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AN EXPLORATORY STUDY OF TRUST DYNAMICS IN DISASTER
RECOVERY PROJECTS

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Jing Pan

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GLOSSARY

Disaster Recovery Project – Disaster recovery includes restoration and reconstruction to the affected property. It is referred to as "recovery projects" in the dissertation.

Restoration Contractor – the professionals in providing restoration, mitigation, and reconstruction services. It is referred to as "restorers" in the dissertation.

Social Network Analysis (SNA) – It refers to the mapping and measuring of inter-agent relationships and flows. A social network is made up of nodes and links. Nodes represent the agents and the links show relationships between nodes.

Sociogram – It is a graphic representation of social links that an agent has. It is a graph drawing that plots the structure of inter-agent relationships and flows.

Closeness Centrality – It emphasizes the distance an agent has with all others in the network by focusing on the distance from each actor to all others.

Restoration Triangle – the dynamic relationships among the three key stakeholders of a disaster recovery projects. They are the property owner, the restoration contractor, and the insurance adjuster. It is referred to as "the triangle" in the dissertation.

ABSTRACT

Pan, Jing. Ph.D., Purdue University, May 2013. An Exploratory Study of Trust Dynamics in Disaster recovery projects. Major Professor: Robert Cox & Randy Rapp.

Trust is a core factor in disaster recovery projects on two layers. It first measures project performance by predicting work relationships, it also indicates disaster recovery efficiency on community level. However, none quantitative studies have been conducted regarding trust in disaster recovery projects. This research proposes a two-dimensional trust dynamic model. The spatial dimension of the trust dynamic model is a trust measurement model. It includes three latent types of trust – dispositional trust, cognitive trust, and structural trust. The temporal dimension is comprised of short-term trust and long-term trust which is sustained from projects into business alliances or interpersonal relationship. The spatial dimension of the model was visualized using social network analysis. Such model can be applied to great scale of community members in disaster-prone areas to visualize the direct and indirect connections among government, business and communities. The research implies the importance of trust in improving performance in the aftermath of a disaster. By adopting the set of suggested strategies, communities and business could achieve higher efficiency in resource allocation during the recovery process.

CHAPTER 1. INTRODUCTION

1.1 <u>Problem Identification</u>

Trust is the solution to deal with uncertainty and vulnerability in economic transactions (Luhmann, 1979; Heimer, 2001). Previous studies of trust in organizational behavior show that a minimum level of trust is needed to enable any transaction (Barney & Hanson, 1994). In construction, a sustained trust relationship between the project owner and the contractor helps both parties control the risk of the other party's failure to perform in accordance with the service agreement (Godfrey, 1995; Miller & Mitamura, 2003; Zaghloul & Hartman, 2002; Girmscheid & Brockmann, 2005).

Disaster restoration or insurance restoration as an important sector in the construction market, shares the same professional contracting relationship with conventional construction projects; therefore, many of the managerial issues construction management scholars have addressed also apply to restorers. Some of these issues include operational efficiency, project control, and marketing (Rapp & Pan, 2010). Trust building and customer management are also major managerial concerns in disaster recovery projects (Rapp, 2009; Consigli, 2011; Sailer, 2011).

Key stakeholders involved in a disaster recovery project include the property owner, the insurance adjuster, the insurance agent, and one or several restoration contractors. These stakeholders form a project team with the goal of restoring or rebuilding the damaged property.

Trust functions as a prerequisite for inter-organizational cooperation because of the common value and order formed and maintained by it. The development of trust relationships among stakeholders enables better communication and reduces adversities in the above situation. The openness and mutual understanding decreases the level of uncertainty. Though little literature is retrievable studying trust in disaster recovery projects, trust has been concluded as vital to optimize team work efficiency (Luhmann, 1979; Barney & Hansen, 1994; Heimer, 2001; Child, 2001; Girmscheid & Brockmann, 2005).

Previous trust studies in construction management framed trust as an explicit construct. However, trust initiates as a combination of cognitive and dispositional states, with depositional trust playing the leading role in cases when unequal power exists or when agents lack knowledge about each other (Luhmann, 1979; Hardin, 2004). The studies of trust building using only explicit indicators therefore miss an important piece of the puzzle.

Disaster restoration is also an integral part of the disaster recovery process. Restorers face at least three unique challenges of 1) limited resources and great uncertainty, 2) disaster survivors as clients, and 3) the involvement of insurance adjusters.

In disaster recovery projects, uncertainty comes from the fact that each disaster impacts people and communities differently. Each disaster recovery project is therefore a special case. Variations of different disaster recovery projects come from the extent of losses , whether the client is a homeowner or business owner, the level of disaster syndrome of the client, the likelihood of aftermath hazards, the availability of necessary resources, the insurance coverage of the impacted property, the institutional requirements (local building codes, warranties, etc.), and contract arrangement.

The restoration work is challenging also because of the greater demand of client management compared to conventional construction projects. When the damage is not devastating, restoration work takes place with the residents on site. The restoration work has to be done in a way to control its impact on the daily life and interruption of normal business operation. Communication and mutual understanding are vital under such circumstance. For more severe cases, the loss of one's home and property causes distress and depression (Sattler et al., 1995). Typically at the time restorers are involved, property owners have overcome such short-term syndromes, unless in some extreme cases the syndrome becomes chronic. In these cases, more than the technical expertise of restorers is required to interact with property owners who have survived a disaster.

Trust, under such circumstances, becomes a source of competitive advantage that differentiates a highly trustworthy firm from its competitors (Barney & Hansen, 1994). Property owners prefer to hire trustworthy restorers. Working with a

trustworthy restorer reduces the risks and uncertainties property owners face. It saves transaction costs by engaging higher levels of trust mechanism and lowering levels of formal governance such as contract management.

To build up such a competitive advantage and to achieve high efficiency, a restorer needs to 1) understand how trust initiates and develops over time, d 2) perform trustworthy actions that sustain trust with property owners, and 3) operate future projects with the goal of building up trustworthiness.

The purpose of this research is to propose and test a fuzzy integration of both implicit and explicit indicators of trust dynamics to get more insight into the trust mechanism. This research is intended to analyze disaster recovery project team interactions using trust as the trait.

Also, this research is an attempt to adopt social network analysis (SNA) to assess strengths of relationships within the context of the disaster recovery phase. It attempts to depict project-based trust on both spatial and temporal dimensions. The spatial dimension includes a quantitative trust measurement model with significant factors and a sociogram showing different levels of trust-building significant agents. Temporally, this research proposes the temporal trust dynamics that depict trust development on short-term and long-term, as well as how it is sustained.

The reminder of this chapter lays the basis for this research. First the context of this study is introduced with challenges and characteristics identified. Second, the research goals are stated and are broken down into specific research questions and hypotheses.

1.2 <u>Disaster Restoration Industry</u>

As a sector in the construction market,, disaster recovery projects are an integral part of disaster recovery activities. This section provides a detailed look into why disaster recovery projects are in conjunction with both fields, and why trust building is essential from both perspectives.

1.2.1 Disaster Restoration and Emergency Management

Disaster restoration is an integral part of the disaster recovery phase. Disaster recovery is one of the four phases in emergency management, in which an organization prioritizes its operations for efficient business continuation and determines how to protect and restore these components (FEMA, 1993). Figure 1.1 shows the four correlated and cyclical emergency management phases. Disaster recovery includes the recovery of the affected community within its built environment, socio-economic environment and ecological environment (Masurier et al., 2006). The focus of this research is built environment recovery or, more specifically, private building restoration.
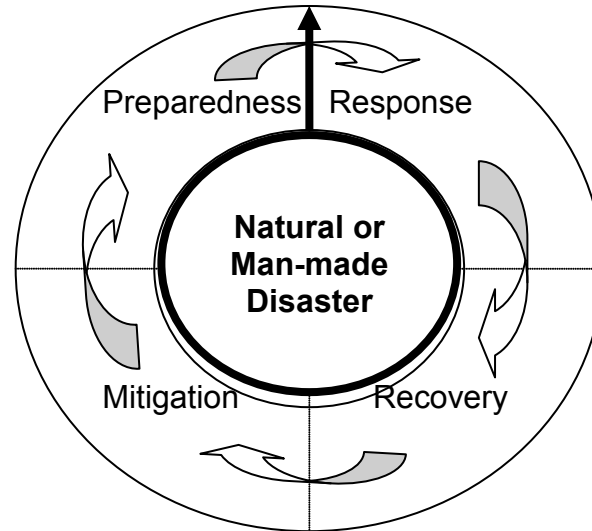
Figure 1.1 The Emergency Management Cycle

Restoration is a part of emergency management efforts, which typically take place from the recovery phase to the mitigation phase (Rapp, 2011). As an important step towards short-term recovery, it shares the complexity and dynamic nature of emergency management activities.

Less comprehensive than general disaster recovery efforts, which return the built infrastructure to minimum operating standards and guide long-term efforts that return life to normal, disaster restoration refers to the specialized construction project that involved repairing and mitigation (Consigli, 2000). It includes activities that "bring structurally sound, economically repairable facilities back to pre-disaster levels of functionality and aesthetics (Rapp, 2011)."

The recovery of these private properties is essential to the overall rehabilitation of a single family in incidents as small as burst pipes caused by accidents and human error, to recovery of multi-family communities in weather-related catastrophes. Little research addresses the necessary knowledge of what to do

and how can restorers act effectively in terms of customer management, project operation, and business development (Rubin, 2009).

As an important compartment of disaster recovery and mitigation, disaster restoration is rarely studied among emergency management scholars as part of the disaster recovery and mitigation process (Quarantelli, 1999; Smith & Wenger, 2006; Rubin, 2009). Studying disaster restoration management to identify best practices for high efficiency is therefore a necessary aspect of the study of disaster recovery. This research aims at identifying trust dynamics in disaster recovery projects, which serves the above need of research in recovery. Despite its emergency nature, disaster restoration, as part of the physical recovery process, is a sector within the construction industry. The following section presents the relationship of disaster restoration to construction in general.

1.2.2 Disaster Restoration and Conventional Construction

According to the 2002 North American Industry Classification System, 236118, disaster restoration, or insurance restoration, is one of the four specializations of construction remodeling (Will & Baker, 2007; JCHS, 2007). Profile America (2007) reports 16,000 companies specialized in water damage restoration and 800 specialized in fire damage. The industry is characterized by small restorer domination with concentrated specializations or service in geographically specific markets (Will & Baker, 2007). An estimated 38% of these 16,800 restorers had only one employee (CII, 2007).

With the self-reported low entrance cost and regulatory barriers of the market (RIA, 2011), the number of such small firms keeps on growing and prevailing in

the market (LCHS, 2007). The disaster restoration market has been the second fastest growing market in the remodeling market for five years (2003 to 2007) (JCHS, 2007). In 2006, the insurance restoration market grew by 16% (JCHS, 2007). The increasing rate has been growing over the years to a self-anticipated 24% (Fish, 2012). Such phenomena suggest a healthy competitive market and the recession-resistant feature of the disaster restoration market. However, easily entering during an upturn and exiting during downturn may challenge the notion of stability, which harms the reputation of the industry as a whole (Fish, 2012). Moreover, such variability and sole proprietorships may not best serve consumer interests of assured quality of service.

Disaster restoration companies are listed as home improvement companies providing disaster-related home repairing services (JCHS, 2007). They stand for 6% of the annual U.S. total remodeling spending in 2007. There were a total of 916 disaster recovery projects recorded in 2007, which totaled $12,700,000 . Out of the 916 disaster recovery projects, 187 were DIY by property owners, which equals 21% of all disaster recovery projects that year (JCHS, 2007). Different from infrastructure recovery, t private property restoration, including homes and commercial/industrial restoration, is mainly self-funded and operated by private sectors including insurance companies, restoration contractors, and sometimes lending agencies. The restoration market has self-reported greater than 90% of clients with property insurance coverage. For such clients, the disaster recovery project involves not only the restorer and the property owner,

but also the insurance adjuster who inspects the damaged property to determine the scope of restoration work to be covered and reimbursed (Rapp, 2011). Zon (2005) studied the differences of post-disaster reconstruction projects compared to regular construction processes in 6 aspects: contracting, related regulations and legislations, investment, cost, time, and quality. During the reconstruction process, building acts have to be followed resulting in structures that are of the same quality as they would be after a normal building project (Zon, 2005). Such regulation fails to address the disaster preparedness in the restoration process, and the fact that the same strict safety codes have to be met in a disaster restoration project lead to severe delays and overrun budgets.

Disaster recovery projects often require quicker planning and execution than construction projects in general (Rapp, 2011). Less planning time is allowed with relatively general scheduling, and estimating requires the restorer to be well-organized and efficient. The ability to respond to a project request quickly enables a restorer to compete for better jobs and grab the best time to restore the disaster-affected property.

Besides the common stakeholders well-understood in construction projects, a special stakeholder involved in a disaster recovery project is the insurance adjuster. A typical disaster recovery project involves three primary parties, as shown in Figure 1.3, among the disaster recovery project mix. They work under written agreement in a given time with a finite budget. The project team forms immediately after the initiation of the restoration work agreement or contract and disperses after completion. Long-term agreements exist between property

owners and insurance providers, and commercial property owners with restorers.

In private home restoration markets, long-term relationships rarely exist between

restorers and property owners. In the restoration industry, such a project

relationship is referred to as the "restoration triangle" as illustrated in the figure

below (Consigli, 2000; Sailer, 2011).
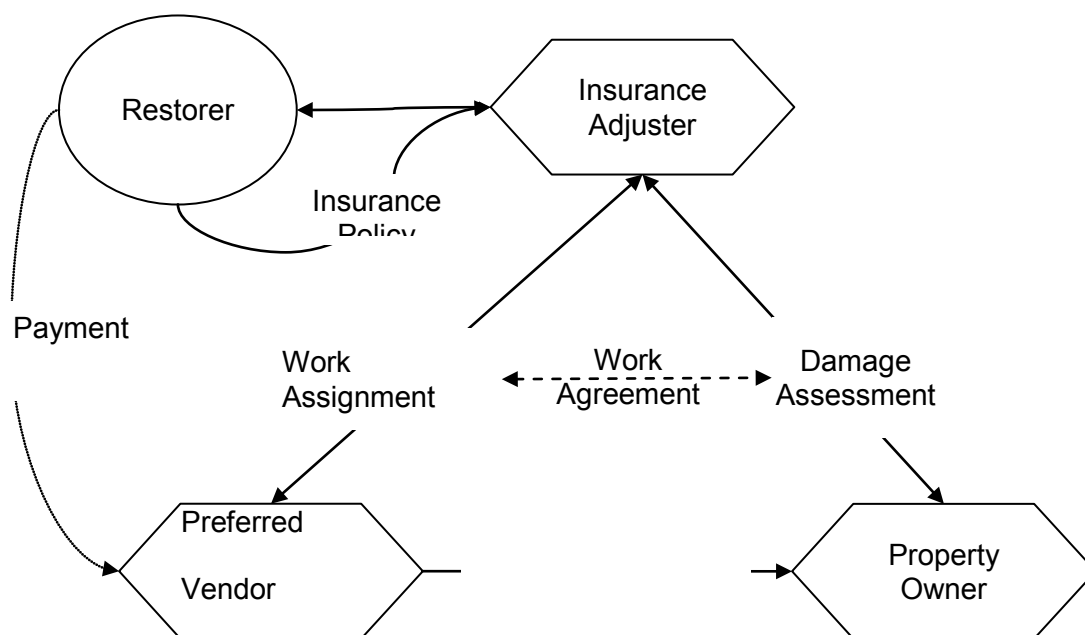
Figure 1.2 Typical Stakeholders in a Disaster Recovery Project

Insurance adjusters are employed to assess the loss in an insured property. Most

banks and lending agencies require property owners to purchase basic insurance

for a mortgage (Granovsky, 2005). Insurance actually provides relief to those

who suffer economic losses from a disaster, although the degree of relief is

largely based on the policy one property owner holds (Bean, 1992). Water

damage is somehow a special case for that is not covered by most private insurance companies. Instead, the National Flood Insurance Program (NFIP) protects property owners against losses caused by water (Kunreuther, 1996). The NFIP, which covers buildings and their contents (Granovsky, 2002), is marketed by private insurers, but the premiums are deposited in a federally operated Flood Insurance Fund, which then pays all claims (Kunreuther, 1996).Property owners buy it voluntarily. However, studies show that such voluntary policies bring vulnerabilities for half of the victims due to their non-purchase or failure to renew the insurance policy (Kunreuther, 2006).

The restorers have to deal with great uncertainty in finance, environment, regulation, and much more. Labor-intensive, high-fragmental, and case-specific conditions are some of the characteristics that flood recovery projects share with construction projects (Becerik, 2004). Concerns about existing structures, spatial constraints, scarce resources, and collaboration with insurance companies and property owners are unique challenges of restoration contractors (Egbu, 1999). Unknown existing conditions and potential hazards after the disaster require higher technical knowledge of the contractor. Restoration customers are unique. Customers are not familiar with construction processes, and they reside where the work is going on in the structure or are temporarily relocated depending on the severity of damage and insurance coverage. This may translate into a higher level of client interaction associated with more service-based industries (Holm, 2000).

