are they going with the owner or the association. [Agreement]
119	CH	01:00:43	Well actually anything from the road to the back of the property line. [agreement] You don't just talk about the structure itself. You need a mapping of every thing on that. [agreement] The electrical, the telephone, the water, the sewer. Everything from basically your driveway all the way back to the end of your property. That way you have one bit of information or one document with everything on there so that individual person or that government entity can take that one document and find everything on that property.
120	BC	01:01:16	So in a perfect world, that's what you would want? What would we need to get there? What technologies do you see around that would help you do that? What is standing in our way?

Turn No.	Speaker	Start Time	Text
121	CH	01:01:29	I think we've talked about the technology, that's pretty straight forward. I think Raj hit, what you've got to do is you've go to – I don't like to use the word force the issue – you probably need to mandate that through city ordinances. You probably need to come up with a procedure which is basically a building official procedure that you mandate that every building is built – houses might be, you might and you might exempt certain family homes.
122	BF	01:01:54	Right now there not required to be brought in and that's single family homes.
123	CH	01:01:58	Single family homes are a different deal.
124	BF	01:02:00	Any commercial project.
125	CH	01:02:01	Any commercial project, exactly, would be, you had an ordinance that say every commercial project will be required to produce electronic copies of the as built, get them to city hall, and do some of these things. And you might want to codify, you don't get to far into the private sector business with city ordinances.
126	BF	01:02:22	One of the things that Cliff was saying that don't think would require [an ordinance] is having the civil drawings [Agreement]
127	DS	01:02:28	I think it's more of an awareness problem with property or building owners. These guys are talking from the standpoint of properties that are going to be built tomorrow and in the future. I think if owners understood what the impact on their down time and the cost to restore the property they would jump in the program with both feet and get all their documents and back them up and send them up north and do whatever. They don't understand what it is costing them in both time and dollars.

Turn No.	Speaker	Start Time	Text
128	BH	01:02:58	Let me speak from condo association president's viewpoint and I completely echo what you're saying. When you think of condo association presidents get elected every year and they rotate and information gets lost in between. You need to have a condo association needs an outside force to remind them of this stuff whether it be the association management groups or whether it be a city ordinance. Somewhere you've got to have something that says on such-and-such a date you've got to do an audit or provide data or something or you're going to lose it. It was by the grace of God that we found some plans for the building that we had. That helped tremendously in getting it rebuilt after the fact. The Condo Association and Homeowners Association are the same way, you have a file cabinet full of stuff or a briefcase full of stuff and it get passed on to the next president or the next treasurer and the next one and somewhere along the way and they say what happened to the stuff three years ago and they said oh I don't know Sandy has it over there somewhere. Well Sandy' long since passed away, so now what do you do?
129	DS	01:04:01	Sandy doesn't like me anymore. [Laughter]
130	BH	01:04:02	Well that has happened too.[Agreement] [Laughter]
131	RM	01:04:09	You need some kind of centralized location. This kind of data is all over the place.
132	BH	01:04:15	Right. Somebody mentioned insurance and I think that was let insurance companies keep it. The issue I'd see from that is we re-bid insurance each year, our courier changes all the time and the agent may even change from time to time simply because that's so hard to come by anyway. That should be worse than the president keeping it. [Isolated Laughter]
133	DS	01:04:35	They won't store it.
134	CH	01:04:36	They're going to require you to show them what you had because that way they can potentially pay less and if you can't prove they are not going to have to pay.[murmurs] [agreement]

Turn No.	Speaker	Start Time	Text
135	LN	01:04:52	The best thing that we could potentially have would be the city building authorities maintaining those files. We could literally make that a portion of all commercial buildings you have to submit the entire not just the structure and then they could bury them someplace north of the inter-coastal way then when it came town to rebuilding you have access to that entire file. Because if the condo association says I'm not moving it, the managers, you have the same problem with the managers [agreement] and boxes seem to just disappear. You end up with one of the major people here who used to be the largest player on the island and now all of a sudden they don't have any plans at all for anything. And they used to have a whole roomful of it. So it's those continuing things because outside the government entities there really is no one who has a responsibility to keep those documents and they can disappear rather fast.
136	CJ	01:06:07	From a governmental entity standpoint from Chuck's side then you're talking about more manpower, [agreement] more cost [agreement] and therefore [inaudible] [agreement] I mean that's a difficult task.
137	DS	01:06:22	Well the one who suffers is the property owners so I think the property owners have to deal with it seems to me.
138	CH	01:06:29	Also I want to ask Brandon something here, too publicly. There's an Alabama record statue in Alabama for keeping records. I think the maximum for keeping records is thirteen years. This says we keep them in perpetuity until the structure changes. You only throw away a scanned as-built CDs when the structure change. We need some kind of set procedure to make that happen. How long will we be keeping these records anyway?
139	BF	01:06:58	We'll keep them as long as the building is on the slab.
140	CH	01:07:00	There you go, that's what needs to happen. I just want you be aware that there are statues in this state that you can throw away public records after given a amount of time. And that's something that has go to be …
141	BF	01:07:08	And that was the purpose for having, hiring a college student this past summer was to come in a scan copies that the hard copies that we are throwing away so that we'd still have them. He spent numerous weeks scanning in copies.

Turn No.	Speaker	Start Time	Text
142	CJ	01:07:31	I would think a difficult thing that you have is there is still so many buildings out there that have never been completely destroyed or re-built that there is probably very little plans even left out there. [agreement]. What are you going to do about those? I mean that's a situation you're kind of catch 22. How are you going to require them to provide something to you when who knows weather there is anything.
143	BF	01:08:01	The probably need to have…
144	DS	01:18:03	Well in a real word situation after a disaster, you know you probably don't have the staff to dole out all of these back to the owners. It still doesn't belong to the owner, it's the problem that belong to the owner. The cost and the suffering belongs to the owner and you may keep them for your purpose but it seems that the owner has to/needs to be educated on the ramifications of not having this data, gathering it now and then storing it themselves.
145	BH	01:08:36	Since that will be so easy to solve. [laughter] [agreement] [murmurs]
146	BC	01:08:40	So right now it turns into a political issue, right? If this is going to be whose going to pay, whose going to store the documents in the city. It's a strategic thing, long-term costs and short term costs. Are there any other outstanding issues that come to mind? [discussion] [murmurs] Well I think this has been very informative to me and I thank you all very much and I might have some follow-up questions and maybe get back to you via e-mail.
147	CH	01:08:28	Again, I say contact Donnie Brown 9681165 and she can tell you about the Gulf Coast IT Program.
148	CS	01:09:37	Again I think Bob you organized it. it has been very good because he has been researching and working on this problem for the last six to eight months we never thought about this issue that you are bringing up and that is the magic of coming out and talking to all of you. Yes you say we are doing things and this is so cool. I am work out something that is realistic that will make an impact on the community instead of we guys just sitting and he is going to spend another year on this research.
149	CH	01:10:07	Most of the people sitting at this table experienced, represented here, ten hurricanes.
150	CS	01:10:14	I think that is what is you know…
151	CH	01:10:15	Seven major ones in the last ten years.

Turn No.	Speaker	Start Time	Text
152	CS	01:10:16	Again, I appreciate all of you talking to us I think its, I know it looks like a one hour, but we guys learned a lot so it is very, very good [murmurs] [laughter] [casual discussion]

APPENDIX E. CONTENT ANALYSIS CODEBOOK

Relative advantage – the degree to which a disaster recovery method is perceived as being better than the method it supersedes.

Value and need compatibility – the degree to which a disaster recovery method is perceived as consistent with the existing values, past experiences, and the needs of potential adopters.

Trialability – the degree to which an disaster recovery method may be experimented with on a limited basis.

Observability – the degree to which the results of adopting a disaster recovery method are visible to other.

Network collaboration – the degree to which a potential adopter of disaster recovery methods is dependent or independent from other actors in their network including industry, competitors, and regulatory agencies.

Communication behavior – the manner by which a potential adopter of disaster recovery methods communicates. This includes exposure to mass media (e.g. newspapers, TV, advertisements, magazines, and vendor literature) and interpersonal communication (e.g.

With consultants, vendor personnel, computer specialists, colleagues, teachers, and friends).

Homophily – the degree to which a potential adopter of disaster recovery methods is similar to others within a network of actors.

Socioeconomic Status – a potential adopter of disaster recovery methods having either social or economic status that allows for a degree of slack, or allocation of resources to devote to any aspect of adopting disaster recovery methods.

Geopolitical location – any description of a geographic or political location including general and specific locations.

Moderation – any comment involved with moderating a discussion including instructions, administration, and clarification and exploratory questions.

Demographic – any characteristic of the population under study, mostly those related to member's role in the community.

APPENDIX F. CONFIRMATORY FOCUS GROUP TRANSCRIPT

Turn	Speaker	Text
1	BH	… This group came in and we got a group of us around the table to talk about what we had to go though in recovering after Ivan and Katrina, basically. The initial project was one that kind of related to what information technology needs would have made things better, but the more you got into the conversation you realize that there was way more than that involved in recovery. (dynamic, emergent issues) I was up at Auburn about two months ago and had the opportunity to look at the work Barry has done and my reaction was that we need to get that back in front of y'all and see if there is something you can do with this now and implement some of the recommendations coming from it. So I guess to start, let me just go around the room for all of your sakes so we all know what number goes with which card, I guess. I'm Bob Higgins with Baldwin County Economic Development Alliance
2	CH	I'm Chuck Hamilton. I'm retired Public Works Director for the City of Gulf Shores. My replacement is across the table.
3	SW	Susan Wingard with Baldwin County Extension Office
4	KG	Ken Grimes, number four, City of Orange Beach Special Projects Coordinator
5	LS	I'm Lanny Smith, I'm the Building Official and the Flood Plain Administrator for the City of Orange Beach
6	KA	Kit Alexander, City of Orange Beach Engineering Environment Services
7	MA	Marc Acreman director of Public Works, City of Gulf Shores
8	PR	I am P.K. Raju. I am the director of Auburn Engineering Technical Assistance Program. Some of you may have heard of this. I will talk a little more about it a little later.
9	CS	I am Chetan Sankar, faculty member of the department of management at Auburn University
10	DB	I am Dave Barton Public Works Inspector City of Gulf Shores and I am number ten.
11	Many	*Laughter*
12	BC	I am Barry Cumbie I am a doctoral student in the Department of Management studying information systems & a frequent visitor to your beaches.
13	BH	What we thought was with this was PK, I think, you go through some introductory things. We'll see the presentation of the work that Barry did and I guess from our side I'd like to feel free to feedback. If we are going to slow, too fast, say something. Or if its too much in research detail say something.

		The purpose of getting together is to get to results and decide and to have a conversation on what do we do with that. Okay. So feel free and don't feel bad if we interrupt.
14	BC	No, I'm very flexible and that's what we'd like, to hear what you have to say, not to hear ourselves talk
15	BH	From a time standpoint, I think the plan is to go to about 1:30 or 1:40. That's okay? Cool. Dr. Raju:
16	PR	First and foremost on behalf of all of us from Auburn, I take this opportunity to thank you for taking the time to come and help us in this project and secondly, I thank Bob Higgins for arranging all of this. Thank you very much.
17	BH	Thank Ken Grimes for picking up lunch
18	KG	Well, y'all [from Auburn] bought it.
19	Many	*Laughter*
20	PK	• Somewhere you might have heard about this, but I'd thought I'd talk about this program, technical assistance program which is actually sponsoring this project and so this is a part of Auburn University's outreach. What I am going to talk about is what is Auburn Engineering Technical Assistance Program, why we need AETAP, what are the goals of AETAP, some of the highlights of our activities, what we do, some of the companies we assisted, and show you impacts on the economy in the Auburn area and the state of Alabama. • The Auburn Engineering Technical Assistance Program is a coalition of Auburn University engineering departments focusing on Alabama Industries • That doesn't mean that we don't work with other departments. Depending on the nature of the problem either we can do it in Auburn engineering or we seek the help of other schools and colleges in Auburn University. Or even we can go further to research labs in the state of Alabama to help us solve the problems. • Why AETAP? As you all know, Auburn is the largest Engineering school in the state. With state of the art development resources. We have 12 research centers. We have numerous department laboratories. We have three research peaks of excellence. And we have faculty from a wide variety of disciplines. And last, but not the least, highly creative Auburn engineering students. • We have a close relationship with the College of Business and we have a long standing program and history of success and numerous partners including the Alabama Cooperative Extension System, NASA, Alabama Power Company, Alabama Development Office, numerous cities, governments, and many industries who have been working with us. • What do we do? We try to provide cost effective high quality technical assistance and technology transfer to industries. We train technological workforce in modern manufacturing technologies and processes. We facilitate the transformation of knowledge into innovation that will bring new work and strengthen the regional economy. We have a knowledge sharing system to facilitate virtual communication among industries, researchers, and county agents. • During the period of 1996 to 2006 we provided technical assistance to 920 industrial units, 35 faculty, 4,900 students, participated in all of these projects. We organized about 26 workforce development seminars. All this was possible through funding from different agencies to the tune of $3.9 million dollars. • Some of the areas of expertise: quality improvement assistance, material analysis and ... analysis, preventative and predictive assessments, site presence to help

problem solving, noise and vibration, access to rapid prototyping machines, so we can provide access to rapid prototyping, we can also help in plan safety assessments, lean manufacturing, and if there is as factory which needs automation, we have experts who can help in provide the technology. Waste reuse, business planning, HVAC analysis, and many others.

- Some of the industries we work with: US Steel, Mercedes Benz, Kimberly Clark, …, GTA Westpoint Aerospace, Southern Company, …, in Auburn, and … in Prattville, Hyundai in Montgomery.
- The way we work though AETAP projects: one we can do the project as a student undergraduate course project.
- The problems are developmental in nature because it requires longer…. One or two semesters, supervised by the faculty…and…sponsor pays materials,…developmental in nature because, as you know, it is a student project. It will take time…solution the next day as some of us want it.
- Or you could look at a graduate student theses project where you have a graduate student working on it full time….sponsor needs to pay for the graduate student's time and university overtime. That way, the sponsor will get the graduate student to work on the project who already has a bachelor's degree in engineering and he or she will…faculty…sponsor…and overhead.
- But if you want a short turnaround for your project we can have a faculty student project where we put together a small…pay for faculty and student time and…
- Say you have a multidisciplinary project where you need a …engineer, …engineer, and mechanical engineer…get the results in a short time.
- Or if you just need expertise of one faculty member, two faculty members, it can be done as a faculty consulting project but the sponsor needs to pay for faculty time and university overhead.
- Now what are the benefits? For the students they get experience in solving real-world problems. It is phenomenal to the. Faculty get industry contacts…highly creative…engineering…vision into reality…Auburn faculty…design…testing…timeline….
- What do we get? AETAP gets facilitate faculty-industry-student interaction and bragging rights
- The impact on Alabama's economy. We help recruit industry to Alabama. We have been very successful in recruiting industries in Auburn…existing industries…estimated impact is $9M per year in Alabama through our work and $4M in neighboring states.
- …job creation…hydraulics located in Auburn and one of the reasons stated for choosing Auburn for its location is the availability of the AETAP program and proximity of ME department because they are interested in fluid dynamics expertise and some of the opportunities that AETAP can provide.
- We also do some industry visits…Baldwin County June 14, 2005…Tallapoosa county…
- And we also do some workshops. I think Susan was there at one of our workshops a couple of years back…Talladega…Mobile County.
- Now some of these recent projects here we helped in the design of plant layout for the new assembly development for Morris Forrest Projects in …Alabama. We worked with Wal-Mart…We also worked with NASA, for example, …developed…Resource Innovation to provide the manpower to start a new chemical process. We worked with Chemical…in…Georgia…to reduce…current process.
- We are, for example, working with Euro-pro to help them prototype design of current sweepers. Those automatic sweepers you have. Euro-pro products are available in Sears now. We also did some work for …Atlanta, Georgia to reevaluate and design…awnings.
- That is in brief about our AETAP. Currently the National Science