1.2.3   Disaster Restoration as the Interdisciplinary Area

The above two sections provide a review of the literature that identifies

restoration as a division of the construction industry and as an integral part of

disaster recovery and mitigation activities. Figure 1.3 below shows the location of

the restoration industry at the cross-section of disaster recovery and construction.
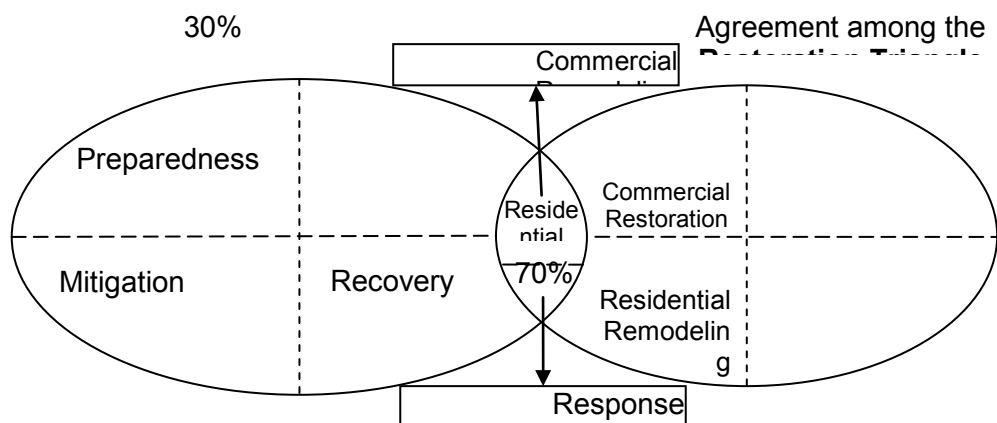
Figure 1.3 Restoration as the Intersection of Disaster Recovery and Remodeling

The restoration industry is the intersection of the disaster recovery and

construction industries because it shares many characteristics with each industry.

It consists of construction projects with emergency concerns, and emergency

management activities focusing on building environment.

The restoration industry distinguishes itself from the construction industry in

general because of its emergency nature. Disaster recovery projects require

prompt planning and decision making compared to construction projects in

general. As a part of emergency management activities, restorers face greater

uncertainties and both internal and external challenges. Internal challenges

include the involvement of insurance adjusters in the scope definition process, the likelihood of psychologically impacted property owners to work with, and project administration issues including healthy cash flow and safety concerns. External challenges might include scarcity of certain resources, such as building materials or utilities, and institutional challenges to cope with, such as inappropriate building codes.

The restoration industry belongs to the emergency management domain with a focus on building environment recovery. Construction management and administration principles mostly apply to disaster recovery projects. Although specific standards and best practices apply, disaster recovery projects require basic knowledge of building science and project management techniques.

Flood damage caused by external flooding is not covered by standard homeowners' policies, but the coverage is provided by the federal government's National Flood Insurance Program (NFIP) (FEMA, 2012). NFIP initiated in 1968 as the response to the increasing amount of damage caused by floods (III, 2012). It is available to communities that agree to adopt and enforce floodplain management ordinances to reduce future flood damage. It is a self-supporting program unless a catastrophic disaster. Some private insurers also provide private flood insurance as additional insurance coverage. It is coverage above the basic policy or for people whose communities do not participate in the NFIP (III,2012). 14% of American homeowners had flood insurance coverage in a 2011 poll by Insurance Information Institute. 69% of NFIP flood insurance policies covers single family homes, 20% covers condominiums and 5% covers

businesses and other non-residential properties according to the insurance Fact Book 2012 (III, 2012). Flood losses totaled $728 million in 2010 from 28,000 claims., which is lower than the $773 million loss in 2009. Although the efficiency of NFIP is currently under debate after the widespread flooding incurred by Hurricane Katrina in 2005, the program is still in effect without significant changes.

For an insured property, the typical restoration work starts with the filing of a claim by the property owner (as the insurance policy holder). Most property damage is covered by property insurance. Even NFIP, which is operated by the federal government, is sold and processed via private insurance companies. Therefore, for flood damage from external flooding or other domestic causes, the process depicted in Figure 1.4 is applied.

The property owner contacts the insurance agent immediately after noticing the property and building content damage caused by the disaster. The insurance adjuster schedules an on-site inspection of the damaged property to estimate extent of the damage and the covered perils. The property owner, in the meantime, is responsible for taking any capable mitigation to avoid further damage.

Next, one or several restorers might be invited to bid on the project. The numbers of bidding restorers depends on the availability of local restoration services, the property owner's preference, and the property owner's relationship networks. At least one restorer inspects the damage and provides estimates of the scope of work. Depending on the level of agreement on the scope of work by the restorer

and by the adjuster, sometimes more restorers might be invited to bid, or a public adjuster might get involved to justify the estimate made by the insurance adjuster. The adjuster submits the claim damage report based on the inspection and professional judgment. The property owner will get paid for the amount of the claim damage report within the period as specified in the insurance policy.
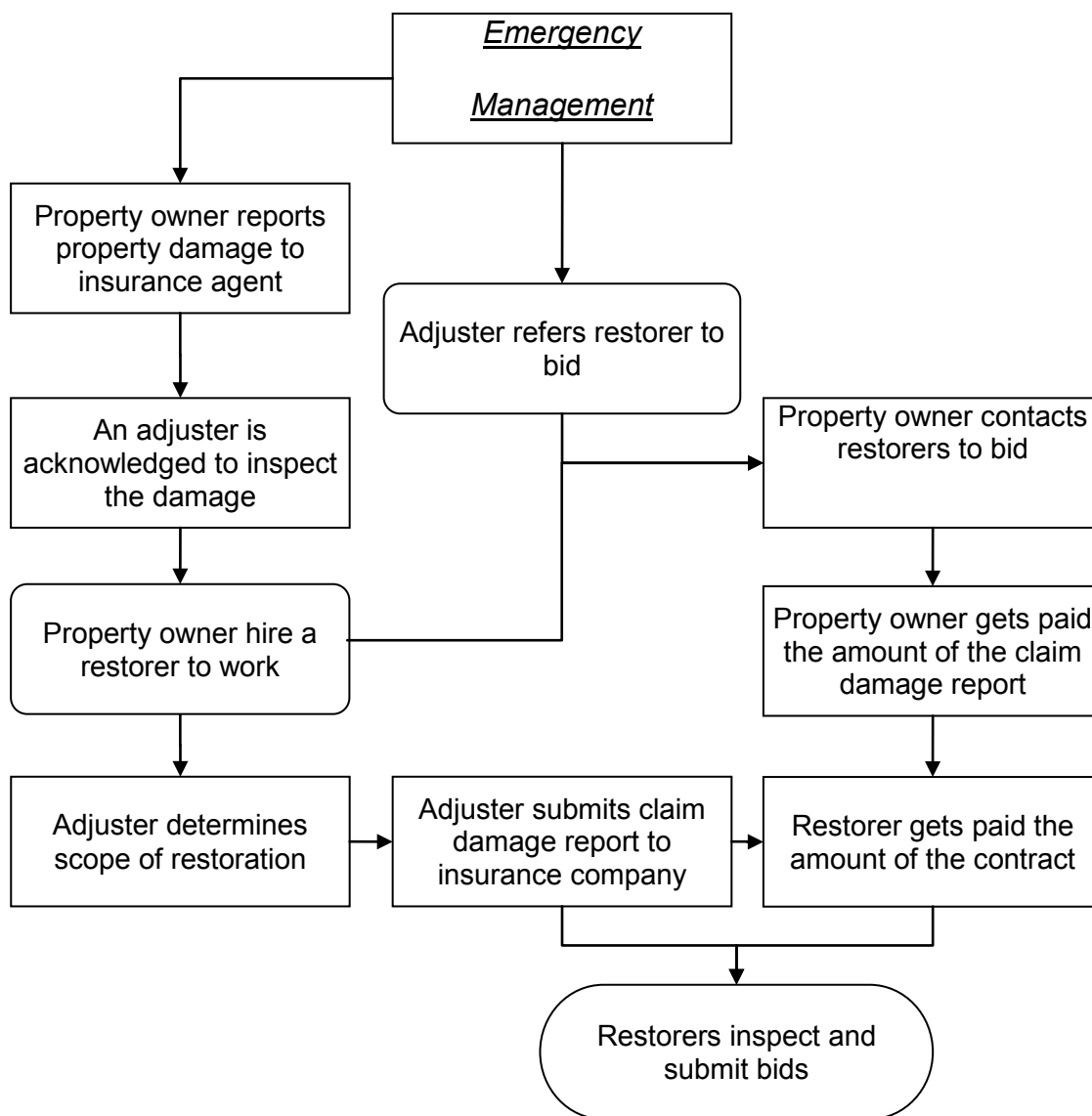
Figure 1.4 The Disaster Recovery Project Process

Once the best bidder has been picked, the property owner will sign a written agreement to authorize the restorer to start working. Restorers often work on projects with residents still occupying the same property (Rapp, 2011). Special customer care including communication with residents about the work and coordinating work schedules with them are necessary to minimize the interruption of their normal lives or operation. Special care is also needed in terms of safety management and scheduling to avoid violating those residents' right of use.

As shown in Figure 1.2, restorers get progress payments and final payments from the property owner, not the insurance company. The building of trust between the restorer and the property owner has the common effect as that of relation building in contracting parties of construction projects in general (Swan et al., 2002; Wong et al., 2007)

The restoration market has been growing over the past several years. The business is relatively stable and resistant to economic recessions. In 2010, homeowner insurance losses totaled $39.6 billion, with the average claim severity of 2005 to 2009 at $7,876 (III, 2012). The frequency of property damage claims is six out of every 100 insured homes in 2009. Fire, wind, and water damage are the three major causes of such property damage claims. In 2009, 29.22% of losses were caused by fire, lightning, and debris removal; 31.31% of losses were caused by wind and hail, and water damage accounted for 23.7% of the annual total amount of losses.

With its growing share in the remodeling industry and construction industry at large, the investigation of disaster recovery project management practice is important in better understanding the industry. This research is an attempt to investigate the trust building dynamics in disaster recovery projects. Data are collected from key stakeholders including property owners and restorers. Such empirical data are used to create the conceptual framework of the trust dynamic model and a list of business strategies for restorers in building trust with property owners who expect restorers to help them overcome their nightmares.

1.3   Statement of Purpose

The research combines two areas of study. First is the study of the trust mechanism. Trust has been studied widely in sociology, economics, organizational behavior, management science, and psychology. By reviewing literature in these areas, this research develops a definition of trust, the benefits of trust, and the measurement of trust within the context of flood/water damage recovery projects. The second half of the research has roots in the researcher's focus area in disaster restoration management. As stated in the previous section, this research investigates the dynamic trust mechanism exclusively in disaster recovery projects. It concentrates on proposing a mechanism beyond conventional construction management schemes that focus more on tangible preplanning items. Instead, a conceptual model of customer-focused, in-time corrective dynamics is proposed. The goal of such model is to improve the overall project performance by controlling the intangible elements of a project, including trust and relationship building. The correlation of trust dynamics and

project performance is analyzed. Conclusions about trust relationships in enhancing project performance are drawn from such analysis.

Within the focus identified, the major goal of the research is to propose a dynamic trust mechanism in disaster recovery projects with trust measures on both spatial and temporal dimensions. This research focuses on the trust mechanism in flood recovery projects with the basic required insurance coverage, in which private insurers and restorers are the main force of disaster recovery. Institutional factors such as disaster management regulations, federal emergency aid and insurance programs, professional certifications, and third-party reputation mechanisms are also investigated for their significance of impact on the trust relationship of property owners and restorers. SNA is adopted to assess their effects on the trust dynamics in disaster recovery projects.

1.4   Research Questions

As a result of the aforementioned, this research examines the dynamic trust mechanism in disaster recovery projects with the following three research questions to be answered:

1.   What are included in the trust dynamics in disaster recovery projects on the spatial dimension?

2. What are included in the trust dynamics in disaster recovery projects on the temporal dimension?

3. How are the two dimensions of the trust dynamics in disaster recovery projects relate and shape the trust dynamics?

1.5   Significance

The study of trust mechanisms in disaster recovery projects provides a theoretical framework that restorers could use to guide their strategies for developing trust with customers. The trust dynamic in disaster recovery projects enables open communication. It helps avoid conflicts and rework caused by misinterpretation of project scope. This is realized by the mutual understanding of goals and the satisfactory predictability of each other's actions. It enables the optimal use of the limited resources available during the restoration process, including physical resources and time. Trust with customers also provides better strategies for contract arrangement, project control, and financial planning.

The restoration industry could benefit from such research as the trust mechanism promotes best practices in project management for optimal performance. Such improvement, coupled with consistent progress in technical aspects, sustains the prosperity of the restoration market.

Disaster recovery is the least understood area by emergency management scholars and practitioners (Bullock et al. 2004; Dueñas-Osorio, 2009). Disaster recovery refers to the aftermath of a disaster, when restoration effects are in addition to regular services (Heath, 2000). As a key step in recovery, disaster recovery projects focus on the physical recovery of the destroyed properties after a disaster. Much academic research is needed to fully develop the industry and to facilitate understanding of the bigger picture of disaster recovery.

The timely restoration of properties accelerates the process of community rehabilitation following a disaster and the people within. The study of trust

mechanisms in disaster recovery projects is therefore a complement to the field of emergency management study.

1.6 Assumptions

The study will be conducted under the assumptions as follows:

1. The trust between an insurance adjuster and a restorer has already reached the optimal level for the investigated disaster recovery projects.

2. Distrust is another construct but not the other extreme of trust. It does not exist between the property owners and the restorers in this research.

3. The samples for both the restorers' survey and the property owners' survey are representative of the population.

4. The damaged properties investigated have at least a minimum property insurance coverage.

5. Flood insurance, or National Flood Insurance Program, is operated via private insurance companies. Therefore NFIP is considered only as an indirect or institutional factor that may have impact the trust relationship in a disaster recovery project, but not a direct stakeholder in a typical flood recovery project.

1.7 Limitations

These research results are applicable to the following limitations:

1. The research subjects are all part of the private sector – privately owned properties, private property owners, privately owned restoration firms, and private insurance companies.

2. The property owners investigated are survivors of major floods in 2011.

3. The restorers investigated are restoration companies specializing in water and flood damage restoration for both commercial and residential properties.

The research scope is disaster recovery projects after major floods. However, most restorers have more experience in smaller-scale water damage and flood damage; the interview data, therefore, contain restorers with both large and small disaster restoration experience.

1.8 Delimitations

This research is designed and conducted with the following delimitations:

1. Insurance companies or adjusters are not included in the trust dynamics.

2. Uninsured properties and their owners are not included in the research,

This research does not consider the public sector in terms of trust building and restoration work.

1.9 Hypotheses

After a primary investigation, including a literature review and interviews of industrial experts, two survey questionnaires are designed to collect data on property owners' views and restorers' views about trust in disaster recovery projects separately. This step is to answer the question of "How does the trust relationship between the property owner and the restorer improve overall project performance?", "What types of trust are included in the trust mechanism in disaster recovery projects?" and "How can they be measured?" The following hypotheses are to be statistically tested using the survey data, and they fall into

the four categories of dispositional trust indicators, cognitive trust indicators, institutional trust indicators, and time-based trust dynamics.

This research proposes that the trust measurement is comprised of institutional trust and inter-agent trust. It is adopted from previous studies of trust as multi-dimensional constructs. Table 2.1 presents the milestone studies of trust following this path. The discrimination of these two types of trust is by the power held by each party to correct the trust relationship over time. Compared to institutional trust, in inter-agent trust relationships the involved agents are able to correct the trust based on the feedback they each get. Based on the nature of the feedback, inter-agent trust can be further broken down into cognitive trust and dispositional trust. As shown in the names, these two types of trust are categorized because of the different mental process for the types of information gathered over interactions. Section 4.1 provides a much more detailed explanation to these categories. The focus here is to present the hypotheses. The nine hypotheses are clustered in four categories. The first three categories are the measure for each type of trust. The last category is to test the temporal significance of the trust dynamic.

1.9.1 Dispositional trust measures

Hypothesis 1 Sociological status of a property owner has significant impacts on the trust mechanism in disaster recovery projects.

According to the sociological study of trust, sociological status determines an agent's capacity to trust. Such capacity to trust is closely related to the initiation

of trust, which is vital to all economic transactions including disaster recovery projects.

The identified measures in this category are listed in table 1.1. The notations are also included in the table. These notations are used hereafter in the research. Listed are the independent variables (IV) to be tested using ANOVA. The dependent variable (DV) used to indicate trust is O24: "The restoration contractor's actions agreed with my expectations of appropriate restoration." The statement is the definition of trust rephrased. It specifies the context, addresses the dynamic nature of the trust mechanism, and includes the cognitive feedback mechanism of the trust mechanism. Significance tests are run between the DV and each IV to explore significant correlations between subjects.

Table 1.1 *Measure Variables Nested in Hypothesis 1*

Measure	Notation	Number in Property owners (O) or Restorer's (R) Survey
Highest education level	DT1	O3
Gender	DT2	O4
Marital status	DT3	O5
Building science knowledge	DT4	O19, R16
Availability of emergency plan	DT5	O20

Hypothesis 2 Personal experience of floods and disasters of a property owner has significant impacts on the trust mechanism in disaster recovery projects.

Each disaster recovery project is a special case for restorers considering the diversity in property owners. The scale of loss, the personal affection toward the damaged property, and the unusual mental state of a property owner in the aftermath of a flood makes each case unique. It is challenging for restorers to work successfully in such cases. The identified measures of property owners' experiences in disasters are listed in table 1.2. The significance of correlation of these measures and the property owners' capacity to trust is examined.

Table 1.2 *Measure Variables Nested in Hypothesis 2*

Measure	Notation	Number in Property owners (O) or Restorer's (R) Survey
Ownership of the damaged property	DT6	O1
Years of ownership	DT7	O2
Number of floods experienced	DT8	O9, R15
Primary home/business property	DT9	O12/O13
Number of residents affected	DT10	O14
Amount of loss	DT11	O15
High stress in aftermath	DT12	O16, R14
Utility and goods shortages	DT13	O18

Again, O24 is used as the DV for the analysis with each IV listed above. ANOVA will be run to validate the hypothesis about the trust mechanism and these indicators as included in the property owners' survey.

1.9.2   Cognitive trust measures

Hypothesis 3 Technical expertise and business integrity together build up the professional reliance of a restorer. It has significant impact on the trust dynamics in disaster recovery projects.

Professional competence and work integrity are concluded by McAllister (1995), Rousseau et al. (1998), Hardin (2004) and many others as the two components of cognitive trust. Property owners rely on restorers to restore the damaged property. Professional reliance on a restorer is built from the two aspects of professional expertise and business integrity. The professional expertise reduces the uncertainty that a property owner has because of his or her lack of knowledge in building science. The business integrity reduces the vulnerability of the property owner as he or she finds the restorer ethical and honest.

The two aspects of professional reliance are further developed into measures as listed in table 1.3. These have to do with the development of trust through a cognitive feedback cycle. As it is a two-way process, most variables are included in both surveys. O24 is used as the dependent variable for the ANOVA analysis in the property owner's survey with each of the O-items as DV. R27: "The customers worked with my company as a team to reduce conflicts, misunderstanding, delays, and work shifting." is used as the DV in the ANOVA of the measures in the restorers' survey. Note that R27 is parallel to O29.

Hypothesis 4 Restorers and property owners differ significantly in their perception of the importance of the cognitive trust measures.

The two surveys are designed to enable comparisons between the restorers and the property owners. The significance of the IVs, after identified respectively, is compared to discover discrepancies in the perception of trust measures between restorers and property owners. Such discrepancies can be roadblocks to trust building in disaster recovery projects.

Table 1.3 *Measure Variables Nested in Hypothesis 3*

Measure	Notation	Number in Property owners (O) or Restorer's (R) Survey
Clear goals and objectives	CT1	R17
Effective communication	CT2	R22
Clear and complete contracts	CT3	R23, O25
Openness during initial interactions	CT4	R24, O26
Honesty and permeability	CT5	R25, O27
Objective and fair decisions	CT6	R26, O28
Effective cost control	CT7	R28, O30
Effective schedule control	CT8	R29, O31
Effective quality control	CT9	R30, O32
Work to meet standards	CT10	R31, O33
Effective safety manners	CT11	R32, O34
Courteous to customers	CT12	R33, O36
Respectful to cultural/religious requirement of property owners	CT13	O35
Assistance in applying financial aids	CT14	R34, O37

1.9.3   Institutional trust measures

Hypothesis 5 The network of relationships significantly impact trust mechanism in disaster recovery projects.

Hardin (2004) states that thickness of relationships determines the capacity of agents to trust. In disaster recovery projects, such networks of relationships include the property owner's family and friends, his or her insurance agent, community, and much more. It enables wider networks with both thick ties and weak ties. This is reflected in disaster recovery projects, including the diverse manners in which a property owner may get in touch with a restorer. Table 1.4 lists the measures contained in this hypothesis. O24 and R27 are used respectively for the ANOVA in the property owner's sample and restorer's sample.

Table 1.4 *Measure Variables Nested in Hypothesis 5*

Measure	Notation	Number in Property owners (O) or Restorer's (R) Survey
Years with same insurance agent	IT1	O8
Means of finding the restorer	IT2	O22, R19
Preferred vendor of insurance agents	IT3	R20

Hypothesis 6 Availability of professional certifications significantly impact the trust mechanism in disaster recovery projects.

The other institutional factor of trust building that has been identified is trade organizations. These organizations offer various certifications for practitioners. Property owners initiate trust with restorers that have one or several specific

certifications because of their trust in the market order and ethics. Table 1.5 shows the only variable to be tested under this hypothesis. It is tested in the property owners' survey to see their awareness of such institutional support. It is included in the restorers' survey to analyze the correlation of it with the trust relationship built in projects.

Table 1.5 *Measure Variables Nested in Hypothesis 6*

Measure	Notation	Number in Property owners (O) or Restorer's ® Survey
Certifications held by the restorer	IT4	O21, R18

Hypothesis 7 National Flood Insurance Program significantly impact trust mechanism in disaster recovery projects in its availability, sufficiency, and more.

Five measures are designed to illustrate the significance of NFIP as an institutional factor towards trust. Table 1.6 lists the five measures.

Table 1.6 *Measure Variables Nested in Hypothesis 7*

Measure	Notation	Number in Property owners (O) or Restorer's (R) Survey
Damaged property covered by NFIP	IT5	O6, R8
Sufficiency of NFIP coverage	IT6	O7
Customer's more cooperative with NFIP coverage	IT7	R13
Customer's awareness of NFIP	IT8	R12
Assistance in applying financial aids	CT14	R34, O37

1.9.4   The temporal feature of the trust mechanism

Hypothesis 8 Trust improves over time during a disaster recovery project.

O38 and R35 ask respondents to evaluate the degree of trust improvement directly. The mean values of the two questions are used directly to test hypothesis 8.

1.10   Project Overview

This chapter presents the background of the research, significance of the research, and the research goals and research questions in particular. Also a brief outline of the research scope is provided. In next chapter, a review of past studies and literature will be presented.

With the identified gap in the intersection of the three fields identified, the proposed trust dynamic is presented in detail in Chapter 3. The research methodology to collect data in order to validate the proposed trust dynamics is stated in Chapter 4. Research results and hypothesis testing results are presented in Chapter 5. Chapter 6 concludes the dissertation by providing a general review of the tested model and its interpretations. Theoretical contributions of this research are restated together with its applications. Last but not least, suggestions for future research are stated in order to complete the theoretical study of trust in disaster recovery projects.

CHAPTER 2. LITERATURE REVIEW

This chapter provides an overview of the background, the theoretical and practical issues related to disaster recovery projects. As a primary step, this part of the research is to establish the three pillars for the development of a framework for understanding the contractual dynamics of a typical disaster recovery project. The first pillar of this research is also the context of the proposed trust dynamic model. It has been described in Chapter 1. The first section of this chapter reviews literatures on trust theory. It serves as the theoretical framework of the proposed trust dynamics by providing a multidisciplinary review of scholarly studies of trust. These bodies of literature serve as the preliminary inventory for the proposed trust measurement model, which is the second pillar of the proposed trust dynamic model. The third pillar of the proposed framework is social network analysis. It serves as the theoretical framework for the trust social network model. The second section of this chapter reviews the major components of the social network analysis and previous studies of construction projects from a social capital perspective.

2.1   Trust Theory

Scholars from sociology, management, organizational science, and psychology have devoted efforts into the interpretation of trust (Luhmann, 1981; Butler, 1991;

McAllister, 1995; Cook, 2001; Gillespie, 2003). Sociologists studied trust and power in social relations (Blau, 1964; Luhmann, 1979; Cook, 2001). Managerial scientists studied trust as a competitive advantage in economic transactions (Barney & Hansen, 1994; Child, 2001; Girmscheid & Brockmann, 2005). Organizational scientists studied trust in improving organizational effectiveness (McAllister 1995; Mayer et al., 1995; Hardin, 2004). Psychologists studied trust as a state of mind that deals with vulnerability and predictability of others (Frost et al., 1978; Rousseau et al., 1998; Gillespie, 2003). Among all these studies in trust, sociological study of trust lays the theoretical framework for trust studies in organizational and management science (McAllister, 1995; Yamagishi et al., 1999; Hardin, 2004; Holmstrom, 2007; Girmscheid & Brockmann, 2005). Despite the widely spread focus of research in different domains, researchers from all fields attempt to define trust. The following section provides a review of such efforts in defining trust.

2.1.1 Defining Trust

This section focuses on answering the question of "what is trust?" Instead of a mere sentence defining the term, the definition of trust include the three parts of contents including the concept of trust, types of trust, and levels of trust. The often times confused terms of trustworthiness, mistrust and distrust are also defined.

2.1.1.1 <u>The Definition of Trust</u>

Trust has been concluded to be critical in many fields in the past decades. However, it is a phenomenon that remains "under-theorized, under-researched, and therefore poorly understood" (McAllister, 1995; Child 2001; McEvily & Tortoriello, 2011). Generally there is no universally agreed definition of trust. Trust is a complicated state for its multiple layers of concept. Different definitions for trust tend to address one or several layers of it (Luhmann, 1979; Gambetta, 1988; Yamagashi & Yamagashi, 1994; McKnight & Chervany, 2001; Hardin, 2004; Castelfranchi & Falcone, 2010). On the basic layer of interpersonal trust as stated by psychological scholars (Bachmann, 1999), trust develops among people in one organization into organizational trust. It further develops among people from different organizations involved in economic transactions into inter-organizational trust (Barney & Hansen, 1994). In this research, all these subjects involved in trust relationships are referred to as "agents". So the term agent is the general term for people, groups, teams, and organizations involved in different contexts of trust.

Psychologists understand trust as a psychological state. The basic unit of a trustor and a trustee would be an individual. Psychologists define trust as "a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another (Rousseau et al., 1998)."

Sociologists including Lumann (1979), Gambetta (1988), Yamagashi (1994), McAllister (1995), McKnight and Chervany (2001) and Hardin (2002) pointed out

the significance of not only the psychological state, but steps further to the action basing on such intention. They provide several definitions of trust basing on their observation of social interactions. Hardin (2004) defines trust as a three-part relation: A trusts B to do X. A is the trustor, B is the trustee, and X is the specific context of the trust. This is in consistence with earlier definitions by Luhmann (1979), Cook (2001), and many others.

One gap of current research in explicit trust measurement lies is that many inventories designed without acknowledging the context. The construct of those trust inventories are sometimes abstract and vague because many of such research is designed to reach the most people so no specific contexts are stated explicitly. Such generalized questions are designed to investigate the pattern of generalized trust. However, the way that those questions are framed lead respondents to restrict the range of matters in which they would trust other agents (Hardin, 2004). This draws question mark to the accuracy of the research results. Several models measuring trust have been proposed: the Wong inventory, the Hartman color, and the dynamic model.

One thing in common among the above definitions of trust is that trust is not an event but a state. Here an event is defined as "fixed at a point in time" and is "unrelated to any present experience" (Luhmann, 1979). It always involves changes and unpredictable natures (Luhmann, 1979; FEMA, 2003). State, on the other hand, lasts over certain period of time and "persists regardless of change over points in time" (Luhmann, 1979). It often times is predictable and is

perceived as series of events as "altered form of continuously present expectation" (Luhmann, 1979).

This research attempts to investigate the trust relation between home owners and restorers in disaster restoration projects. Disaster restoration projects deal with contingencies. Although many efforts in studying ways of forecasting floods, it remains unexpected for most of the cases. Trust is therefore vital in reducing uncertainties of a disaster restoration project.

The existence of trust implies situations involving risk (Coleman). Hardin (1993) makes an even extremer statement about the correlation of trust and risk as "my estimation of the risk is my degree of trust in you." Trustor chooses to trust trustees because their goal achievement depends on the performance of the trustees. Risks involves as none of the institutional mechanism covers every details and events.

However, trust itself does not engage risk, but action on trust does (Meyer et al., 1995). Even with the trust in place, it provides no guarantees of the parties to act on that trust. Risks emerges as the people or groups involved social interactions and economic transactions decide to trust the others basing on somehow limited information or experience about the future behavior of the others. However, such risk is unavoidable. And for such risks, the research of trust assessment is necessary to minimize such risks with low transaction costs. We emphasize on the low costs because trust mechanism has the advantage over formal control mechanism for its lower transaction costs and higher efficiency (Williamson, 1995; Zaghloul & Hartman, 1999).

2.1.1.2 <u>Types of Trust</u>

Researchers study the factors impacting trust and categorize trust by types (Lumann, 1979; Yamagashi, 1994; Mayer et al., 1995; McAllister, 1995; Rousseau et al., 1998; McKnight et al., 1998). The trust that is defined in earlier section is the inter-agent trust. It takes place when the feedback from each other would work rapidly and significant on the trust relationship (McKnight & Cummings, 1998; Hardin, 2004). Hardin (2004) further specifies the two contexts of inter-agent trust as interpersonal trust and inter-organizational trust. Much research adopts such classifications of trust.

Though diverse factors have been identified, most scholars in trust theory agree on the two bases of disposition and cognition. People choose to trust in some ways but not in others (Lewis & Weigert, 1985; Gillespie, 2003).

Dispositional trust refers to an agent's tendency to trust. It is a trustful attitudes and motivations towards no specific agents including people, groups, and institutions (Hardin, 2004; Becker, 1996). Dispositional trust is the source of the bounded rationality of trust. It depicts the emotional bonds between individuals (Lewis & Wiegert, 1985; McAllister, 1995). Such bounded rationality includes trusting untrustworthy agents, or distrust trustworthy agents

Compared to dispositional trust, cognitive trust requires more thought from the trustor (Luhmann, 1979). Cognitive trust is more of the belief and expectation about a specific agent in a specific matter (Becker, 1996). Cognition-based trust develops with competence, professional skills, and satisfaction with performance. This type of trust involves the assessment of the other agent's trustworthiness

from evidences (Cook, 2001). Lewis and Weigert (1985) also states that trust develops from cognitive evaluations of the trustworthiness of other people and groups.

The psychological definition of trust as an expectation of the other agent's dutiful action illustrates the view of trust as a cognitive result. Although such importance of cognition acknowledged, many researchers agree on that trust is an multidimensional state and involves not only cognitive processes but also emotional, or which is framed as dispositional trust (Hardin, 2004; Lewis & Weigert, 1985; Luhmann, 1979; McAlister, 1995; McKnight et al., 1998). Besides the ongoing dispositions and cognitions about the trustworthiness of each other, researchers notice the effect of third parties as the intermediates of trust (Luhmann, 1979; Kramer, 1999; Hardin, 2004; Cook, 2001). Luhmann (1979) proposes this type of base for trust as institutional trust. Institutional trust is achieved basing on the shared understandings regarding systematic rules regarding particular behaviors (Kramer, 1999).

Institutional trust provides basis for the emergence of inter-agent trust. The term "institutional trust" is used to emphasize the reliance of public trust in institutions. It serves as the reduction mechanism for the complex tasks such as economic transactions, and therefore moderates the vulnerability and uncertainty (Luhmann, 1979; Girmscheid & Brockmann, 2005). Providers of institutional trust are identified by many researchers, and Rousseau et al. concludes them as the following three types. The government and the market are where the institutional trust is mainly based (Hardin, 2004). United States is a "high-trust society" (Child,

2001), which is characterized by highly developed institution system that protects agents in it from being taken advantage of due to the opportunistic behavior of others (Luhmann, 1979; Yamagishi et al., 1998). This lays the base for a trusting society in which honesty is treasured, with people treated equally with fairness (Child, 2001).

The institutional trust in disaster restoration projects includes the citizen's trust in the government agency in charge of emergency management, Federal Emergency Management Agency (FEMA) in particular. FEMA, and especially NFIP, provides protection to citizens against the worst events by providing aids and assistance. Contract law and court enforcement provide solutions to disputes caused by irresponsible behaviors from both stakeholders. In this way, agents are willing to take risks on "modest cooperative ventures" (Hardin, 2004) such as selecting a professional restorer, or communicate openly with a stranger comes in for help in the aftermath of a disaster.

Some institutions serve as knowledge requisite of the trustworthiness of some agents (Hardin, 2004). Professional expertise is stated as one important factor of building trust (Cook, 2001; Castelfranchi & Falcone, 2010; Meyer et al., 1995). Nevertheless, the greater the expertise level and scientific knowledge, the more uncertainty property owners might have. Such uncertainty comes from the doubt on the capability of restorers, and the limited alternatives. Professional organizations legitimate such problem and provide assurance by certificate and qualify restorers. The reference system of insurance agents, acquaintances

serve the same purpose in reducing uncertainty in such scenario. Warranties

and guarantees provide institutional trust for property owners.
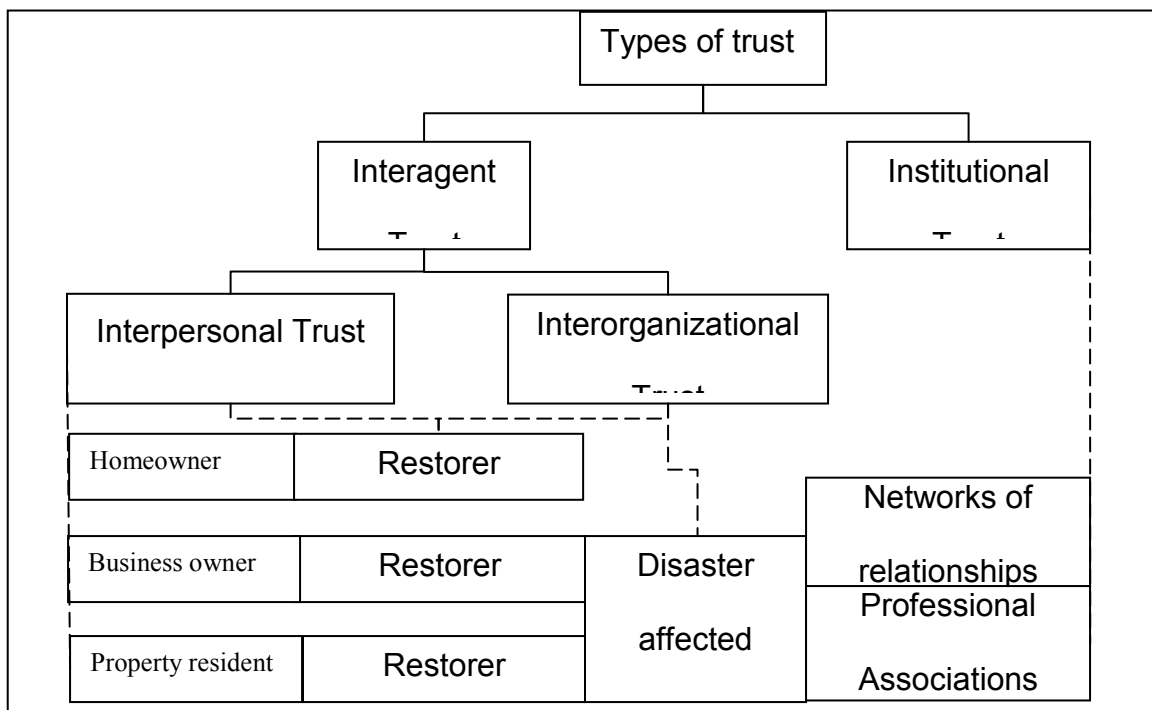
Figure 3.3 Types of trust

2.1.1.3 Trust and Trustworthiness

Trustworthiness refers to an agent's capacity to "judge one's interests as

dependent on doing what one is trusted to do (Hardin, 2004)." It is of a different

construct of trust but always be confused with the concept of trust. The core idea

of trustworthiness is the trustee behaves to fulfill the trust or's trust in her (Hardin,

2004).