		Foundation… project that Barry is doing. Barry will describe more about it. • Thank you, any questions.
21		*Timestamp: 14:29 for file "FG2 Audio Data - Part 1, Recorder 2.MSV"*
22	BH	A couple of things. We invited PK and he came down here a year or two ago and introduced to several of our businesses… ProCell… to offer assistance.
23		*Timestamp: 0:00 for file "FG2 Audio Data – Part 1, Recorder 1"*
24		As I look at this today we might keep in mind there are engineering projects in either city. Why not take advantage… other things that require tight time frames which are more difficult to do but you can do them. The other thought that came to mind on here is we're spending a lot of time and effort to recruit young professionals to move here. You know, what better opportunity to get them down here as part of an internships or a summer program and get them introduced to some of our businesses and our cities and maybe we just keep them here after that. So anyway, just a couple of thoughts with that, I think this is a really, really neat program and shame on us if we aren't taking advantage of it.
25	PK	And also we work with College of Business Information Systems. Say you want a simple web site or something to do with IT. We have students who can really help you in that area. As simple as that or maybe a more complicated project that is more involved, we can help you with that. Thank you all
26	BC	Jeff, Welcome
27	JM	Thank you, Sorry I am late
28	BC	Oh, no problem. Happy to have you here. I will reiterate just the thanks for everybody taking some time out of their Friday to come spend some time with us. I hope the first visit we had in February we had was beneficial. Chuck you were there. You can kind of see if we made sense of all that. This presentation is a result of that.
29	BH	We all walked out of the room and wondered what are they going to do with all of this
30	Many	*Laughter*
31	BC	And I have some copies of the presentation if you want to follow along there if it is difficult to see.. This presentation is "The roll of IT services in expediting the recovery of service based coastal communities from hurricane damage". It sounds appropriate to this audience. I wont spend a lot of time telling you about what I am going to tell you, I'll just go ahead and tell you This first part we introduce the research problem and one of the things we looked at is the growing coastal problem. Projected from about 50% of people living in the coastal counties in 1999 to 75% expected to live there shortly I am sure you guys have experienced more congestion more people coming down And it is a unique lifestyle and desire to come to the coast so we've got more people coming And in Alabama, alone the coastline is very important. These statistics, you guys are probably more familiar with,

		Take a look there and see a lot of visitors. Approximately $2B in travel related expenses… 28% of Alabama's lodging related expenditures in Baldwin County All of these stats, when you look at Alabama's coastline is less than 2% of the entire US coastline. So it is small but vital..>Baldwin Counties… That being said, with more economic importance… the coastal storms threaten the lifestyle and economic vitality of these areas. Something I am preaching to the choir… Community stakeholders… everyone in this room… job down here… community decision makers in this room Concerned with economic viability and sustainability. That is a sustained economic viability, that we want to be in operations today and have this community, have this lifestyle after a storm. We started out asking what data need to be backed up by the community What are the factors, why do people do not back up this data. What might inhibit the community from not adopting these methods….identify what reasons… Affect a change… it's a beautiful day down here… think about disasters when you have nice weather… Take a moment today to discuss that Part of the academic side of this … literature… academic and practitioner-oriented… initial understanding of this research question… develop a theoretical model and hypothesis. And this gives us analysis of the focus group we had last February down at the tourism bureau. Ultimately what we will get to are our findings and general policy recommendations and let you discuss that So the theoretical/academic side is when you look at IT disaster recovery methods kind of exist on this continuum… days to hours… hours to minutes… and of course the faster you need to recover… the more costly that practice is going to be. This is not an exhaustive list… building redundancy… fully redundant… what are the critical data sources… heavily based tourism industry versus client centric versus document centric …
32	KA	But is that just relationship physically in the environment or is that relationship of dispersion of data? Not quite sure I understand the data…?
33	BC	Okay, so the relationship is there, they are interdependent … as far as the data… … construction data… … who does your surveying… … actuary, insurance adjusting… … drawings and plans… … what happens…. issue of ownership and transfer of accessibility… doesn't posess them… access to a previous survey… the original survey isn't available because you are dependent on someone else… can't return … you can wear your seatbelt… left field… everything in you control but you can still get in a car accident as you know … dependent on the external environment… restaurant… condos aren't open yet and nobody has a place to stay… too thin… is that just relationship physically… data As far as the data we will get to the point … jump to 41:30 Feasible not feasible
34	BH	Yeah, let me give you an example… … condo association president here in Orange Beach… critical to our recovery… time to

		recovery…what is the mechanics of all the associations keeping…restaurant across the street to open…figure out a way to manage
35	BC	Does that help, does that clarify
36	KA	Sure
37	BC	…conflicting interests…potentially pay less…builders turn the keys over and walk away…incentive is not here is all of the data…fail and modify it…do your job and you are not really charged…promoting data longevity as I say here. And the fourth finding…cue to action events, that is the Atlantic coast hurricanes…near miss…never again…other communities…do survive the disaster…disaster can happen and can cause people to act two different ways…I am invincible
38	KG	We saw that with evacuations when a storm did not hit us. We talked about that with something in the same line because people say, well, oh every time there is an evacuation – mandatory - it may not even rain But we were thankful that we had to do it because at that time for 48 hours in…
39	JM	You saw two things. You saw people who stayed during Ivan were first to evacuate when the next one came along and those who didn't stay were like, oh I'm not sure I am going
40	KG	So, Complacency is a good word
41	CS	When did it happen, which hurricane?
42	KG	Hurricane Dennis
43	JM	Hurricane Dennis and Katrina and Wilma. Not so much Wilma but Dennis and Katrina
44	KA	I thought we had more people evacuate for Dennis
45	KG	It was mandatory
46	JM	But then you had the brush and nothing really happened
47	KA	It turned
48	KG	And went to Navarre, FL
49	JM	And so Katrina you didn't see as much, but then everything that happened to other people we didn't evacuate in '06 and '07 So I think the further you get away from a terrible event like Katrina and Ivan for us
50	KA	The more complacent you get
51	JM	You're going to see evacuation rates go down After Katrina, if we would have had one early in the '06 season I think it would have been a pretty high evacuation rate The further you get away from the event or a significant event anywhere in the near area the complacency rate goes up

52	BH	Well, I think you can measure that by the amount of landscaping planted at ground level around the beach. Hardly any replaced right after but the longer you get the more people are willing to invest money in it.
53	L	And there is another mindset for those people who leave, for one, and then have trouble getting back in a timely manner because For instance I know during Ivan a lot of people had evacuated to middle Alabama And it got hit really hard and they got stuck in back roads and towns The interstate was out for awhile and kind of had trouble getting back. So a lot of those people, I'm one of them, decided for Katrina, I'm not leaving because I want to be able to get back and respond and be there when I'm called upon It took me two days to get back from Ivan
54	KA	That's interesting
55	BH	Yeah, me too.
56	BC	And sometimes the data follows the people. You have a back up tape or certain drawings and those are removed from the site and then accessibility is an issue It's very interesting how that relates to evacuation
57	KG	We've changed that because our technology data, our computers went in the white van all the way to Robertsdale in Ivan which was probably more likely to get hit by a tornado than flooded here
58	Many	[agreement]
59	KG	So that was an example of where we re-thought some of those strategies of we load all the computers in a van to get hit by a tree
60	BC	And our other finding was the weak role of relative advantage…cost/benefit analysis…rational decision maker…sure the cost is a driving factor…people who are well-experienced in these disasters …observability…complexity…so many choices…group seemed not too concerned…complexity wasn't as big of an issue. …toward a city ordinance…GIS, GPS, aerial photography…good from a risk assessment…eggs in one basket…unifying perspective…accessibility when we need this…newly generated civil engineering data Our thought…requiring people in the community….governed by these mandates…start internally…hone your processes…city infrastructure…leverage university relationships… For buildings that have been creates and lost that structural data…retroactive way…slowly work backwards…encourage …focus group that is realistic at the expense of generalizability…research perspective…practical perspective… That's all I am doing is reporting what they said and kind of playing off what they

		recommended. Now that being said what I would like is to get your reaction... What are we missing... feasible not feasible Open up
61		*Timestamp: 41:38 for file "FG2 Audio Data - Part 1, Recorder 2.MSV"*
62	CH	Right off the top, looking at this thing and getting into some detail, putting some meat on the bones so to speak. The – I'm not sure, I've visited Lanny's comments on this and I wish Brandon was here from Gulf Shores, chief building official. I'm not sure any city nation wide captures the type of data that I think necessary for quick and confident structural, mechanical, electrical building recovery including individual homes Now home builders don't even produce plans unless they are high end homes and they have architects paid to do that. And Laney, again, I did like to hear your comments on this Now home, that may be one site plane, one elevation. You turn to a guy that knows how to build a house and you say, go build that house When it comes to an evaluation after a storm or when you have a storm surge across the beach that hit a lot of houses In Gulf Shores we lost 50 houses in Ivan and another 250 with major damage. You know, are the pilings cracked? If you've got stuff in behind the walls, some kind of structural damage you've got back there. We hired a series of structural engineers to look at that and I think Orange Beach has a light contract for next go around. You know, they might be helped by the kind of information that you take off a set of house plans or actual structural drawings.
63	BC	Okay
64	CH	So, maybe I'm just putting this up to totally discard it once and for all, but would it be cost effective at all in a coastal community to require some kind of a structural plan for an individual house It doesn't have to be detailed architectural drawings but it would help to have if you've got hidden structural details where the pilings interface with walls up above in the structure, or if you've got those kind of things it would be helpful to have on file.
65	??	Chuck, we require that. You have to have that on a home
66	CH	You do?
67	??	Now you do, the problem is your are talking about the inventory of buildings that we have now. Some of which are 30, 40 years old, some of which are new.
68	CH	That don't have plans
69	??	Right.
70	KA	The older ones
71	??	The new buildings, everything that has been built in our city since 2004, since before Ivan, we have structural engineered drawings on them That's from single family all the way up to the multi-family condominiums

72	??	And they are in print form
73	KA	Hard copy
74	??	In a room, right next door.
75	KA	But it's hurricane proof.
76	??	They don't want to know that I can tell you
77	CS	So it's not in a digitized form?
78	??	Right, no it's not digital
79	JM	No, that's a good point when you talk about the city ordinance require that they be submitted in digital form and hard copy simultaneously
80	??	I didn't mean to interrupt you, I
81	??	It's funny that you mention, the engineering firm shortly after Ivan we saw the need to contract with a structural engineering firm to be basically on call and ready to do structural inspections in the event that we were hit again and mostly talking about the high rise structures along the coastline and that was the first question they asked was the availability of data, of original drawings, of elevations, of structural calculations for those buildings. And there again depending on how old the buildings are some of them we have that kind of data on, some of them we do not And we found out after Ivan that not only on a lot of the older buildings do we not have the information but nobody does either
82	Many	*Speaking at once:* And that's a Go back to the county
83	KA	That will forever be the case
84	??	That doesn't matter anymore because they are not here
85	CH	Well, correct me if I am wrong but I think what happened there in Gulf Shores is there is an Alabama law that says you have to keep records for 13 years. Well they treated house plans the same way they treat an administrative record
86	JM	It's called the Records Disposition Authority and that's state law published through the Department of Archives and it says how long you keep each record. Correspondences: 3 years. There's a whole
87	CH	Correct me if I am wrong Jeff, that doesn't go into house plans
88	JM	Some things are required, I would have to pull the RDA and look exactly, but some things you are required to keep permanently. Personnel files I can never get rid of. I do not know about house plans.
89	CH	Well here's my point

90	?	They do not recognize digital archives
91	JM	They do not at this point the state of Alabama does not recognize digital archiving.
92	CH	Well I think irrespective of what the law says
93	KA	You have to keep a hard copy. You *can have* a digital copy
94	JM	Except for record that is digitally created, meaning e-mail. They recognize e-mail. I get an e-mail or send and e-mail it is public record I have to keep it for 30 years. It allows me to print out a hard copy of every e-mail I send and put in a file, which is a little counter productive.
95	CH	In a coastal community there ought to be a system regardless of what the state law says about it and of course obviously you need to be more stringent that the state law but nothing keeps you from being more stringent In a coastal community a set of plans and specifications for every single structure ought to be kept until that structure is demolished
96	KA	I agree
97	JM	I agree
98	?	Yeah
99	CH	If that's 200 years, that's 200 years
100	KA	I agree
101	CH	And both a hard copy and a digital copy would be optimal. Now the problem with that in Gulf Shore's case originally is the space to house all of those records, then you talk about the cost of building hardened archives that are protected from storm surge and wind because that data needs to be immediately available on site to my way of thinking So you have to have – that speaks to a 200 mph rated structure that is elevated – that has the archives in it. Both the soft archives, the digital archive, and the IT archives, and the hard copy archives.
102	BH	Do you have a high level of confidence that the material in the archives is as-built or is it...? No. Because where
103	??	I know where you are going with that question
104	KA	Some things, yes and no.
105	JM	The answer to that question is: it depends
106	KA	Exactly. Yes and no.
107	?	Usually in relation to what you are trying to do after a storm, you usually have a happy answer and the answer is yes. Now if you are trying to recreate some aesthetics of the building going in and remodeling the answer might be 'no'. Cosmetically there might be some changes they have made But as-built drawings, occasionally I am wrong, but as-build drawings occasionally they will put the beam over here two feet or a foot further and not change the drawings, not

		make it as-built But unfortunately we take a lot of drawings go in the pile that aren't marked up as as-built drawings and that does create problems with going back to create and re-create the structure.
108	JM	And that's, we're down here talking about how difficult it would be to require them to submit in electronic form And then it's the, Lanny informed me we used to do that but the problem was is that there is multiple
109	KA	Changes
110	JM	Well, the programs that they use, you've got to have a standardized
111	??	What format they use.
112	KA	Oh, but you can stipulate the program. You can stipulate the program
113	BH	But then you'd have to go back and find some years old version of it in order to play it back
114	KA	Well this is what we'd we like in an ideal world and we don't feel that we are that far off. We have because of our county, a GIS-based parcel map to build upon They provided us LiDAR data, they provided us aerial data, they update our aerial data
115	JM	Every four years, believe on the aerial
116	KA	I don't believe we have centroid data, building centroid data. We are building our infrastructure data on it. What we would like, and the reason we don't have that is we would like the ability, we would like to have the ability to have that GIS information be interfaced with our digital records so that whether housed in a separate program, though an interface program or built into that. We don't know how much that will cost nor do we know how we will do that. We would also like that to interact with our local permitting module. We know what we want and we know that and we know that's where we want it Because we would like it to be available to the public.
117	JM	Ultimately we would like when the company comes in to do inspections after the storm, be able to take their laptop, access our system, click on the parcel, click on the building and get a menu of the building plans, the civil plans, electrical, HVAC, plumbing, be able to click on anything there and there it would be.
118	?	... permits, inspections
119	JM	The permits, inspections, the whole history of that parcel is what we are working toward but it is in stages. The problem is twofold, I mean I think you could relatively easily come up with a standardized format that you want to use from this point forward but going back and having everything that is in that archive that is digitized to a form that you are going to but in is going to be time consuming and costly
120	??	Expensive