Trust is a mutual assessment of one another. An agent chooses to act on trust if the other agent convinces him of her trustworthiness (Hardin, 2004). Figure below include the terms and their contexts of use. This is an attempt to clarify the often-times confusing terms of trust and trustworthiness. Figure 2.5 shows that trust and trustworthiness are two constructs but are related.
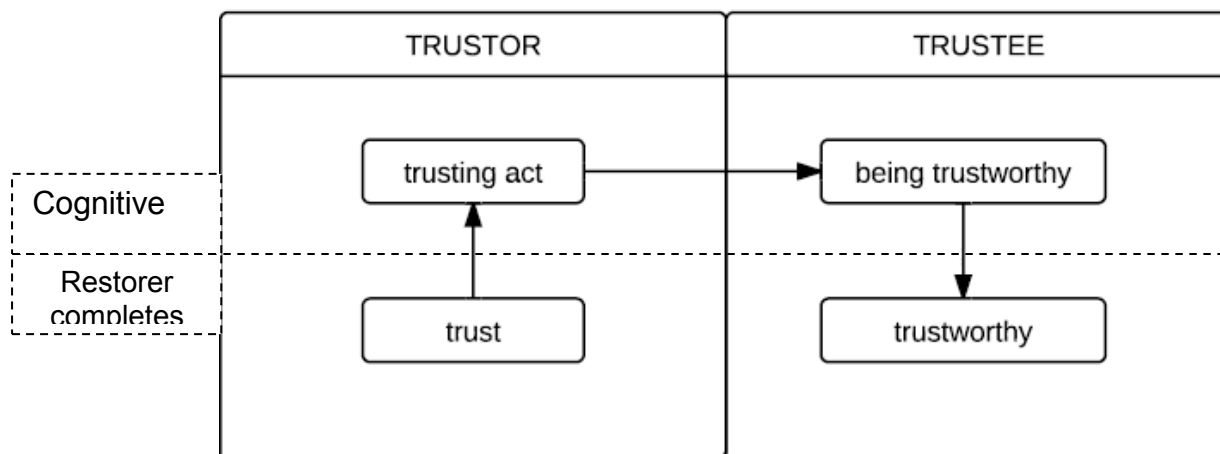
Figure 2.5 *Trust and trustworthiness*

Trust can be created and destroyed, use and not use. It is a social capital that enables teamwork and goal achieving in organizations and the society at all (Luhmann, 1979; Cook, 2001; Stolle et al., 2001). Social capital here refers to "the web of cooperative relationships between citizens that facilitates resolution of collective action problems (Fukuyama, 1995)." Barney & Hansen (1994) presents trustworthiness as a competitive advantage for organizations in economic transactions. It becomes a commodity that organizations invest, and gain return from.

2.1.1.4 <u>Trust and Distrust</u>

In this research, trust and distrust are considered as two different constructs rather than the two extremes within one construct. Trust and distrust are distinct constructs instead of two extremes of the same construct (McKnight et al., 2003; Lewicki et al., 1998; Gillespie, 2003; Clark & Payne, 1997). The extreme of trust, instead, is the violation of trust (Elangovean & Shapiro, 1998).

The relationship between agents is not either trusting or distrusting. One can trust and distrust the other agent at the same time (Becker, 1996; McAlister , 1995). To define it, distrust is also a three-part relation – A distrusts B with respects to do X (Hardin, 2004).

Distrust is not considered a bad morality. It is actually a strategy that the trustor can adopt in dealing with vulnerability to the potential trustee (Heimer, 2001). A chooses to distrust B is the rational choice if the evidence shows B as not trustworthy in term of X. Strategies such as insurance, guarantees, deposits, and surety bonds are results of the existence of distrust (Heimer, 2001). It is an important way to control losses. Institutions and norms are constructed within the distrust mechanism. It is the tentative step towards trust (Heimer, 2001).

The lack of trust is fundamentally different from distrust. Trust can be gained if it starts as a low level. It is even able to be rebuilt after detrimental behavior of the trustee. The existence of distrust represents that the agents are less likely of cooperate. No cooperation means the agent gains no information about the trustworthiness of other agents. The opportunity costs for her is therefore high. Distrust is therefore itself static (Hardin, 2004).

As shown above, distrust is itself a mechanism coexists and functions with trust mechanism. Distrust alone discourages openness and relationship building through interactions. However, trust is the mechanism that ease the adversity caused by uncertainty and vulnerability, and encourages future cooperation. This research focuses on the discussion of trust mechanism. It explores what is the mechanism about and how it works in the context of disaster restoration projects.

2.1.2 Benefit of Trust

This section answers the question of "why is trust needed in transactions?" Simply answering this question, a large amount of literature agrees on that trust promotes cooperation (Luhmann, 1979; Putnam, 1993; Cook, 2001; Hardin, 2004, and many others). Trust cleared the way of agents towards cooperation in the following facets.

First of all, trust is essential to any transactions because of the existence of uncertainty and vulnerability. Vulnerability comes from the risk aversion of most people in the society (Williamson, 1995). Trust reduces uncertainty and vulnerability in the circumstance of an event. People study trust in organizations due to the existence of risk and uncertainty (Luhmann, 1982; Jayava, 2003; Bachmann, 2001; Das & Teng, 2001; Jones & George, 1998 and many others). Trusting others lead to vulnerability of one person because of the risk that the others are not trustworthy (Cvetkovish & Nakayachi, 2007). The risk and interdependence of each party in a transaction makes trust an initial reservoir for any such inter-organizational cooperation (Arino et al., 2001).

Trust is a solution to reduce the structural complexity in an event. According to Luhmann's system theory (Luhmann, 1968), the central characteristics of modern society lie in the great complexity. Trust is one mechanism of complexity reduction (Luhmann, 1968; Jalava, 2003; Girmscheid & Brockmann, 2005). It is the essential mechanism to reduce uncertainty and complexity, therefore it is the necessary precondition for most social interactions (Luhmann, 1982; Bachmann, 1999). The reason for its essentialness lies in that trust is the basis for mutual goals and values of different groups that do not typically share the same values. The mutual goal reduces the system complexity in a project by reducing the anticipated outcomes to limited subsets of possibilities (Luhmann, 2004).

Trust enables the acknowledgement of the vulnerability and uncertainty among agents. Trustor and trustee can therefore find solutions to reduce vulnerability and uncertainty.

Trust sustains cooperation in a team. Such team can be formed inside an organization, or being inter-organizational (Hardin, 2004) Trust promotes collaboration inside an organization. Trust is beneficial for inter-organizational transactions. Inter-organizational cooperation and temporary teams are more and more frequent these days.

2.1.3 Trust as a Dynamic Process

Despite the early research of trust as static status, most researchers agree on that trust is dynamic. Trust is concluded to be dynamic because multiple separable stages can be observed (Rousseau et al., 1998; Mayer et al., 1995).It develops over time as the trustor and trustee interact more. Such development

includes both increase in level of trust and decline in it. Figure below shows the stages.

Trust dynamic is a loop of activities starts at initial trust and end up by feedbacks towards the system. As stated by Williams (2000), trust is "built throughout relationship in which many repeats of these events will impact future exchange relationships". It is a state that starts at an event and developed over many such events. It is a state of mind impacted by past events and will impact future events (Hardin, 2004; Swan et al., 2002). It starts as a precondition for cooperation and then becomes a result of it (Gambetta, 1998).

The level of trust increases or decreases basing on whether the feedbacks are positive or negative. Trust develop slowly and build up from minor to major transactions (Shapiro, 1987; Girmscheid & Brockmann, 2005). A number of literatures have drawn the conclusion that trust is easier to damage than create (Meyerson et al., 1996; Nooteboom, 1996; Cook, 2001; Hardin, 2004). It decreases easily as a result of a limited amount of actions of the trustee. Those are the trigger events for trust to start diminishing. To build it, however, requires much more efforts in understanding the intention of the other agent, which cost much than the trustor's expected gain from the trust relationship (Hardin, 2004). This research focuses on the investigation of trust-enhancing and trust-decreasing behaviors as a function of the restoration triangle.

Few literatures are retrievable in studying trust as a dynamic in construction management. No researcher so far has depicted the stages involved in the trust

dynamic explicitly. This research proposes a trust dynamic with continuous stages. Such dynamic can be tested using empirical study data

2.1.3.1 Trust Initiation and Development

The initiation of trust has lots to do with emotions and moods (Earle, 2004). People possessing inner security are more ready to trust (Luhmann, 1979). When meeting with a stranger, a person experiences high negative affect such as the feeling of nervous or even afraid (Jones & George, 1998). He or she may initial distrust at that person. However, with the presence of a trusted party or person, such negative emotions might be instead positive. Besides, one's current affective state affects one's emotion and therefore experience of trust (Schwartz, 1990). Psychological state in a special event might matters to the readiness to trust. This is especially true for circumstances of disaster restoration projects. Despite the lack of inner security, other challenges exist for disaster restorers in the aftermath of a disaster. Such challenge comes from the unfamiliarity of the home owners with restorers in most cases. A study conducted by Sattler et al. (1995) shortly after the Hurricane Andrew reveals the psychological distress of victims who lived in the shelter. More than half of the subjects became more spiritual, trusted military personnel and doctors, with only one-third of the sample trusted their insurance adjusters, with one-fifth of the subjects suffered from the survivor guilt. Many of them, from the survey result, had the symptoms of irritable, feeling anxious, and having difficulty to concentrate (Sattler, 1995). These symptoms show the distress of the victims who can then perform less rationally,

which brings impacts to the progress of restoration work or corporations with the insurance adjusters and the contractors. In the same research, only 20 out of the 89 subjects would trust strangers (Sattler, 1995). Considering a contractor work with a property owner for the first time, the distress after the disaster make him or her more likely to consider the contractor as not trustworthy and about to hurt his or her benefits through the work.

First impression in disaster restoration projects will set the stage for the way in which the clients interact (Aleno et al., 2001). The empathy and openness towards a property owner who suffered loss and distress sometimes lead to not only efficient and satisfying work but also the foundation of a long-term bonding. The recognition of the stress and grief that the property owner is going through and proper psychological intervention by the restorer initiates conditional trust. Conditional trust is concluded as sufficient to facilitate a wide range of social and economic exchanges changes into unconditional trust, which is characterized by common value of the involved parties on the basis of interactions (Jones & George 1998). Research suggests the care of public relations of restorers can help build the trust with clients (Settler et al., 1995). Man and woman behave significantly different, implying the different way of communication and intervention with after a disaster.

However, such major forces in initiating trust remain mostly mental states and therefore are the implicit factors of trust building. Bacharach and Gambetta (2001) refers such implicit and unobservable properties of a person as krypta. Later research such as in Castelfranchi and Falcone (2010), such term is used.

For unfamiliar agents, the trustor can decide whether act on trust basing on the analysis of the potential trustee's motivational structure (Luhmann, 1979). Motivational structure is rather an economic term that describes the gain and loss if the trustor chooses to trust the trustee. If the expected gain if the trustee broke the trust relationship is high, the trustor would less likely to trust him. The other aspect is the potential influence of the trustee to the trustor, when imbalanced power exists. Institutional trust also considered as the back force for the action (Luhmann, 1979). The trustor weighs on all these aspects to determine the action. Technical expertise reduces uncertainty and help building trust. Unable to perform the work themselves, property owners are dependent on restorers, who are the experts in disaster restoration. Hovland and Janis (1953) concluded that whether there is trust or not largely depend on the expertise and reliability of the two parties involved. Brochmann (2005) concluded that the competence and experience are important factors of building up the developed trust.

The above acquaintances include relatives, communities, and many others. Heimer (2001) refers such connections as the network of relationships. The network is characterized by links. Such links enable trust not only within the network but also beyond that, for the multiple channels connecting multiplex and strong networks (Heimer, 2001; Kadushin, 2012). Hardin (2004) states that thick relationships exist in such network of relationships. The more overlaps of interactions, the more incentives to trust within the network. This is because agents within the network, especially the complex network characterized by thick relationships prefer to maintain good reputations and not being shunned by

others, so they are less likely to behave opportunistically to others on a deal (Hardin, 2004). Such networks enable transfer of trust among agents.

Researchers argue on whether trust is transferable. If trust is transferable, then it explains how the reference mechanism works. Trust is first transferrable from an agent with high authority because of his competence in the specific matter or his similarity to the other agent that is new to the relationship. In such cases, trust is transferable from A to other agents towards B in the matter of X. In restorations, A could be insurance adjusters, a property owner's neighbor that is in building construction industry, or a supplier for post disaster recovery projects.

The other way of trust transfer in by conformism (Castelfranchi & Falcone, 2010). If the majority agents in a network trust B in doing X, then the trust between other few agents in the network and B can be built both dispositional and cognitively.

The third way of trust transfer can be expressed using the three-part definition. A trusts B in X, therefore A also trusts B in X'. This type of trust is transferrable if two conditions are met. The first is the trustworthiness of B in X. The second is the correlation of X and X'. X and X' are analogous tasks or projects so that A could apply his knowledge about Y's trustworthiness in terms of X to when dealing with X' (Castelfranchi & Falcone, 2010). Inferential assessment about B's trustworthiness is drawn by A in such scenario. X and X' should have shared characterizing properties in order to be able to transfer the trust.

Similar to the trustee's availability, research shows openness and information permeability as ground for trust. Trust is provisional and probationary, and it is inextricably linked to communication practices (Burgoon et al., 2005). Such

argument shows that trust is a result of effective communication and information sharing. In other words, the communication and information system (CIS) affect trust and team performance (Burgoon et al. 2005).

The interactivity within a team also matters to trust and project performance. Interactivity compromises the four principles of contingency, participation, transformation, and synchronicity. Burgoon's research (2005) answers the question of what task loads have to do with the interactivity, trust, and team performance. Task load refers to circumstances where informational, physical, cognitive, and/or communicative demands of a situation or task (restricted channels for information transmission, serious time-press) exceed the capacity to perform them effectively or efficiently. Too complicated information will add up to the task load, and detriment team performance and trust.

Trust is important in disaster restoration projects for it is for most cases the property owners' decision about which restorer is the best to hire (Bean, 1992). Besides the bid price, the reputation and technical profession are important aspects that the client assesses. The client is facing the risk of a contractor's failure to complete the job on time under budget – he or she will have to pay for the reworks and completion under such circumstances. Therefore trust needs to be made as early as the client, or at that time the potential client called for bidding and assessment, or during the first visit.

2.1.3.2 Breakdown of Trust

Trust is not unbounded, it cannot be taken for granted and it may break down (Nooteboom, 1996). Trust breaks down easily over detrimental events (Bachmann, 1999). It can be broken in sudden and hardly ever to be rebuilt. The damage will be in terms of emotional, economic, and social to each individual or organization involved. Such feature of trust mechanism in a transaction explains the importance of the coexistence of governance mechanism. In other words, due to the limitation in their capacity a combination of trust and governance is the most common way to ensure a satisfactory outcome for each individual or party involved (Bachmann, 1999). Which one should dominant depends on the nature of the transaction, the industry, and even the legal system as a whole. And this dilemma is also one of the questions to be answered of the research.

Mutual contamination and imprecise form of non-face-to-face communication that contains important information (Girmscheid & Brockmann, 2005). Barber (1983) addressed the concept of "expectation" to trust. If the expectation is not reciprocated, trust spirals downwards and vice versa (Butler 1983).

2.1.3.3 Rebuilding Trust

The regain of trust is much slower than the initiation of trust. Trust mechanism is dynamic. Although quite slow, trust is able to be regained between the same groups after detrimental events. Trust happens between people, and needs co-efforts of both people, not one of them, to create mutual trust (Bracey, 2002).

One important feature of trust is that it emphasizes the interpersonal or inter-organizational relationships of two-way engagement (as opposed to one-way communication) – a transaction process between individuals or organizations with different values and knowledge (Petts, 2008).

2.1.4   Study of Trust in Construction

A central concern of construction management field has been identifying determinants of project success through management and cooperation (Egan,1993; CII, 1998; Godfrey, 1995). The separation of function groups is the root for requirement of cooperation and teamwork in a construction project (). Researches show that trust can be created over time among team members (Burgoon et al., 2005; Girmscheid & Brockmann, 2005). However, the construction project teams are mostly found in limited time and up to immediate cooperation, which falls into the category of a "temperate team" (Bennett & Jayes, 1995). In a temperate team, each party tries to understand the other parties' expectation, needs, and goals. Thus trust was believed to be not applicable to construction projects, more efforts were then put into the study of project control schemes.

In construction, contracts or written agreements exist as the prevailing governance mechanism long before the attentions to building trust. The optimal contract is designed in a way that shapes the behavior of the contractor (agent) into the goals of the project owner (principal). However, a growing number of empirical researches show that the perfect contract serving the goals of the

project owner and eliminate opportunistic behavior and uncertainties does not exist (Zaghloul & Hartman, 2002; Kadefors, 2003; Huemer, 2004). Baier (1994) also explains the necessity of trust in economic transactions using that fact that it is not possible to have all risks calculated. This is why trust is economically feasible – the calculation of all risk is costly and distrusts lead to high opportunity costs when not cooperating with trustworthy agents (Hardin, 2004; Castelfranchi & Falcone, 2010). Thus trust is introduced to reshape project relationships – to decrease adversarial and inefficient relationship by building up trust in project teams (Kadefors, 2003; Egan, 1998).

The necessity of building trust in construction project teams also lies in the the many characteristics of them – scope, schedule, cost, quality, safety, and administration (Rapp, 2009). Construction projects often involve multiple players with different goals and experience different dimensions of risks (Huemer, 2004). Despite the existence of initial trust that enables the cooperation, the competitive contracting practices increase the adversarial relationships in the project team (CII, 1993). Trust has tested to be rewarding in other industries, therefore many scholars in organizational research investigate how to sustain it (Barney & Hansen, 1994; Nooteboom, ; Child, 2001; Swan et al., 2002).

Instead of the idea of trust mechanism as the substitute of governance mechanism, a group of researchers take the stand of trust mechanism and govern mechanism as complimentary in construction projects (Wong et al., 2007). Since 1990s, a school of thinking in partnering emerges (CII, 1993; Thomas & Thomas, 2003). Such partnering thinking focuses on the establishment of long-

term relationship via cooperation. Partnering is an organized effort to improve communications in design and construction projects (Ranco & Ranco, 1997). The idea of partnering falls perfectly in the establishing and maintaining of trust. Trust and openness are stated as norms of partnering (CII, 1989). To develop and maintain trust in construction projects requires long-lasting efforts. Partnering brings together all key players on a project in an effort to bridge many of the gaps set up by the way the design and construction industry divides the work. However, such trust built in strategic partnering is not in contradict with the long-term business interests of either party (CII,1989). Trust is essential in partnering because it is the basis for all corporations. It helps decrease the adversarial relationship and build up positive and open cooperative relationships at work. Such relationships produce high team performance and it indeed improves the trust (Wong & Cheung, 2004).

Recent study of trust in construction industry has seen a shift from strategic partnering scheme to contracting in general (Wong et al. 2007; Yukl, 1994). Openness, mutual goals, and dispute solution system are the three main takes from the trust in strategic partnering studies. Late researchers of trust in construction find these factors are also applicable to general contracting schemes.

Although the many research in trust in construction industry, the following gaps are identified in the current studies. First of all, most of these research studies trust using an explicit construct. Indeed, trust initiates as a combination of cognitive and dispositional states, with depositional trust playing the leading role

in cases when unequal power exists, or when agents lack knowledge about each other (Luhmann, 1979; Hardin, 2004). Construction management scholars study trust as a strategy for cost saving (CII, 1993; Khlfan & Swan, 2007; Kadefors, 2003). Among the category of costs, transaction costs and opportunity costs, which are the driving force for building trust in projects are both implicit and hard to measure (Williamson, 1995; Cook 2001). The studies of trust building using only explicit indicators therefore miss an important part of the puzzle. A fuzzy integration of both implicit and explicit indicators of trust dynamics should be applied to get more insights in the mechanism.

Secondly, confusions on the constructs of trust, distrust, and misuses of trust, trustworthiness, and distrust, mistrust exist. Trust itself is a complicated construct, such confusions add up to the understanding and application of the research results. This research clarifies those common terms close to trust, and in the proposed model, the key terms and their definitions are stated.

Trust functions as a prerequisite for inter-organizational cooperation because of the common value and order formed and maintained by it. Indeed, higher level of trust helps the team to establish formal coordination and control (Bachmann et al., 2001), which is necessary for achieving the common goal of any inter-organizational team.

As mentioned earlier, governance and trust are complimentary mechanisms in construction projects (Hartman, 2003; Wong & Cheung, 2004). Contract rules out the worst risk scenarios and the contingent procedure once such risks happen. Trust mechanism is therefore able to function well with the worst scene outcome

specified in the contract and have the project parties agreed on (CII, 1993; Hardin, 2004). Trust increases communication and cooperativeness of involved parties, therefore enables mutual understanding of contract terms and certain level of flexibility to avoid low efficiency caused by too much control.

Although researchers have described trust models in a great amount of literatures, none graphical model has been built to visualize the trust dynamics. Altogether the stages are shown in figure below along the timeline. This curve depicts the dynamic changing trust status as well as its levels. Such graphic model is developed basing on a comprehensive review of literature in trust in multidisciplinary fields including sociology, economics, psychology, organizational science, management science, political science, and last but not least construction (Luhmann, 1979; Gambetta, 1988; Barney & Hansen, 1994; McAllister, 1995; Meyer et al., 1995; Fukuyama, 1996; Mcknigiht et al.,1998; Hartman, 1998; Nooteboom, 1996; Cook, 2001; Swan et al., 2002; Kadefors, 2003; Ostrom & Walker, 2003; Hardin, 2004; Wong & Cheung2004).

2.1.5 The Big Picture

A minimum level of trust is necessary for all economic transaction (Nooteboom, 1996; Gambetta, 1988; Meyer et al., 1995; Child. 2001). The initial trust is illustrated as the merely above-zero level of trust at time zero. The level of such initial trust is based mainly on the dispositional factors including familiarity, trustor's readiness to trust, and her personality (Cook, 2001; Castelfranchi & Falcone, 2010). Trust develops over time in both directions (Meyers et al., 1995; McKnight et al., 1998; Hardin, 2004). When the interactions between the two

agents are positive and non-opportunistic, the level of trust increases. However, when detrimental events happen, such as the negative attitude at work, trustee fails to perform or the trustor fails to pay leads to decrease in the level of trust. Trust grows at a slower rate as it decreases (Mayers et al., 1995; Hardin, 2004). That explains the fact that the decrease slope is steeper than the increase slope on the trust curve. Notice that optimal level of trust exists. As teams gain more positive experience, the level of trust continues increase until it hits the optimal level. The level of trust, or the trust relation of the agents involved stables after the optimal point until the unexpected events take place and damage the trust relation. The decrease from the optimal level of trust is expected to be slower than the decreases happen at lower level of trust. This can be explained using social network theory – when stronger social network is built at the optimal trust level, the multiplex network of the trustor and the trustee is stronger comparing to the relations of trustor and trustee prior to such network is built (Messick & Kramer, 2001; Kadushin, 2012).

2.2   Social Network Analysis

Trust and networks are both social capitals. Previous research shows trust and networks help reducing transaction costs in social exchanges (Williamson, 1993). Both trust and networks can be measured using the social and economic exchange efficiency (Nakagawa & Shaw, 2004). Putnam et al. (1993) measure social capital using the four indicators of newspaper readership, number of sports and cultural clubs, turnout in referendums, and incidence of preference voting.

Serageldin and Grootaert (2000) add the institutions including laws, government, and industrial organizations also as compartments of social capital.

Social networks can be defined using the three-category construct: bonding ties between family members, neighbors, close friends, and business associates that share similar demographic; bridging ties among people from different ethnic, geographical and occupational backgrounds but with similar economic status and political influence; and linking ties between community and those in positions of influence in formal organizations such as banks, schools, housing authorities, or churches (Nakagawa & Shaw, 2004).

In a restoration project, the social network and trust works together as the bounding factors for the success of restoration efforts. Such network can be shown as the trust diagram in figure 2.10.
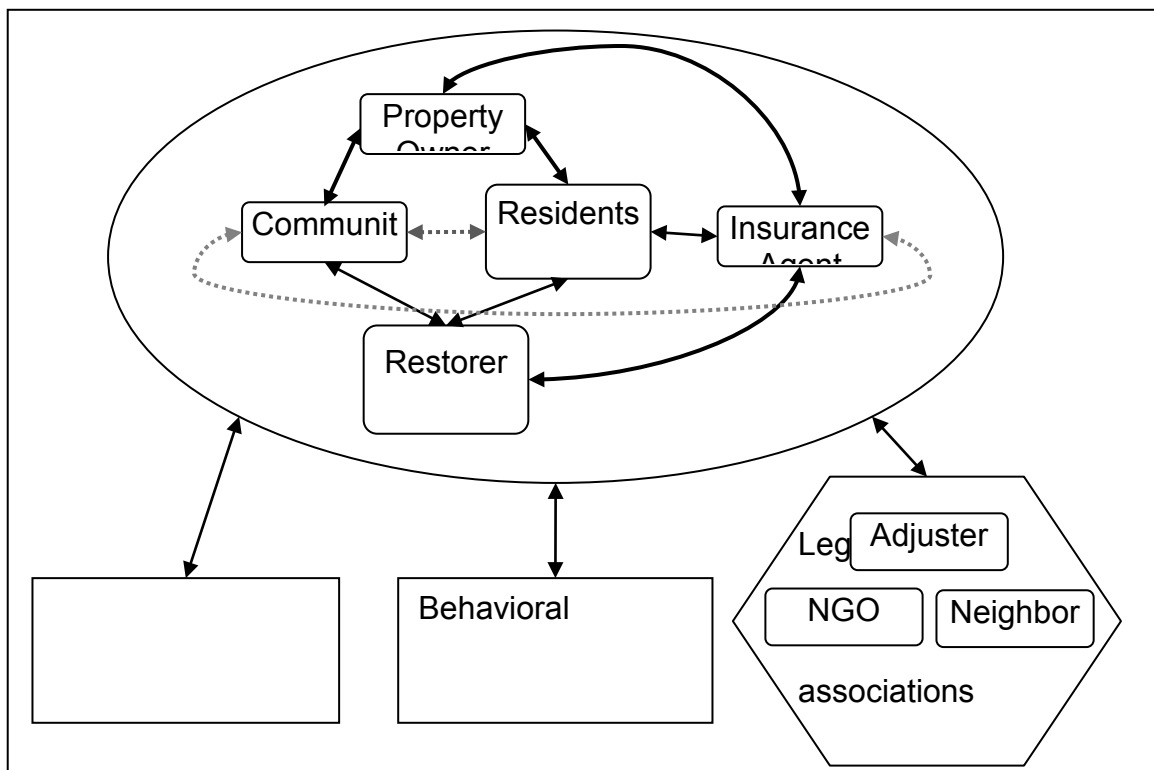
Figure 2.1 Development of SNA

2.2.1.1 <u>Social Connections and Relational Data</u>

Stakeholders involved in a project form a network. Each pair of them are

connected formal or informally. In disaster recovery, network boundary is vague.

In the proposed framework of trust dynamics in disaster recovery projects,

network boundary was set by layers. Three layers are included in the framework.

The first layer is the center clique as the restoration triangle. Second layer is the

community network, which provides the necessary supports and connections.

The outer layer is comprised with institutions associated with post disaster

recovery.

As a social capital that exists in between agents, trust is a vital indicator of the

social connections in an ongoing project. SNA is applied to identify the key

influencers in a network, the bridging agents between networks, and the

weakness in a network.

2.2.1.2 <u>Networks and Embeddedness</u>

Embeddedness refers to the process by which relations shape economic

transactions and it differs from the way through which economic logic of market

behavior shape actions (Uzzi, 1996). It can be further broken down into relational

embeddedness and structural Embeddedness (Gulati, 1998). The former refers

to the informational value of the structural position participants occupy in the

network, the latter refers to the role of direct cohesive ties as a mechanism for

gaining fine-grained information.

As for this research, trust affects the work relationship of the stakeholders in the central clique of the disaster recovery network mainly in term of structural embeddedness. Structural embeddedness here includes both the quality of the relation and the structure of the network.

2.2.2 Basic SNA Components

SNA provides a quantitative analysis tool for project-based social relationship investigations. Many attributes are available for diverse research goals. As for this research of trust dynamics in disaster recovery projects, network density, closeness centrality, and circles were adopted to investigate the quantitative relationships among stakeholders in a disaster recovery project. The definition and the function of each attribute are reviewed in this section.

1. Density

Uncertainty gives rise to commitment to be trust worthy (Yagamashi et al., 1998), and the density determines the reliability of such commitment.

Research has been conducted to investigate the optimal level of network density (Coleman, 1998; Burt, 1992;).

2. Centrality

Network centrality describes how close are the agents to each other, and the extent of connectedness of them (Scott, 2002). Centralized agent is more embedded in the flow of resource and infusion of trust in the network than the less centralized

3. Sociogram

A sociogram depicts one or several types of relations within a population (Rapopart & Harrath, 1961). For this research, the relation characterizes the network among pairs of people in the population is trust. As stated from previous section, trust is bilateral – agent A trust B in restoring the property of A, and B trust A to fulfill the payment and necessary support as stated in the signed work agreement. The data used to conduct the sociogram are from the survey. Therefore, trust is multivalent according to the five-point Likert Scale as was used in the questionnaire. Interview data are also used to validate key features of the sociogram including nodes, connections, and distance among nodes.

Agents based social network

2.2.3 Applied Social Network Analysis in Construction Management

Link reciprocity theory explains that in the long-term of a business network, a trustworthy agent is able to find new business partner with no more bound to reciprocate (Grimm & Mengel, 2009; Rand, 2012). Instead, he or she is able to select a more reciprocal partner to cooperate, and such dynamic in a network promotes the systematical efficiency and fairness (Bravo et al., 2012).

SNA provides a new way of project efficiency improvement rather than the task-based divisions (Chinowsky et al., 2008). Chinowsky et al. (2008) proposed the social network model for high performance team. Galotti (2008) furthered the investigation of social network analysis in construction teams based on a case study of a student competition team. He studied several social attributes including communication, information interaction, trust, reliance, and value sharing as the indicators of high performance construction team. This is a

fundamental change of construction management philosophy from task-oriented to people-oriented.

Also social network enables the infusion of trust and other social capital among the structure. This is referred to as structural embeddedness by learning and control mechanisms among the network participants (Buskens et al., 2010). The structural embeddedness of trust was examined in the proposed trust dynamics based on the data collected.

2.3 Summary

This chapter provided historical information about the research backgrounds and theoretical framework. Literatures about the trust theory were reviewed firstly, and it is stated as a multidisciplinary subject. The definitions of trust, dimensions of trust, benefit of trust, and dynamic of trust are studied respectively as the theoretical framework of the further research. Secondly, trust studies in construction management is reviewed as the results of this research is designed in a way that is ready to be adopted by the construction industry, other than the mere circumstance of disaster restoration projects or flood damage restoration projects. Last but not least, concepts and techniques associated with social network analysis, and sociogram in visualizing the social network, were presented as the last section in this chapter. This part provides methodological foundation for the visualization of the spatial dimension of the proposed trust dynamic model in disaster recovery projects.

The literature review was not exhaustive because of the great number of retrievable literatures in multiple disciplinary. The goal of such literature review was to sort out findings and summarize data showing interrelationship among the trust measuring factors in the proposed conceptual model.

Research gaps are identified via the literature review of trust studies in construction management. No project-based study of trust has been done. Furthermore, little has been done in the theoretical trust model development in construction management or disaster recovery. Considering the special challenges facing restorers, it is necessary to develop such a trust mechanism model that depicts the dynamic trust relationship in disaster restoration projects. These serve as the foundation for the proposed framework of trust dynamics in disaster recovery projects.

With the research gaps identified, and theoretical framework reviewed, the proposed trust dynamics model is presented in next chapter.

CHAPTER 3. THE FRAMEWORK

The proposed trust dynamic framework approaches the research of trust in disaster recovery from both spatial and temporal dimensions. Space and time are the two fundamental dimensions in describing human interactions (Kant, 2003). This research is designed to explore the interrelations between the spatial and temporal dimensions of the trust dynamic in disaster recovery projects.

The spatial dimension is concluded as the trust measurement model which is described in detail in section 3.2. It consists of institutional trust and inter-agent trust. To illustrate how such trust measurement models fit into the concept of space, or virtual space, a social network analysis process is presented in 3.3. The trust-based sociogram, which is the result of the SNA, depicts the space in which the trust dynamics exist.

The temporal dimension of the trust dynamic in disaster recovery projects includes the phases of trust initiation, development, and sustainment. It consists of short-term and long-term trust.

This chapter describes the proposed two dimensions of the trust dynamics in disaster recovery projects in detail. More importantly, it explains the necessity of identifying the interrelations of the two dimensions. In other words, the research goal is to explore trust dynamics in disaster recovery projects from a two-

dimensional perspective with emphasis on identifying these dimensions' connections.

Before proposing the two-dimensional trust dynamic, a definition of trust in the context of disaster recovery project is developed in the next section.

3.1 Defining Trust

3.1.1 Context and Notations

This research focuses on the trust relationship within private disaster recovery projects. In other words, the context for this research of trust dynamics is private disaster recovery projects. This context shares many characteristics of disaster recovery management and conventional construction management while also facing its own challenges.

The proposed trust dynamics involve the following variables:

A: trustor. The research takes property owners who survived floods as the trustor. They are assumed to have suffered varied levels of property damage, including both water damage and flood damage, and they rely on a restorer's expertise to restore the property.

B: trustee. The research defines professional restorers as the trustee. They work for A to restore their flood-damaged property to its original state.

X: the specific context, in which A trusts B as competent and willing to behave according to the scope that he or she delegates B to do. For this research Q refers to the agreed scope of flood and water damage restoration work. It is the expectation of A towards the work of B. It is the goal that B works towards to build his or her trustworthiness.

3.1.2   Trust in Disaster Recovery Projects

The definition of trust in disaster recovery projects includes the concept of trust and types of trust. In the proposed trust dynamic model, trust is defined as a three-part relation as:

A trusts B to do X.