121	JM	Yeah
122	KA	That's what we would
123	BC	That's where the university could
124	KA	Yes, you are reading my mind
125	JM	That's one of the things when thinking about the different types of partnerships y'all were laying out. I could see that it might be a boring summer internship but it could be
126	Many	*Laughter*
127	CH	Yes, they call it digitizing slavery
128	?	We'll they do get off at 5.
129	Many	*Several people talking*, *joking*
130	?	We gone a long way in doing that over the last year. We've gotten kind of our civil infrastructure into our GIS: our culverts, our ditches, our cross sectional information that ditch. Kind of doing the groundwork for eventually updating citywide master plan. We're trying to do what I think y'all are trying to do, capture our utility infrastructure and we are having some trouble getting the, because for utilities who have spent a lot of time collecting the data to actually take the data and put it on a map. It's sitting on a shelf not being used; however, they are taking some steps hopefully they are progressing but it costs money and sometimes that is a sticking point for some people, that0 goes for utilities. They've hired an individual whose supposed to do nothing more than go around and update their GIS maps, GIS data. As new infrastructure gets expanded or its old, expanding new installed. He's supposed to update the GIS Unfortunately I think they put him on reading lift station meters [more immediate needs]. That's going to be the critical element for us in the recovery process. We're going to know where our culverts are at. We're going to know where our ditches are at and what those ditches cross sections should be prior to the hurricane, but unless we've got very good data to provide the contractors on the utilities and the utility companies themselves can go back and stake out those locations, the manholes and fire hydrants and water meters and gas valves, then the contractors are just going to plow right through that. Contractors do more damage to infrastructure than a hurricane does
131	CH	And there is another advantage for having that data too, that Marc's just working through now. And that is for grant purposes If you've got storm damage, you've got FEMA project works with your recovery grants but you've also got mitigation grants. And having existing data where you have had floods and that type of thing really helps to justify the designs and the cost of design for grants. That's another use for that, mitigation
132	BH	Could you use… you had mentioned back when we started this that there is a National

		Science Foundation grant that you were applying for some of us to understand it. Could not this coastal region, Gulf Shores and Orange Beach, be the subject, why not be a priority and apply for a grant for funding to get where the vision is and let this be an example for the other 98% of the coastline.
133	CS	I think not only that but what we are talking about, students interning may be one of the things I see. It may be boring work, but if we give them the opportunity not only to digitize the current one but you come up with new ways of doing it, I think, I don't know about you all but my students teach me the new technology.
134	KA	*Laughing in agreement*
135	JM	I have a 12 year old who does that
136	CS	I think we can give them the challenge to digitize it, but it in the standard format but when you are doing the internship when we get a project like this at the same time come up with new ways of putting it in and I think the students like our Michael, tell me systems which exist out in the world which I have no clue. I am not ever going to go and check them. Our students are very creative folks, many times they do iPod or something all the time because that is all the challenge they have. We have this challenge that you are facing which is very critical to you and we can get the university students to work and as you said work with somebody from a funding agency to provide it and I think what Barry said, maybe they are work during the night and go to the beach during the day. Our students would love something like that. I think we can definitely develop a good partnership to, that way you get your data digitized as well in the process. Maybe in a one or two year project. At the end of it you have all of your data digitized. Then our students will be coming here working with the community
137		*Timestamp: 55:15 for file "FG2 Audio Data - Part 1, Recorder 2.MSV"*
138	JM	I think from the Orange Beach side we are very open to something like that
139	KA	Would be fabulous
140	JM	We would be very interested in pursuing this
141	BC	That's what this dissertation is...
142	??	We had a network...
143	CS	What's that
144	??	We had some hard drive problems and lost a lot of what we had digitized. Steve Henderson is trying to get it off. He's taking the hard drive to another location
145	BH	A recovery specialist
146	??	A recovery specialist, try to get it off or something. But even then I think we need to be looking at a JPEG or something that doesn't take as much space.
147	JM	For the record, and one other thing for the record so everyone knows. Once we kind of get our arms around what we want to do together I think it makes sense obviously

		for Orange Beach and gulf Shores to work together on this and it's a federal agency that we identify the funding source, Orange Beach and Gulf Shores also share a federal lobbyist who would be happy to assist us through the Congressmen and Senator's offices. That is something that we would want to make available.
148	CS	I think that will always help
149	JM	Doesn't hurt
150	BC	One thing that would lend strength to our argument would be really to nail down the costs as best we could. What it is like to rebuild with this data or without this data. If there is any way, suggestions among this group, should we grab some random plan out and do a simulation and say imaging not having [the data]. What would be the cost to assess this building without this plan and do something there to project this estimate?
151	MA	We could almost so that with Gulfplex That's exactly what we found ourselves in. We had a situation where our main public beach was devastated after Hurricane Ivan and we had one of those things that was continuously added on to as the years went by; things were updated, reconfigured We never had one true, current, as-built drawing of the site. So we were actually going back through trying to grades, inland inverts, from data that was from 1980. That was the foundation and those other things that were approved upon was another set of plans, then another set of plans. The project was bid out and was awarded to a contractor and I think cost us another $1M in change orders. It was a $2M, ended up being $3M, is that what it was?
152	??	$4M, I think
153	MA	It almost doubled the contract cost because of lack of drawings
154	?	And that's with on what, five structures on it?
155	MA	Yes
156	?	That's mostly just land and infrastructure and very minimal structures
157	?	Yeah
158	?	versus say a
159	?	It sounds absurd but there was like a quarter of a mile boardwalk that was...
160		*Timestamp: 59:00 End of File "FG2 Audio Data - Part 1, Recorder 2.MSV", start of file "FG2 Audio Data-Part 2.MSV"*
161	?	We got to the city limits and we are standing there Laney, I think you were there and the mayor was there and I was there and some other folks And we were like, something's missing And we realized it was (Blane Ray's) House

162	KA	The biggest building
163	Many	*Excited chatter*
164	?	[some inaudible number] Square foot mansion, literally gone, no sign that it ever existed The gates are there What is missing, and then, oh my God it's the house Laney, especially had to pull out aerials to determine where houses were, just thank God we had them
165	?	Going back to what Barry was talking about, as far as a cost/benefit type of analysis, I think the engineering firm that I was referring to we have a contract with would be very helpful in a hypothetical, how would it change the evaluation of this structure if we had that information versus if we had no information to give you. How would that affect the way they evaluate and do damage assessment on some of these houses.
166	JM	I don't know if it was said earlier, but the name of the company is MacTech
167	CH	Out of Pensacola
168	??	Used to be Law Engineering, but its now MacTech
169	CH	Law Engineering was a well respected company
170	KA	[names of people]. A sad day
171	BC	So let me ask this question. I mention in my recommendation that we leverage the university relationship again to develop the plans that are non-existent. Is that feasible from an engineering perspective, to go back in?
172	??	I think as far as the city-owned facilities, we corrected that mistake, we've got as-builts of everything along the coast that we did not have. We've got every public beach access that we have that has a structure or any improvement on. We've got it surveyed as as-built drawing and its in our state plane coordinates so it is on our aerials too.
173	CH	Might be hard pressed to go back. I think what Barry is talking about houses that have no drawing at all
174	??	Yeah
175	CH	That's what you are talking about? To create those would be very tough
176	?	I don't know, the high rise condominiums would have pretty good records for the most part. Most of them we are dealing with are 25 years old
177	BH	Or less
178	??	Or less. One plus from the severity of Ivan and Frederick when it when through is a lot of the very old structures are no longer there: The sub-standard constructed Things that have been built recently, again, I don't know about y'all but the single family homes in our area for the most part relatively new too.

179	??	We have one area of town where that would not be true
180	??	We've got one also, we've got one or two areas right around City Hall area
181	JM	But Barry, to go to you question I think that opens up another partnership, and I'll use Bob's condo for an example. If they didn't have, let's just say, its an older one… Part of our problem is that we didn't become a city until 1984 So let's just say it's pre-'84 condo that we don't have records for. Its Bob's condo. Bob doesn't have records, no one in there has records of it. That could open up a partnership where then we could then offer it to that condo to partner with us and have the university come in and have as-builts done for them because it could be beneficial to them from an insurance standpoint. The line you had there in one of your slides if it is not there the insurance company may not have to pay on it, it may be to their benefit to help fit the cost to have an as-built done. It would be to our benefit to have it and utilize it in the department
182	CH	Jeff, probably the county has some of those records, don't they
183	JM	[indicates no]
184	KA	Depends on
185	CH	Are you serious?
186	KA	Whether you kept them. Why would they keep them?
187	CH	That gets back to that 13 year rule
188	KA	Exactly, why would they keep them?
189	?	You are familiar with the Broadmore?
190	CH	Yeah
191	?	Very, very heavily damaged. It was a toss up to whether that building was substantially damaged or not and whether we were going to let them repair it. They chose to repair it and of course the first thing that contractor wanted when he got into town was to look at the plans. Well, it was already built before Orange Beach was a even a city, so we went to the county. The county had absolutely no records.
192	KA	I would imagine
193	??	How about the architect?
194	?	The architect is out of business and the initial contractor on that job went to great length to try to locate any information. He went back to the original contractor, made some contacts there, went back to the original design professional and we never located the first drawing of that building.
195	KA	That's the oldest condo, isn't it, on the beach?

196	?	For us
197	DB	I've got a point, I used to work for David Volkurt and Associates and I've been in their off site storage archive when we've moved several times from different buildings. One time when they were Perry Hand and Associates they did a lot of the inspection for the City of Gulf Shores, they had no inspectors at that time and engineers for contract review for condos and things. They also did a lot of, I think, for Orange Beach. In their archives, in their old archives, Perry Hand's as well as Volkurt, there are old drawings in there of condos like yours. Of both the site and I also saw architectural drawings an some of those because they were submitted to the design engineers for review, I think. The site engineer for review for review of those condos. Now, whether or not they are as-builts or not, I am not sure. Some of the engineering firms that have been in business in this area for a long time and architectural firms, their old archives may be a source buildings such as yours and others that they've had stored off-site Now, most of it is Mylar, or old onion skin drawings but they may have it. I have seen that before.
198	?	That would likely be a major partner in a project like that would be – because there is a limited number of architect and engineering firms in the three or four or five county area
199	?	A lot of it depends on if there is a long standing company like a Volkurt or if it was a mom n' pop shop and – you know – like my subdivision. The engineers dead.
200	KA	Is he dead?
201	?	Yeah, and when he died, everything got thrown away.
202	KA	God rest his soul
203	DB	But it would be a place to start
204	?	Yeah, I agree
205	Many	*inaudible many people speaking at once discussion*
206	DB	They have a pretty good handle on it, they have an inventory. Now it may not necessarily be in that box with that number on it,
207	JM	That could be a project unto itself for a student
208	DB	It0 very well could be
209	BH	Yeah, maybe an archeological student *Joking*
210	Many	*laughing*
211	?	Multiple discipline
212	CH	But overall, what kind of a dollar amount this will have as impact. I mean if we like do a project like that what will be the benefit to both of the cities here.

213	BH	You'd have to multiply that through Marc gave you an example of one site
214	MA	cost us probably $1 to $2M dollars just on one site
215	BH	$1 to $2M dollars just on one site not having data
216	??	Well, there's also another component to that, it's not just to after the storm recovery. It would be day to day for fire departments doing pre-fire planning. There's day to day uses to it to outside of post-disaster recovery process that would be of benefit because most of the major buildings, the fire departments do pre fire plans on
217	BH	There's also a piece in there too of time. We talked about that too when we were there last time. If you are sitting there, if you are the contractor looking at a building after the storm and you need to get at some drawings to know where stuff is, even the pilings if there is some missing or whatever, how quickly can you access it – suppose its on paper and you have it over here – how long will it take you to along with 5,000 other requests for that same data all from the people who are trying to get the...
218	CH	Well, let's take an even worse example. Let's take Lanny's example, the Broadmore. To me what would have to happen there is you'd have to pay an architect and an engineer to recreate
219	KA	They did. They redesigned the entire site. That's an enormous amount of money.
220	CH	It is.
221	?	That gets to your question because when you have to recreate drawings for existing structures, that's even more expensive than creating drawings from scratch for a new building You've got to go in there and do measurements, you've got to do all of that stuff.
222	?	And just to abandon what's already there and just basically recreate everything, that's even more of an expense. It just kind of snowballs
223	CS	If you take both of the communities it'll be, the potential benefit will be billions of dollars is what we are saying? I mean, I am thinking if we go to NSF or someplace to ask I'm going to spend this much money, what is it I am going to get out of it is the first question they will ask , because you know when the government puts money they want to see a big benefit
224	CH	Well it won't in the billions. I would guess it would be not be in the billions but in the hundreds of millions
225	BH	If you count the lack of tourism and the lack of being able to
226	CH	You throw all of those factors in a very sophisticated economic analysis
227	KA	Well, th ety, condemnation. We've got all of these things going on and we have limited staff Time is one thing Time it takes for staff to look for files

		Time it takes for staff to go find the files and then copy them Time it takes for staff to find out there is no plans I mean, to be able have this accessible, which is what we are talking about, GIS accessible to all, through the computer from home frees up our staff considerable It frees up staff to deal with contractors If contractors can go and open up the set of plans, they've got the plans, they go and say I've got the plans give me the permit, they are out of there.
228	BC	Are those plans public record, or would that be something that you would have to have password-protected?
229	KA	That's a good question
230	CH	Probably public record, the plans would be public record
231	KA	I think our legal counsel tells us that once it is approved it is public record
232	JM	Yeah, I think so
233	?	If I'm a thief and I can get plans to every building, that be great
234	JM	That is an argument that is made more so from a national security When we start talking about the structure power facilities, water reserves
235	KA	There are certain things that… water reserves
236	JM	That's a current debate, if you will
237	KA	City facilities, they are protected
238	BC	Semi-public, make it available to the contractors?
239	?	That's what I was thinking
240	KA	It is so far reaching Money saved paper wise
241	?	If you get it password-protected and its available for the public doesn't mean it has to be available, you know You could do two level, they could come in have to fill out the request But you could make contractors or engineers password protected I think you'd have two levels
242	?	It be the same thing we do when we allow people back on the island Its contract workers with the utility department
243	?	I wouldn't even go that
244	?	You can have access to this information for a limited time and then your password is gone
245	CH	Bob well getting back to your thing, though, that you mentioned about the time delay and if you have to recreate drawings like in the Broadmore case, That's a That sophisticate economic analysis that takes into account the losses of tourism, all the other delays, the loss of income, and all of those things.