Where A stands for the trustor, who allocates trust and relies on B. B stands for the trustee, who A believes as trustworthy in the specific context X. X is that specific context in which A trusts B as competent and willing to behave according to the scope that A delegates B to do. A becomes vulnerable because his or her welfare in X is reliant on B's action. The level of trust depends on the likelihood of B's trustworthy actions and A's capability in predicting B's actions in meeting A's expectation of B to do X. Figure 3.1 illustrates such trust relationship.
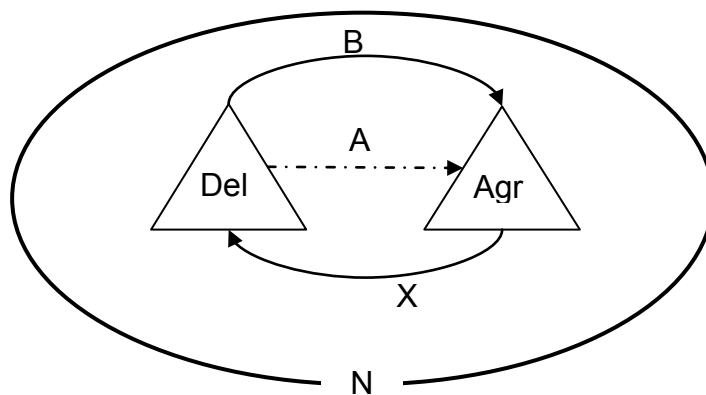
Figure 3.1 Trust as a Three-Part Relationship

For this research, A refers to the property owners who survived major floods but suffered damages to their properties. B refers to the disaster restorers with

specialties in water damage and flood damage. For simplicity, A, B, and S are used instead of the descriptive name for each subject of research unless special notification has to be made.

3.2 Spatial Trust Dynamics

As stated earlier, the spatial dimension of the proposed trust dynamics in disaster recovery projects is based on the agent's personal perspectives and experience. Its purpose is to explore significant dispositional and cognitive factors in explaining trust in disaster recovery projects. Such identified factors together comprise the proposed trust measurement model. The model contains 34 variables representing the spatial dimension of trust dynamics in disaster recovery projects. The 34 variables are derived from the preliminary investigation in trust theory and industrial practice. These 34 variables can be categorized into the following three types.

3.2.1 Dispositional Trust

Dispositional trust refers to an agent's tendency to trust. It is a trustful attitudes and motivations towards no specific agents including people, groups, and institutions (Becker, 1996; Hardin, 2004). Dispositional trust is the source of the bounded rationality of trust. It depicts the emotional bonds between individuals (Lewis & Wiegert, 1985; McAllister, 1995). Such bounded rationality includes trusting untrustworthy agents, or distrusting trustworthy agents.

3.2.2 Cognitive Trust

Compared to dispositional trust, cognitive trust requires more thought from the trustor (Luhmann, 1979). Cognitive trust consists more of the beliefs and

expectations about a specific agent in a specific matter (Becker, 1996).

Cognition-based trust develops with competence, professional skills, and

satisfaction with performance. This type of trust involves the assessment of the

other agent's trustworthiness from evidence (Cook, 2001). Lewis and Weigert

(1985) also state that trust develops from cognitive evaluations of the

trustworthiness of other people and groups.

Dispositional trust and cognitive trust together explain inter-agent trust, which

describes the type of trust between agents of equal power. The following type of

trust exist between A, the trustor, and a more powerful institution. Compared to

institutional trust, in an inter-agent trust relationship, A is able to correct the trust

based on the feedback he or she receives from B, and vice versa.

3.2.3   Institutional Trust

Institutional trust, also known as structural trust, is achieved based on shared

understandings of systematic rules regarding particular behaviors (Kramer, 1999).

Compared to inter-agent trust, institutional trust involves more powerful

institutions or agents on the societal level. Although agents could force changes

in the institution, an institution stands on its own justice more than on the

feedbacks from citizens (Luhmann, 1979; Hardin, 2004).

Institutional trust provides a basis for the emergence of inter-agent trust. The

term "institutional trust" is used to emphasize the reliance of public trust on

institutions. It serves as the reduction mechanism for complex tasks such as

economic transactions, and therefore it moderates vulnerability and uncertainty

(Luhmann, 1979; Girmscheid & Brockmann, 2005).

3.2.4   The Proposed Trust Measurement Model

Trust can be measured by different characteristics in human perspectives and interactions. Based on the nature of the feedback, inter-agent trust can be broken down into cognitive trust and dispositional trust. These two types of trust are categorized by the different mental processes for the information gathered through interactions between them. The other type of trust is the institutional trust. The proposed trust measurement model includes 34 variables that fall into the above three types of trust.

Figure 3.2 shows the proposed trust measurement model. In this figure, square-shaped items are measurable variables that are to be measured directly in the survey and the interview. Oval shapes represent latent variables which are not directly measured using survey questions, but are able to be tested using exploratory factorial analysis.

As illustrated in Figure 3.2 and explained above, the 34 measurable variables clustered into the three types of trust. A regression model is proposed mathematically as below:

$$\text{Trust} = a+b \times T_1 + c \times T_2 + d \times T_3$$

$$= a+b \times [w_{11}t_{11} + w_{12}t_{12+} \ldots +w_{113}t_{113}] + c \times [w_{21}t_{21}$$

$$+w_{22}t_{22}+\ldots+w_{212}t_{212}]+d \times [w_{31}t_{31}+ w_{32}t_{32}+\ldots+w_{39}t_{39}]$$

$$= a+b \times \sum_{j=1}^{13} w_{1j}t_{1j} +c \times \sum_{k=1}^{12} w_{2k}t_{2k} +d \times \sum_{l=1}^{9} w_{3l}t_{3l}$$

Where a is the coefficient for the constant term, and b,c,d are the coefficients for the three types of trust; T1 stands for dispositional trust, T2 stands for cognitive

trust, T3 stands for institutional trust. These can be further broken down into the weighted sum of each measurable variable t_{ij} by the assigned weight w_{ij}. I stands for the type of trust, and j for the number of measurable variables within the type of trust. Specifically, J equals 13 for i=1(dispositional trust), k equals 12 for i=2 (cognitive trust), and l equals 9 for I = 3 (institutional trust).

Measured
Variables

Latent Variables

Measured Variables

Damaged property
ownership

Years of ownership

Numbers of floods
experienced

Property covered
by NFIP

Primary residence

Experience
of disasters

Numbers of
residents

Sufficiency of
NFIP coverage

Disaster syndrome

Customer
cooperativeness

NFIP

Dispositional Trust

Extent of loss

Utility shortage

Customer
awareness of NFIP

Education level

Assistance in
applying aids

Social
status

Gender

Marital status

Building science
knowledge

Years w same
insurance agent

Preparedness

Means of finding
restorer

Network of
relationship

Institutional Trust

Clear goals

Communication

Permeability

Preferred Vendor

Initial openness

Fairness

Certifications

Professionality

Effective   cost
control

Effective
schedule control

Cognitive Trust

Effective   quality
control

Work to meet
standards

Effective   safety
control

Customer courtesy

Respect diversity

Figure 3.2 Trust Measurement Model

3.2.5 Presentation of the Spatial Trust Dynamics in a Sociogram

To fully present the trust dynamic in a spatial dimension, this research proposes using social network analysis to illustrate the involved stakeholder and their interactions from a trust building perspective. A sociogram is generated based on the relational data collected from survey questionnaires and interviews. It depicts the significant parties of impact in terms of trust building within the "triangle." Social network analysis is an analytical tool used in studies of inter-agent relationships and interactions (Scott, 2002). More importantly, SNA focuses on the relationships between agents, or nodes in a sociogram, which fits perfectly with the focus of the exploration of the spatial trust dynamics in disaster recovery projects.

The proposed SNA presents the spatial trust dynamics graphically. The graphic presentation of such dynamics is helpful in integrating both quantitative and qualitative data. Also, graphic representations make it easier to identify patterns in trust dynamics and to discover ongoing issues within the dynamics.

3.3 <u>Temporal Trust Dynamics</u>

Researchers in sociology, political science, and management have identified several stages in trust dynamics. In this proposed model, four levels of trust are identified in association with stages of interaction and time. They are: entrance trust, initial trust, project-based trust, and alliance-based trust. These phases of trust are shown in figure 3.3 and explained in detail in the following sections.
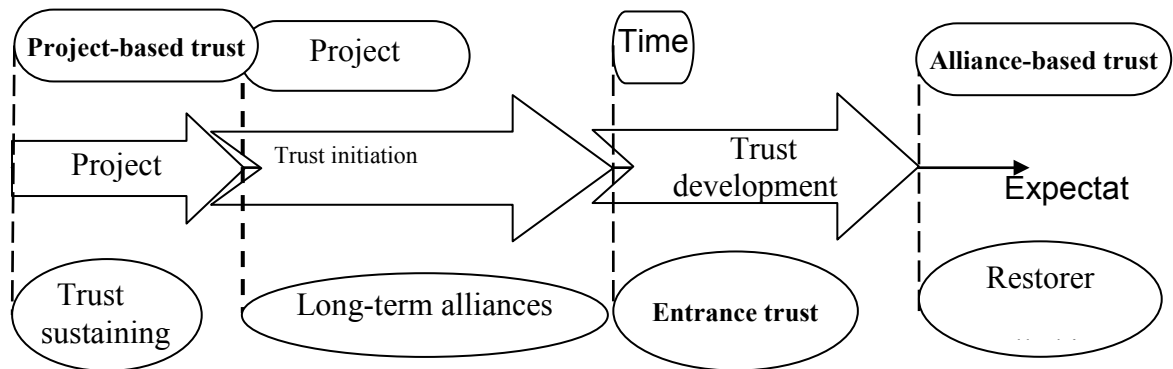
Figure 3.3 Time-Space Integrated Trust Dynamics in Recovery Projects

3.3.1   Entrance Trust

When a disastrous event took place and A's property got affected, A search for

professional services via his or her network of relationships. Under such

circumstance, B is only being contacted when the entrance level of trust is above

the minimum level of trust required for such an economic transaction. Such

entrance level of trust is largely based on institutional factors such as the general

credibility of the restoration industry and the legal systems. If B is referred, then

the closeness of the network between the referrer and the property owner affects

the entrance level of trust. Also, the socio-economic status of A, the property

owner, such as his or her occupation, income level, education level, age group,

and ethnic group, all have the potential to affect this entrance level of trust. The

entrance trust is the basis for any disaster recovery project that takes place and

for any restorers that get hired.

3.3.2   Initial Trust

An initial level of trust is reached by the time of the initial interactions. The initial

interaction stage starts from the first contact of A with B, either by referral or by

the owner's research. The initial interaction serves as the cognitive process for A to assess B's competence and integrity. If the cognition regarding B is positive, trust improves between A and B. For A and B who have little or no network relationships, the initial trust mostly comes from the institutional trust that A has towards the legal system and the disaster restoration market. The first several on-site inspections and estimates are included in the initial stage.

3.3.3 Project-based Trust

Once B wins the restoration contract, the project stage, or trust development stage begins. Project-based trust is the project-based relationship between property owners and restorers. In both residential and commercial sectors, project-based trust is reached over one or two disaster recovery projects. Compared to the level of alliance-based trust, it is built over the short term, so it is shown in Figure 3.4 below as short-term trust. As the project proceeds and time goes on, the continuous positive cognitive feedback about B builds up the knowledge of A for B in restoring the property, until B performs an opportunistic act that damages such trust relationship.

3.3.4 Alliance-based Trust

When the project is completed, the short-term trust reaches a certain threshold. A and B move on to the next level of trust. Two deviations exist at the end of the trust development stage. The well-developed trust, reaching a certain threshold, sustains beyond the project and moves towards the next level of trust – alliance-based trust. Commercial restorers with the alliance-based trust built with clients enter strategic alliance programs with their clients. Although the likelihood of

damage occurring more than twice at the same property in the residential sector is less than 5% (III, 2012), some forms of informal alliances are built among homeowners and restorers as well. Such alliance-based trust lasts much longer beyond one or two projects. It is therefore encapsulated in long-term trust as in Figure 3.4.
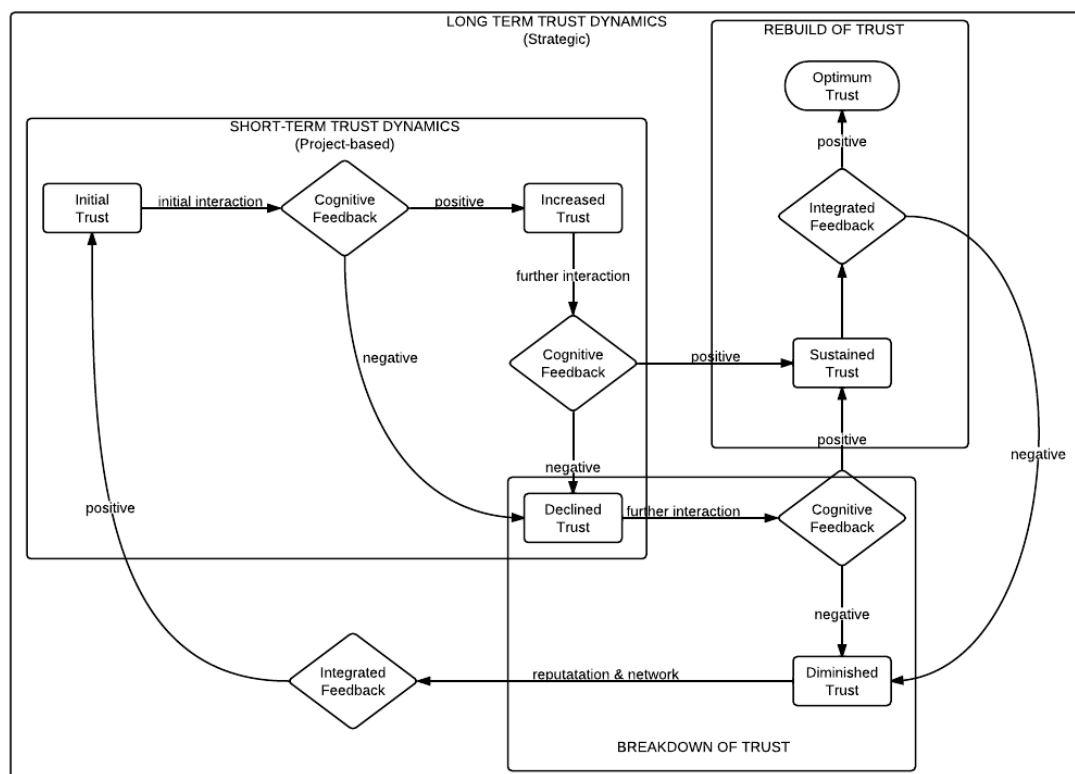
Figure 3.4 Temporal Trust Dynamics in Disaster Recovery Projects

3.3.5 The Breakdown and Rebuild of Trust

Figure 3.5 captures both the positive and negative changes in levels of trust during the development stage along the timeline. Such variation happens in both

directions, positive and negative, based on the cognitive signals from the

interactions.

The short term trust during a disaster recovery project
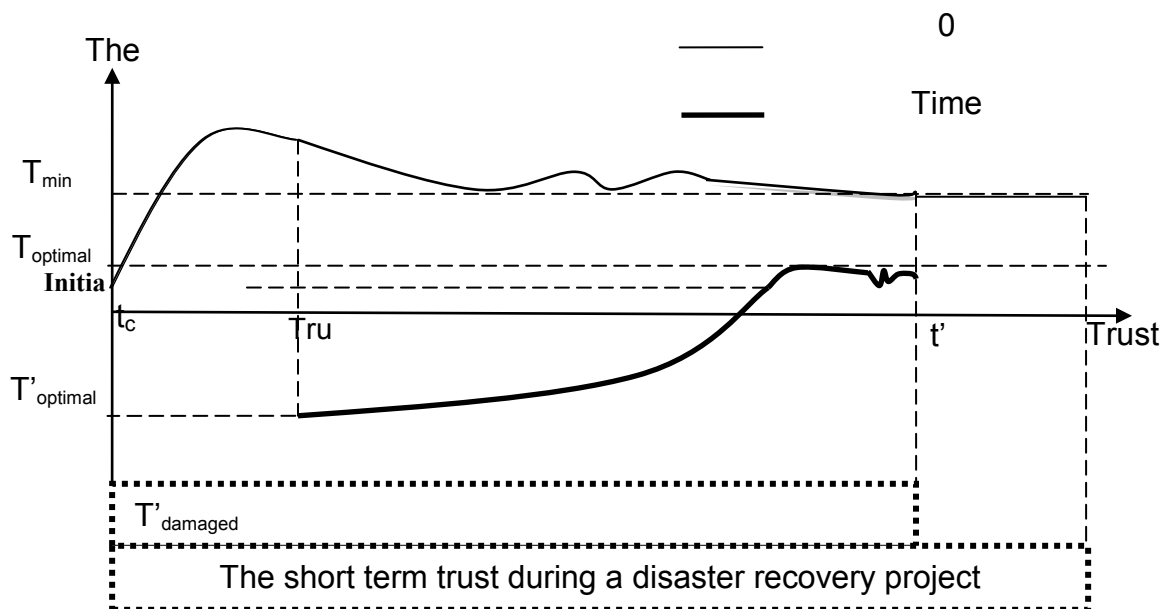
Figure 3.5 Trust Dynamics with the Two-way Development of Trust

At the initial stage, without much interaction yet, institutional trust and

dispositional trust characterize the basic level of trust that enables cooperation.

Such basic level of trust is denoted as T_{min} in Figure 3.5 along the vertical line

showing level of trust. Such level of trust is met during the entrance trust

development stage and is reached once A decides to hire B.

Trust develops in both directions over the project planning and execution period.

As shown in Figure 3.5, the upper going curve in the thinner line stands for the

positive trust dynamics in Figure 3.4, in which the level of trust increases over

time as A interacts with B and continuously receives positive feedback on B's

trustworthiness assessment. Without any detrimental events, the project-based trust reaches an optimal level as shown in Figure 3.5 as $T_{optimal.}$

At time t' within the project planning and execution period, a detrimental event may happen. The bolder curve with the kink point at t' from the original curve depicts the trust dynamics in such scenario. Note that the slope for trust decreasing is much steeper than the trust increasing rate in the thinner line over the same time. Also, the damaged trust develops positively over time as A and B interacts over the project execution period but at a much slower rate than the dynamics without a detrimental event. Also the optimal level of trust in this scenario is much lower than that of non-detrimental event trust dynamics, but is still higher than the entrance trust. Otherwise, the recovery project will be suspended and an alternative restorer B' will be hired to replace B. The work relationship terminated in this extreme case. Also, in the proposed temporal trust dynamics, detrimental trust does not sustain and further develop into long-term trust. A prefers to form personal relationships or business alliances with more trustworthy restorer B.