		Because doing a set of drawings from scratch would take you, even if you are in a hurry, a month
246	KA	At least
247	CH	At least a month
248	CS	Has any community already done something like this successfully in a coastal community?
249	KA	You mean the actual data housing so that it is interfaced
250	?	Probably San Destin, because it is built by the same
251	JM	That's not a community
252	?	I know but its an example of
253	KA	No, we're talking about a municipality that has
254	CS	A municipality that has what you are talking
255	KA	Let's think of where all these GIS geeks are. Silicon Valley, who knows, I don't know, it's a good question
256	CS	You don't know
257	KA	I know not in this area of anyone succeeding, and quite honestly coming here with what the county has provided: aerials, parcel data, LiDAR data, all of the information that's provided here is far beyond quite a few places because they've got the grants and we are young. We are a young community, here. The older communities there is just so much data to be entered that they are kind of behind, if you follow me
258	CS	Okay so what you are saying is that in one way it is easier for you because you are a younger community
259	KA	Because we are a young developing community
260	?	We'll and your not an urban, metro area well you've got all the other issues here Baldwin county alone is smaller than most urban areas, but it is new and it has more technology probably in this county than most coastal communities you will find around the country But yet the problem is, what Kit and Laney and everyone is saying, we are working towards baby steps right now internally. An example is what [inaudible], tell them about that because that is a baby step toward it What I was going to say is there is more resources but there is not enough staff There is not enough staff, I mean, we just have one GIS, true GIS person here
261	KA	Don't look at me
262	?	No, Shawn

263	KA	Nicole, too. Shawn and Nicole
264	?	He's part time but he's a GIS guy But tell them what we are doing there and that is a step towards digitizing
265	?	Well, and Gulf Shores is going through the same thing. We are working towards all of our inspections results and inspection data being remotely entered and interfacing with a web page where the contractors can go and look up from the time they submit their job, their plans for plan review to the time that building has been C.O.'ed there is a web site that the contractor or the home owner
266	KA	That has been done before That is different. That is being done quite a few communities Because that is not so data-intensive
267	?	But it becomes digital and that's a baby step for us as a city
268	KA	It is for us but a lot of cities are already doing it
269	CH	Are you talking about inspectors with computers in their cars and a wireless deal just like police and fire? That be super, totally integrated wireless city
270	?	City wide wi-fi We've got a fiber backbone in that's going to give us the ability to do that. That's another thing we have done in the last year, we've connected all of our city facilities with fiber and we have a hard facility that Chuck had constructed north of the inter-coastal canal that's already wired up to move our entire mainframe up there in the event of a hurricane. If we lost all of city hall we'd be able to take, plug it back in up there, all the lats are set up all we have to do is physically move it and plug it back in.
271	BC	So you are talking about physically moving it?
272	KA	Yes.
273	BC	And you've got the dedicate fibrous network. Okay, because that was one of my concerns if you wait until right before the hurricane the network is going to be flooded And so if you've got your own network
274	KA	[agrees]
275	?	You can effectively, if you grab your own computer, you can move to any city facility and plug into our network and still have all the data that you had prior to the hurricane. If one of our facilities go down And a category 5, our whole island is going to be under water, so unless you are north of the inter-coastal you're going to have damage or you are on the second floor of a building, or it's flood proof.
276	KG	One of the examples that we've used quite a bit, if you go to the Katrina Storms, is Waveland, MS. Waveland was a town when we got over to help with recovery and both cities sent people within 48 hours we had a load of ice and supplies. When we got there, Waveland had decided, they were a small town near Past Christian

		They had everything at their city hall and it was all washed up. Police cars, fire trucks, everything was under water So, they didn't move anything, So we can't imagine that they had planned ahead at all Because we had done the same thing during prior storms where we parked everything at the SportsPlex and we are not doing that now It's going off the bridge
277	?	It's not going off the bridge, its going over the bridge
278	Many	*Laughter*
279	JM	That's what Ken's idea of evacuation
280	KG	That's a good plan, works wonderfully
281	KA	The big ditch
282	KG	But the same thing they say, is we saw that and even though they are a very small, small town, they put everything in one place and we can only imagine that everything was washed through because it was all under water So, and those towns had no idea because of the fact that you used Camille People when we were there said well we survived Camille, well we never figured anything would be worse than Camille. That was significantly worse than Camille for them with the surge And that was the complacency that came back 30 years later
283	CS	Bob, if we are going to write a proposal and both of the communities are willing to work with us, what is your thought on that?
284	PR	That's a great idea
285	KA	No, its fabulous
286	PR	What I was thinking is
287	CH	Thousand of digitizing slaves
288	JM	I say you almost come up with something like a page, if its typical probably a 24 by 36 [inch], on average is probably the typical page size for the blueprints we have on file.
289	BH	Well if you think about this, you think there are several pieces to this One is digitizing the current un-digitized paper stuff Another one though, is getting to where Jeff's vision was of being able to actually have all of this stuff is some common digital format so you can click through it, the GIS and get down to it.
290	KA	I'm more concerned about how to get it all working together How do you get it interfaced? How do you get it I mean that's where the stumbling block is If somebody could tell us the how, I think we could do the
291	PR	When you say "all", what do you mean?

292	KA	GIS compatible, interfacing to get this overall comprehensive program providing this information system to the public through our GIS system
293	?	PDF files?
294	?	As far as GIS goes, it's a matter of creating a shape file of that map and then linking that image file, if it's a JPEG or PDF and getting the link set up so that your image file is linked to that
295	KA	Correct, and I want to do it the cheapest
296	?	Least expensive, not cheap
297	KA	Sorry, the least expensive way possible
298	CH	In other words use your GIS data as a plan map, as an index, basically and you can cross query the spot. Okay, house "x" is there, go to some digitized file and pull house plans for that house Is that what we are talking about doing
299	?	People are visually oriented. If you look at a map [inaudible] I was right next door to this house here, my house is gone now, click on the What she was saying earlier was right, there are no centroids on any of the data we get from the counties So we have no point that says this is where a house was at. Its just a parcel number So its going to be up to the cities unless the county takes it upon themselves
300	KA	Oh yeah, well
301	?	Go back to the part where it was going to be up to the cities
302	?	Yeah Which is why we're currently, some of the GIS stuff we were doing is that we were eventually going to tie all the building permitting to our GIS too. So we would have to get centroids We have gone back, we got street addresses for all the parcels. Parcels don't have street address They have your tax number.
303	CH	When you talk about centroid, your talking about an "x" and a "y" digitized?
304	?	Just a point in the center
305	KA	"X" and a "y" of that building
306	?	and you link the data to that point
307	CH	The digitized point
308	BH	Yeah, and the orientation around the point
309	CH	And then that point correlates to another file electronically

310	KA	And that's another thing, somebody has to Armed, a couple of students, with GIS units and say go gather me the centroids and attributes needed to feed our GIS layer
311	JM	That would get them out during the day in the summer
312	CH	If they don't get too distracted Productivity goes down in the summer near the beach
313	PR	My question is, to write a proposal can we narrow this down We can do a pilot I can send a couple of students with GPS like she said But throwing them a vast problem
314	BH	It's too tough, right
315	KA	It's pretty, pretty bad
316	PR	Can narrow down, so that in a time frame of three months They can come up with some sort of tangible conclusions That we can expand for the proposal
317	BH	Well that's kind of up amongst this team to define. What would you like first, second, third?
318	?	Well, Brandon Franklin, our building official We get some of this data, figure out what is critical we may start simply with digitizing what we have And then expand it, because you see, we've got to have it tied geographically for us to give to have an easy interface not only for us but for the general public.
319	CH	But you are talking about these steps Maybe you want to digitize these plans you have and also create the indexes that Kit is talking about. That would be reasonably easy to do. Then you have the investigative efforts that we touched on about trying to run down plans from structures that you don't have.
320	KA	I say give up on that
321	CH	Well I think we've got to try and find that, maybe not for the houses, but for the structures. If you've got some commercial structures you don't have plans for do some detective work to try and find those. Call those architect firms, try to run those leads to the ground just like Lanny was saying for the Broadmore.
322	KA	That be a later thing
323	CH	But still, its got to be done Again that solves the delay problem
324	JM	You could start someone digitizing data and they could be going for months and while you are figuring everything out
325	CH	But how many people are we talking about bringing at this point?

326	BH	Hundreds, right
327	BC	At first, its just the pilot
328	BH	Let me ask a dumb question. Why can't we use high quality aerial or satellite photography and digitize the centroids of the house from that? It won't get you within millimeters but it will get you
329	KA	The aerials are not tied to the state plane coordinates We need to have it geodetically accurate
330	BH	Wouldn't that be easier just to certify that then get all of these at once rather than having someone go around with a GPS?
331	CH	I thought the county data was.
332	KA	No, the county data, the parcel data is, but the aerials are just
333	CH	That's right, Steve told me. They are not rectified
334	BC	I am award that NASA is working on some stuff within the state of Alabama with Homeland Security to look at critical locations like water reserves and things like that. I don't know what effort they are doing with the technologies that they have but I have some access to what they are doing and I don't know if there would be any synergies.
335	JM	Does anyone know, we were at the National league of cities the week before last and the Virtual Alabama program, there was a group out of Huntsville that had a presentation on that and that almost directly related to what we are talking about here
336	??	Was that in state plane's coordinates or
337	JM	I didn't think to ask that question at the time because I didn't know I needed to know that information but I'm wondering if it is
338		If that's a state of Alabama thing
339	JM	That's what I am wondering because it would be worth exploring that Virtual Alabama program to see because it is GIS related
340	?	Because NASA's program probably won't be It will be in something else because they are not really concerned with state plane
341	JM	If I remember right, they bought the rights from Google Earth And it's a version of that. That's the basis for which they use it
342	BH	I for one have to get to this transit rollout, this public transit thing down the street here What would you like to do next?

APPENDIX G. 2007- 2008 INFORMATION TECHNOLOGY DISASTER RECOVERY STRATEGY SURVEY

Please answer the following questions assuming that you are participating in decisions to promote the general welfare and sustained economic viability of your coastal community after a community-wide natural disaster such as Hurricane Ivan of 2004 or Hurricane Katrina of 2005.

For items 1 through 12:
Circle one choice per question based upon your level of agreement with the statement.

1. Backup and recovery of commercial and governmental infrastructure information (as-built drawings, surveys, engineering documentation, etc.) is very important to the community.

STRONGLY DISAGREE DISAGREE NEUTRAL AGREE STRONGLY AGREE

2. Backup and recovery of individual organizations' information (financial records, customer information, e-mails, etc) is very important to the community.

STRONGLY DISAGREE DISAGREE NEUTRAL AGREE STRONGLY AGREE

3. Data and information that is critical to restore community buildings and infrastructure is not backed up consistently by our community.

STRONGLY DISAGREE DISAGREE NEUTRAL AGREE STRONGLY AGREE

4. A major reason for lack of backup and recovery of data and information that is critical to restore community buildings and infrastructure is the different value attributed to this information among the stakeholders.

STRONGLY DISAGREE DISAGREE NEUTRAL AGREE STRONGLY AGREE

5. Individuals, organizations, and communities that experience relatively little damage or disruption after a community-wide disaster become complacent and have a false sense of security against potential damages of future disasters.

STRONGLY DISAGREE DISAGREE NEUTRAL AGREE STRONGLY AGREE

6. The costs of implementing data backup and recovery to protect vital community infrastructure data and information are negligible when considering the costs incurred for restoration when these data and information are not available.

STRONGLY DISAGREE DISAGREE NEUTRAL AGREE STRONGLY AGREE

7. The success and/or failures witnessed in other communities is a driving force to adopt data backup and recovery procedures to protect critical community infrastructure data and information.

STRONGLY DISAGREE DISAGREE NEUTRAL AGREE STRONGLY AGREE

8. The complexity of the information technologies and methods involved with enacting disaster recovery plans to protect vital community infrastructure data and information make it difficult to adopt them.

STRONGLY DISAGREE DISAGREE NEUTRAL AGREE STRONGLY AGREE

9. It is critical for the city to enact an ordinance to unify the many sources of data and information of private business infrastructure to facilitate faster and more cost effective restoration after a community-wide natural disaster.

STRONGLY DISAGREE DISAGREE NEUTRAL AGREE STRONGLY AGREE

10. It is critical for the city to enact an ordinance to unify the many sources of data and information of city government infrastructure to facilitate faster and more cost effective restoration after a community-wide natural disaster.

STRONGLY DISAGREE DISAGREE NEUTRAL AGREE STRONGLY AGREE

11. The local government agencies are currently technically capable of implementing and maintaining data backup and recovery services for the community.

STRONGLY DISAGREE DISAGREE NEUTRAL AGREE STRONGLY AGREE

12. The local government agencies are currently financially capable of implementing and maintaining data backup and recovery services for the community.

STRONGLY DISAGREE DISAGREE NEUTRAL AGREE STRONGLY AGREE

For items 13 and 14:

Rank each choice in order of importance from 1 being the most important to 7 being the least important. If two or more choices are of equal importance, provide the same rank to them.

13. Which agency/ies should be responsible for enacting ordinance to unify the many sources of data and information of city infrastructure after a community-wide natural disaster.

RANK (1-7)	CHOICE
	CITY
	STATE
	FEDERAL GOVERNMENT
	PRIVATE COMPANIES
	UNIVERSITIES
	HOMEOWNERS
	ECONOMIC DEVELOPMENT AGENCIES

14. Which agency/ies should be responsible for enacting ordinance to unify the many sources of data and information of private businesses faster and more cost effective restoration after a community-wide natural disaster.

RANK (1-7)	CHOICE
	CITY
	STATE
	FEDERAL GOVERNMENT
	PRIVATE COMPANIES
	UNIVERSITIES
	HOMEOWNERS
	ECONOMIC DEVELOPMENT AGENCIES

Demographic Information

For Items 15-24:
Answer the following demographic organization about yourself and the organization you represent.

15. What is the name of the organization you are representing?

16. What goods or services does your organization produce?

17. How long has your organization been in business?

18. What is your job title?

19. Approximately how many years have you been employed at this organization?

20. How many people are employed in your organization?

PROVIDE A SPECIFIC NUMBER:	***OR***	*CHECK ONE OF THE FOLLOWING CATEGORIES*
		___ 1 TO 5 EMPLOYEES
_______		___ 6 TO 25 EMPLOYEES
		___ 26 TO 50 EMPLOYEES
		___ 51 TO 100 EMPLOYEES
		___ MORE THAN 100 EMPLOYEES

21. What are your organization's annual revenues?

PROVIDE A SPECIFIC DOLLAR AMOUNT:

$_____

OR

CHECK ONE OF THE FOLLOWING CATEGORIES:

___ $0 TO $50,000
___ $50,000 TO $100,000
___ $100,000 TO $200,000
___ $200,000 TO $500,000
___ $500,000 TO $1,000,000
___ $1,000,000 TO $2,000,000
___ $2,000,000 TO $5,000,000
___ GREATER THAN $5,000,000

22. At what level in your organization are decisions about Information Technology (IT) made?

CIRCLE ONE: OPERATIONAL MANAGERIAL DON'T KNOW

23. Does this organization have formal IT positions?

CIRCLE ONE: YES NO DON'T KNOW

24. How many employees are designated as IT staff?

PROVIDE A SPECIFIC NUMBER:

__

OR

CHECK ONE OF THE FOLLOWING CATEGORIES

___ 1 TO 5 EMPLOYEES
___ 6 TO 25 EMPLOYEES
___ 26 TO 50 EMPLOYEES
___ 51 TO 100 EMPLOYEES
___ MORE THAN 100 EMPLOYEES

You have reached the end of the survey.

Thank you very much for your help!