3.4   Two-dimensional Trust Dynamics in Recovery Projects

The level of trust varies over time. Figure 3.5 illustrates the short-term and long-term trust dynamics as proposed in Figure 3.4 on the same timeline, as well as the interrelation of levels of trust along different stages of the temporal trust dynamics. By doing so, the interrelation of the two temporal dynamics is shown graphically. Patterns could be found with the appropriate data. It provides the

framework for integrating the spatial trust measurement model as projected in Figure 3.2 with the temporal trust dynamics in Figure 3.4.

In the proposed trust dynamics, dispositional trust and institutional trust dominate the relationship of A and B in the initiation stage of trust. As interactions increase, cognitive feedback serves as the correction mechanism of B's trustworthiness. Trust improves as A processes the cognitive information gained over time. Once project-based trust is sustained beyond a project, institutional trust (i.e. reputation mechanism) and dispositional trust (i.e. network of relationships) play an increased role in long-term trust development. A and B may or may not have further interactions on X over this time. Therefore, the integrated feedback from institutions, networks of relationships, and interaction in X' determines the development of long-term trust. As stated earlier, X' is the notation of the analogically similar context of X. A is able to make inferences about B's trustworthiness in X based on interactions with B in X'. For the flood-surviving property owners and restorers, some examples of X' include consulting services provided by B. Figure 3.6 below depicts such time-space integrated trust dynamics in disaster recovery projects.
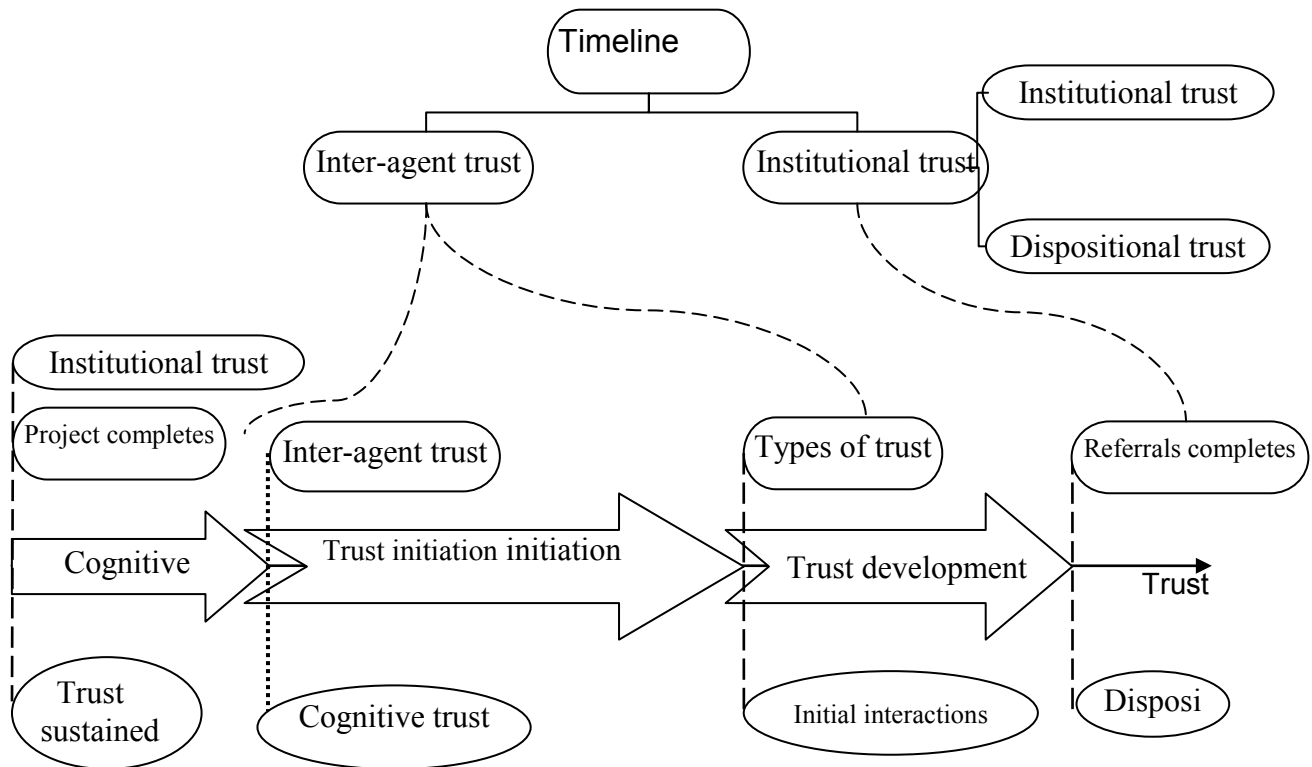
Figure 3.6 Two-dimensional Trust Dynamics in Disaster Recovery Projects

3.5 <u>Summary</u>

In this chapter, time-space integrated trust dynamics in disaster recovery projects are proposed and explained in details. The spatial trust dynamic is represented by the proposed trust measurement model with the three latent types of trust and the 34 measurable variables within them. A social network analysis is proposed in order to produce a sociogram that visualizes the virtual space of trust relationships graphically.

Temporal trust dynamics consists of three stages: trust initiation, project-based trust development, and trust sustainment beyond a project. The stages are

continuous along the timeline and are distinguished by the four special level of trust – entrance trust, initial trust, short-term trust, and long-term trust. Project-based trust develops in both positive and negative directions depending on the happening of any detrimental events and its level of impact. Trust is able to be sustained beyond project-based short-term trust into interpersonal trust or business alliances. The temporal and spatial dimensions of the trust dynamics model integrate in a way to explain the significant affecting factors and types of trust.

The next chapter explains the kind of data needed in order to validate the proposed framework and the data collection methods.

CHAPTER 4. METHODOLOGY

The research aims to explore trust dynamics in disaster recovery projects. It focused on property owners with flood-affected properties in 2010. Empirical data were collected primarily using questionnaire survey and Interviews. The researcher collected data from both A and B in order to form a view about the consistency and discrepancies in their perceptions of trust.

The research was designed to explore what spatial factors: shape each stage of the temporal trust dynamics. Or more specifically, it was designed to answer the following questions:

1. What factors are included in the trust dynamics in disaster recovery projects on the spatial dimension?

    a. What are the significant factors determining the level of each type of trust?

    b. What is the statistical significance of each type of trust?

2. What factors are included in the trust dynamics in disaster recovery projects on the temporal dimension?

    a. What are the stages in the temporal trust dynamics?

    b. Which types of trust shape each stage in the temporal trust dynamics?

3. What do the spatial trust dynamics look like in the form of sociogram?

The proposed two-dimensional trust dynamics model seeks to answer the above

questions. As shown in Figure 4.1, the researcher first conducted a quantitative

survey to collect representative data. For validation and triangulation, interviews

were conducted with focus groups selected from the same population as of the

survey. The interview data was analyzed using the content analysis method. The

themes of the interview data include stages in the temporal trust dynamics, levels

of the spatial trust dynamics, and trust measurement with a focus on dispositional

trust parameters. The following sections explain each research protocol in detail.
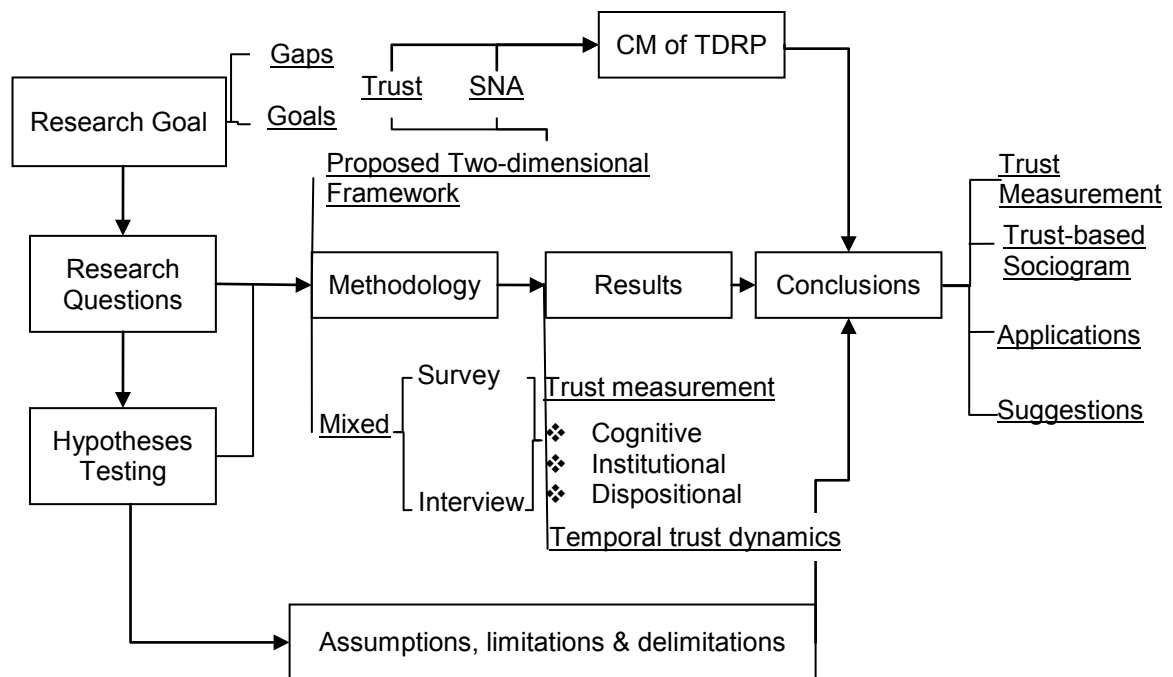
Figure 4.1 An Overview of the Research Design

4.1   Survey Design and Administration

The quantitative data was collected via a set of two questionnaires to the restorers and the homeowners separately. The quantitative approach was adopted to see patterns in a large population with the representativeness of the recruited sample. A survey was designed to answer questions such as "what" and "how". This approach involves a relatively larger number of respondents in comparison with qualitative research.

4.1.1   Survey Design

Significance analysis shows the statistically significant independent variables influencing a dependent variable. An overall view of all significant factors can be identified through the analysis of the survey on trust in disaster recovery projects. Two separated questionnaires were designed for the homeowners and restorers respectively. They are the two key stakeholders when considering trust building in disaster recovery projects. This research focused on the homeowner-restorer relationship among the "restoration triangle" as shown in Figure 2.3. The influence of insurance adjusters was studied as one potential impact on the bilateral relationship between the two key players. The survey process therefore was designed to collect data from both parties in regards to the same aspects relating to trust.

The reason for the separated survey also lies in the rich context of the questions. One of the most agreed limitations of current studies of trust is the over-generalization of the trust mechanism including its measurement. Instead of asking the level of agreement to general statements regarding trust such as "I

trust my restorer", the questionnaires were framed in a way that specifies the context for the respondent. The word trust is not used explicitly, but it remains a latent term that could be measured by the many indicators including dispositional bases and cognitive bases for trust.

The questionnaires were designed based on results of the preliminary literature review. The questionnaire began with the demographic information, followed by 30 questions designed to collect both homeowners' and restorers' view about the issues. Such items as specified in the questionnaires were consistent with the trust indicators identified in the proposed trust dynamic model. The model contains 34 variables representing the spatial dimension of the trust dynamics in disaster recovery projects. The 34 variables were derived from the preliminary investigation in trust theory and industrial practice. These 34 variables can be categorized into the three types of dispositional, cognitive, and institutional trust. The three types of trust are the latent factors that are not measurable, but are able to be tested using exploratory principal component analysis.

4.1.2 Survey Administration

Invitations to both the restorer's survey and the property owner's survey were published by RIA weekly newsbreak online during June, 2011. As shown in Table 4.1, the targeted population of the surveys includes the 1180 RIA members (RIA, 2010). The newsgroup subscribers' actual rate of reading the news is 30% on average (Shaw, 2004). Supposing that all of the 30% viewers of the weekly news actually click through the survey, the potential sample population is 30% of the

1,180 subscribers, or 354 people. Out of the 354 people, 46 responded to the

survey and 41 completed the survey. The other five responses were incomplete

and were deleted from the data set for reliability consideration. The 41

completed responses then equal 11.6% as the estimated response rate.

Table 4.1*Respondents to the Restorer's Survey*

Years of experience in disaster restoration (years)	Percentage (%)
1-10	22.0
11-20	31.7
21-30	34.1
31-40	9.8
41-50	2.4
	100%
Highest education level	Percentage (%)
No high school/GED	4.9
High school/GED	26.8
Associate's degree	24.4
Bachelor's degree	39
Graduate/advanced degree	4.9
	100%
Current position	Percentage (%)
Manager or other administrative positions	46.3
Office coordinator	4.9
Project planner	9.8
Field engineer	4.9
Field worker	9.8
others	24.4
	100%
Size of the current company	Percentage (%)
Small (1-250 people)	87.8
Large (more than 250 people)	12.2
	100%
Service specialty	Percentage (%)
Residential	39.0
Commercial	4.9
Residential and commercial	53.7
none	2.4
	100%

According to the sample of the restorer's survey, the average restorer has 20.5 years' experience in restoration industry with 41 flood recovery projects completed. 78% of them have more than 10 years disaster restoration experience, and 10.2% of them have more than 30 years' experience in the field. The restorer's survey sample also shows the average education level of restorers is an associate's degree. 95% of the restorers have at least a high school education. 46.3% of the respondents are managers or other administrative positions including presidents and owners. Based on this number, a well-balanced field of project-based practitioners and administrative practitioners are included in this survey. The other observation is the male dominance in the industry. Out of the 41 respondents, 3 are female and the rest are male. This depicts the disaster restoration industry as a male-dominated field.

Compared to the process of distributing the restorer's survey, it was more challenging to reach out to the right population for the property owner's survey. After locating the Midwest states which had suffered from major floods in 2010, the researcher primarily turned to the state departments of homeland security (SDHSs) for assistance in distributing the survey. However, due to the required privacy of the flood survivors, such requests were turned down by all five SDHSs. Similar results based on privacy were seen when the researcher contacted regional Red Cross chapters. One of the common concerns of the two groups of contacts is the likelihood of the disclosure of the flood survivors' identities. With such issue in mind, the researcher turned to an innovative channel for survey distribution – social media. Facebook is the largest social media site with 721

million active users (Facebook, 2011). The researcher utilized a keyword search of "flood" and "2011" in order to locate the related potential respondents' pages. Only Facebook Pages were targeted instead of other types of Facebook accounts. Facebook pages are for "businesses, organizations and brands to share their stories and connect with people (Facebook, 2012)." The reason for adopting such survey distribution method is the assumption that the appearance of the users on a Facebook Page with the identity of flood survivors implies their openness to the public and willingness to engage in interactions with a greater online community. Five specific floods related Facebook Pages were located. A message was sent to each Facebook Page account including the introduction of the research, and the uniform resource locator (URL) to the property owner's survey, along with the inquiry to post such information on the retrieved Facebook Page. Two out of the five Facebook Page groups agreed to post the survey on their pages. Table 4.2 provides information of the Facebook Pages contacted and those that agreed to post the survey.

Table 4.2 *Facebook Pages Retrieved for Property Owners' Survey*

Page Name	# of fans	Result
Missouri River Flooding 2011	1,748	invitation posted
Wyoming Valley Flood 2011	6,540	invitation posted
2011 Flood in the Heartland	1,693	No reply
2011 Omaha/Council Bluffs Flood	2,619	No reply
Vermont Flooding 2011	24,861	No reply

Facebook self-reports that it has 90% active users (Facebook, 2011). These are people who have visited the page and interacted with a post (Facebook, 2011). An investigation by Widman (2011) at PageLever.com shows that only 3% to 7.5% of fans view posts from a Facebook Page. With that in mind, the contacted population for the property owner's survey is 5.25%, the median of the percentage of readers of Facebook Page posts, out of the 90% active users in the 8288 fans on the two Pages in total. This equals to 392 people as the estimated potential set of property owner respondents.

With all the efforts to engage property owners in the research, the property owner's survey resulted in 28 responses, 16 completed. The initial review of the responses shows seven responses were not significantly competed. The seven were deleted from the data set for further analysis, leading to a 4.3% response rate.

The overall survey response rate is above the minimum acceptable rate of online survey at 5%. Such response rates suggest that the overall quality of the surveys is acceptable.

4.2   Interview Design and Administration

A follow-up interview was designed as data triangulation to validate some of the important solutions to be drawn from the survey data. Also new themes emerged from the open-ended questions in which the respondents had longer time and greater freedom to structure their answers and share their experience.

4.2.1 Sample Recruitment

This research employed a semi-standardized interview process, which was formally structured with 14 questions. Interview invitations were sent to 20 RIA individual members via their LinkedIn message addresses. The invitation was worded to state the purpose of the research, and to clarify that the participation was voluntary and that the participants were free to drop out during the interview or refuse to answer any questions that they feel inappropriate to answer. The invitation letter is attached in Appendix D.

4.2.2 Interview Administration

The interviews for this research were conducted over phone. The average interview time is 20 minutes. 10 of the 11 interviews took place from 10/20/2012 to 11/2/2012. One participant was rescheduled from 10/29/2012 to 2/15/2013 due to his heavy involvement in the post-Hurricane Sandy recovery during the period between the two scheduled appointments. Table 4.3below provides the demographic information of the 11 participants and the organizations they own or work for.

Table 4.3 *Demographics of Interview Participants*

#	Participant Alias	Locations	Size	Sectors	Position
1	JM	TX, AZ, CA	large	both	general manager
2	PA	Allentown, PA	small	both	president
3	BB	Washington D.C.	small	commercial	president

4	JC	CA		commercial	president
5	OC	Muncie, IN	small	50/50	marketing director
6	MH	MI, LA	medium	both	owner
7	SS	MI,FI,NC	medium	60/40	president
8	JH	CA	small	residential	owner
9	SI	OH	medium	both	president
10	JI	MI	small	Both	owner
11	SM	NY	large	Both	sales manager

4.3 Social Network Analysis

As this research focuses on the inter-agent work relationships between stakeholders, and especially between restorers and property owners, with the appropriate data and techniqtable

ue, a social network analysis was adopted to visualize the ongoing trust dynamics spatially.

Affiliation-by-affiliation data were captured from both survey and interview data. They were prepared in a matrix that is ready to be processed by UCINET.

The key dyad of this research includes two agents – the restorer and the property owner. The network of relationships of the two agents forms the multiple ties that shape the level of trust of the project-based trust relationship in the dyad.

The involvement of the insurance adjuster largely complicated the work relationship of a disaster recovery project, and the three agents form the key triad, in which project-based trust is shaped endogenously by the cognitive feedback and learning process. This triad forms the center clique of trust dynamics in disaster recovery projects. Their centralities are tested using UCINET generated data.

The connections of the three agents in the triad form the exogenous factors shaping the trust dynamics. Density of each exogenous agent is recorded as the measurement of the relative significance for the agent in shaping the trust dynamics.

The exogenous agents together form the network at large. The position of each exogenous agent is generated by using the given hierarchy representative of resources valued in the network. Such hierarchy structure is identified from previous studies on trust as a form of social capital and from the survey data. These exogenous agents with the agents in the center clique, with multiple informal circles formed. Interpretations of the identified circles can bring an in-depth understanding of the thickness of relationship and the key agents as gate keepers between circles.

4.4　Validity and Reliability

Validity of both survey data and interview data, and the results drawn from analyzing it, include internal and external validity (Sekaran & Bougie, 2009). Trustworthiness is also important for research. To be trustworthy, the research has to be reliable (Sekaran & Bougie, 2009). The internal reliability refers to the accurate representativeness, and the external reliability refers to the generalizablity of the results to other contexts.

Internal validity is achievable by respondent validation. After the model is fitted using survey data, the researcher sends the results summary to selected respondents for feedback. This step confirms no misinterpretation has happened in the data analysis process. Data triangulation is also used to ensure internal

validity. Triangulation refers to the research process that involves different information sources, allowing a better assessment of the generalizability of the analysis results (Maxwell, 2005). This research contains data from a survey and a set of interviews. Both types of research are conducted to the same population to avoid variations caused by different populations. By studying both the survey data and interview data, the risk of misinterpretation is reduced.

External validity is achieved by providing a detailed description of the research design, including the population, questionnaire items, sampling process, and the data analysis techniques. In this way, other researchers are able to transfer part or all of the research results to other contexts (Sekaran & Bougie, 2009).

4.5   Summary

This chapter provided an overview of the research procedure designed for this research. The chapter also presented the sampling results of the survey and the interview procedures. The next chapter describes and discusses data analysis results.

CHAPTER 5. RESULTS

To explore time-space two-dimensional trust dynamics in disaster recovery projects, the research employs a mixed method to collect both quantitative and qualitative data. This chapter summarizes the analysis of the data collected from the quantitative survey and its follow-up interview. The research process was designed to answer the three major research questions and to test the eight hypotheses. This chapter also shows the SNA and the sociogram from the relational data analyzed using UCINET.

5.1 Data Analysis

As stated in the previous chapter, this research includes both a quantitative survey and a qualitative interview. Therefore, this section will explain the process of analyzing the two types of data from these two research procedures with different techniques.

5.1.1 Survey Data Analysis

The survey data sets were collected using Qualtrics and analyzed using the Statistics Package for the Social Sciences (SPSS). Two survey questionnaires were designed, one for restorers and one for property owners. The two data sets were collected and analyzed separately. Each set of data was first examined and cleaned for missing data and its distribution. Each item in the set of data was

then analyzed individually for descriptive statistics, including frequency counts, means, and median scores. This analysis enables the researcher and readers to better understand the dispersion in the sample.

The first sections of both survey questionnaires are demographic questions, after which the demographic characteristics of each sample could be drawn. The second half of each survey questionnaire comprises trust-related items. The respondents were asked to assess each statement based on the five-point Likert scale. The descriptive statistics show the perceptions of each group of respondents, as well as the relative importance of the trust-building actions. After this step, the statistical significance of correlation among items in each data set was analyzed using analysis of variance (ANOVA). These ANOVA results were used to test the hypotheses presented in Chapter 1.

Analytical results from the two data sets were then compared item by item to identify discrepancies in the two groups' evaluations and perceptions of trust dynamics in disaster recovery projects. Such observed discrepancies may suggest opportunities to improve both customer service and general operational efficiency.

Finally, to propose a trust measurement model based on dispositional, cognitive, and institutional aspects, a linear regression was run for the project-based trust, using the three types of trust as independent variables. To test the robustness of this linear regression model, two variable-weighing assumptions were adopted, and both ended up with the same conclusion.

5.1.2   Interview Data Analysis

After the preliminary analysis of the survey data, a follow-up interview was designed in which eleven one-on-one, standardized, and open-ended interviews were conducted over the phone. These interviews provided a wealth of in-depth and personal insights for use in addressing the research questions and hypotheses. Before analysis of this information, the interview records were transcribed by the researcher and archived. The transcribed qualitative data then underwent content analysis.

The qualitative data were first analyzed for major themes, which were then categorized according to the research questions they answered. Observation of the themes categorized this way gave rise to new conclusions regarding trust dynamics in disaster recovery projects, beyond the results of the survey data analysis.

A report was then produced to connect the qualitative and quantitative data and analytical results. This step tabulated the main themes identified in both quantitative and qualitative data sets. Details of this report are presented in the following section on research results.

5.2   <u>Results</u>

The research results are organized in consistency with the three themes within the proposed two-dimensional trust dynamics. The results are presented here according to the research questions and corresponding hypotheses. For efficiency, each subsection includes both quantitative and qualitative data analysis results.

5.2.1 Trust Measurement Model

One major goal of this research is to provide a way to quantify trust in disaster recovery projects. To do this, several evaluation items were included in the survey questionnaire. These items were then used to test the proposed hypotheses regarding trust measurement. In addition, interview data provided in-depth information about trust building parameters; this either confirmed findings from quantitative analysis of the survey data or provided new insights based on the emerging themes.

The next sections are organized according to the types of trust that the research is designed to test: first, the survey data analysis results, followed by the interview data analysis results.

5.2.1.1 Dispositional Trust – Significance Test

Hypotheses 1 and 2 concern the statistical significance of the measured variables within the category of dispositional trust. They are primarily tested using ANOVA. ANOVA tables for all hypothesis testing are included in table 5.1. This includes the thirteen variables shown in table 5.1 under two latent variables. Test results suggest that these measures are not statistically significant in explaining trust in disaster recovery projects. The reason, according to the proposed trust dynamic model, is that dispositional trust is most influential on trust dynamics before the project starts and before the two agents engages in any interactions. The non-significance of the measures might also be caused by

the fact that dispositional trust is implicit and vague. The respondents can therefore hardly evaluate these measures explicitly. If this is the reason, then an alternative research design is needed to explore dispositional trust using implicit measures.

Table 5.1 *Dispositional Trust Measures*

Variables from figure 4.2 model		Restorer's survey		Property owner's survey	
Latent variable	Measured variable	Question number	Variable name	Question number	Variable name
Experience of disasters	Property ownership	n.a.		1	ownership
	Years of ownership	n.a.		2	YrOwnerhsip
	# of floods experienced	15	FloodExpd	9	FloodExpd
	Primary residence	n.a.		12/13	PrimaryRes
	# of residents			14	NoResident
	Disaster syndromes	14	Stress	17	Stress
	Extent of loss			15	SizeLoss
	Utility shortage	10	shortage	18	Shortage
Social Status	Education level	6	Edulevel	3	Edulevel
	Gender	7	Gender	4	Gender
	Marital status	n.a.	MaritalStats	5	MaritalStats
	Building knowledge	16	BldgKnow	19	BldgKnow
	preparedness	n.a.		20	preplan

Table 5.2 shows the ANOVA results. The p-values recorded in the table test the statistical significance of each variable in its impact on trust dynamics in disaster recovery projects. None of the measured variables is statistically significant.

However, both groups of survey respondents agreed on the nonsignificance of the four variables in trust dynamics, including the two measured variables of experience of disasters (disaster syndrome and experience of utility shortage) and the two variables under the latent variable of the property owner's socioeconomic status (education level and preparedness).

Table 5.2 *Dispositional Trust Measures and Their Perceived Significance to Restorers and Property Owners*

Measured variables	Perceived significance for restorers			Perceived significance for property owners		
	coefficient	p-value	Significance (yes/no)	coefficient	p-value	Significance (yes/no)
Ownership	n.a.			.9323	.0015	yes
YrOwnerhsip	n.a.			-.0553	.8807	no
FloodExpd	.3403	.0373	yes	.0166	.3786	no
PrimaryRes	n.a.			.2251	.2969	No
NoResident	n.a.			-.0024	.693	No
Stress	.2159	.2242	no	.3619	.0688	No
SizeLoss	n.a.			-.2049	.3411	no
Shortage	-.5926	.0779	no	-.0995	.8251	no
Edulevel	-.0345	.8443	no	.2251	.2969	no
Gender	n.a.			-.105	.7552	no
MaritalStats	n.a.			.9281	.0019	yes
BldgKnow	.3643	.0175	yes	-.0452	.7656	no
Preplanning	n.a.			.057	.7493	no
# of significant variables	3			2		

A special pattern in the dispositional trust measures is that eight out of the thirteen measures were not included in the survey for restorers. This equates to 61.5% of the measured variables. The reason for this design concerns the nature of dispositional trust. First, as stated in Chapter 2, the property owner's personal

experience and socioeconomic status affect his or her capacity to trust. These factors are not observed from the restorer's side. Second, factors such as a property owner's concerns about the residents and emotional attachment to the damaged property might interfere with trust building. However, for the two statistically significant variables to the property owner –marital status and property ownership – two interview questions were designed concerning these measures.

<div align="right">

5.2.1.2 <u>Dispositional Trust –</u>

<u>Indicators and Major</u>

<u>Themes</u>

</div>

After the survey data were collected and underwent preliminary statistical analysis, a set of follow-up interviews were conducted to confirm the conclusions from the survey.

Participants found that dispositional trust significantly shaped their work relationships with property owners in three ways, which emerged as themes in the interview data.

1. Socioeconomic status

Nine of the eleven participants found the socioeconomic status of a property owner to be related to the trust-building dynamics of a disaster recovery project. Seven of them emphasized this point especially for private homeowners. However, these participants formed both positive and negative views regarding "high-end homeowners," as one participant put it:

> **"About 50% of our residential disaster recovery projects are with high-end homeowners. I find they are less demanding and easier to build bond with."**

Although two participants spoke positively about this group of customers, one participant offered a negative perspective:

> **"No, actually I never worked with them. Because they set unrealistic expectations (about the recovery work). They feel privileged and can get really picky. I typically walk away from these people."**

The other three of the seven participants who addressed this theme had mixed feelings about the role of socioeconomic status in trust building, or mixed feelings about their "rich customers," as typified by this response:

> **"Customers with higher level of education often times respect our opinions more. They trust our professional experience. But they can be more demanding, for they often times set higher expectations for our work, and this can be good and bad to work with at the same time. But they tend to trust us more if the job is well done."**

Another participant held a differing opinion regarding this theme. To him, it was not a significant factor, unlike his company's performance:

> **"I work with both poor and rich, but I don't think it determines trust bonding with my customers. I think it is setting the appropriate expectation and meeting it, that really determines how customers trust us."**

2. Level of damage

All eleven participants addressed the significance of the level of damage in determining trust dynamics in disaster recovery projects. They agreed that the trust dynamics are strongly related to the level of severity. One participant said:

> **"The more damage, the easier for trust building. The homeowner sees us as life savers and doing work that is impossible. "**

This statement is representative of the majority's opinion regarding the level of damage as a significant dispositional trust indicator.

3. Emotions and stress level of customers

All participants touched on the mental states of property owners they had dealt with, and they tended to agree on the customers' initial, abnormal mental state. Participants used words such as "nervous," "confused," "angry," and "denial" to describe customers' post-disaster syndrome. One participant, drawing from his 22 years in the disaster recovery industry, gave a longitudinal description of the emotions of a typical homeowner:

> **"When we first meet they are nervous and almost all of them are scared and denial. They deny everything we suggest. They get angry when they see the dollar amount needed for the job. They answer no to everything we said. But later on when they know us better, or as they trust us more, they accept our help ultimately."**

Interview participants also agreed that business owners are less emotional and easier to build trust with than homeowners.

One participant stated that it is more important to build trust with homeowners than with business owners because homeowners are more "personally attached" to the property and its contents. Property owners' disaster experience also significantly affects trust building.

> **"(I noticed that) first time business owners and most homeowners (get nervous and emotional with the damage). It's not that important to build trust with facility managers, but as our competitors do, we do it also."**

The above participant raised another interesting point: that he put in effort in building trust with his customers because of peer pressure from his major

competitor in the local market. This implies the network embeddedness of trust dynamics in disaster recovery projects, which is analyzed in more detail in section 5.2.1.6.

5.2.1.3 <u>Cognitive Trust –</u>

<u>Significance Test</u>

Hypothesis 3 states that technical expertise and business integrity combine to build the professional reliability of a restorer, which has a significant impact on the trust mechanism in disaster recovery projects.

Within the hypothesis, fourteen measures of cognitive trust are identified and are measured with one item in each version of the survey questionnaire. Table 5.3 shows these measured variables and the corresponding survey items.

Table 5.3 *Cognitive Trust Measures*

Measurable variables	Restorer survey		Property owner survey	
	Question number	Variable name	Question number	Variable name
Communication	22	Communication	27	Communication
Effective contract management	23	Contract	25	Contract
Permeability	25	Permeability	29	Permeability
Initial Openness	24	Initialinteract	26	Initialinteract
Fairness	26	Fairness	28	Fairness
Effective cost control	28	Budget	30	Budget
Effective quality control	30	Quality	n.a.	
Effective schedule control	29	Schedule	31	Schedule
Effective safety control	32	Safety	34	Safety
Necessary	n.a.		32	Precautions

precautions				
Meeting work standards	31	Standards	33	Standards
Customer courtesy	33	Courtesy	35	Courtesy
Respect for diversity	n.a.		36	Respect
Financial aid	34	AssistAid	37	AssistAid

Each of the fourteen measures has a corresponding question on both the property owner survey and the restorer survey. Table 5.4 shows the statistical significance of each measured variable in project-based trust.

Table 5.4 *Cognitive Trust and Significance to Restorers and Property Owners*

Measured variables	Perceived significance for restorers			Perceived significance for property owners		
	coefficient	p-value	Significance (yes/no)	coefficient	p-value	Significance (yes/no)
Communication	.721	.0014	yes	.0026	.9909	no
Contract	.481	.0134	yes	.73	.0034	yes
Initial interact	08984	.0001	yes	.5298	.1358	no
Permeability	.4252	.0472	yes	.7036	.0869	no
Fairness	.6448	.0021	yes	.6707	.0032	yes
Budget	.2537	.1987	no	.1284	.6498	no
Quality	.6067	.0251	yes			
Schedule	.6823	.0029	yes	.2995	.3085	no
Safety	.3955	.1630	no	.7478	.0009	yes
Precautions				.2771	.3644	no
Standards	.5576	.048	yes	.7772	.0265	yes
Courtesy	.8597	.0004	yes	.6531	.0183	yes
Respect				.3957	.2822	no
AssistAid	.32	.1816	no	.2680	.5136	No
# of significant variables		9			6	

These significant measures are consistent with the proposed trust dynamics. The most significant measure of cognitive trust is restorers' courtesy toward customers. Disaster recovery research and contacts in the restoration industry all emphasize the importance of customer care in order to reduce the vulnerability of disaster survivors. By showing courtesy and care, restorers convey the willingness to build a trust relationship instead of working under adversity. Property owners process this information cognitively, and their level of trust tends to improve further throughout the project.

It is also important to make sure the restoration work meets applicable standards. When the restorer makes fair decisions about the project, including the scope of work, estimate, and schedule, this builds trust for both stakeholders.

Hypothesis 4 states that restorers and property owners differ significantly in their perception of the importance of the cognitive trust measures.

The surveys for the property owners and restorers are designed to enable comparison of both parties' perceptions of trust measures. Such comparisons are conducted to test hypotheses 4, with results shown in table 5.4 above.

The level of agreement can be observed from the above table. Both stakeholders agreed on the statistical significance of effective contract management, fairness in decision making, meeting work standards, and courtesy to customers, although the perceived importance of these four variables varied. The two variables that both stakeholders found to be not significantly important were effective cost control and restorers' assistance with property owners' financial aid applications. As stated in Chapter 2 regarding the "restoration triangle," restorers'

cash flow is the major concern of the restoration industry (Fish, 2012). However, according to the survey results, cost control effectiveness does not affect trust development significantly, compared to other aspects of project administration. Restorers who were surveyed perceived effective communication as more significant in building trust than property owners did. The same patterns exist for the other two variables: initial interactions and the permeability of the restorer through the project execution. One possible explanation for this discrepancy in significance tests is that because restorers approach the questions from a professional point of view, they incorporate their knowledge about project management and customer service into their survey answers. In contrast, property owners have less knowledge about restoration and project management, thus basing most of their responses on their experience. This also explains why property owners consider the effectiveness of restorers' safety measures to be significantly important in building up trust relationships, but restorers do not. These differing perceptions are of special interest for this research because of the goal of this study: to suggest business strategies for effective trust building with customers. Therefore, the interview questions were designed to further explore why restorers view those variables differently from property owners. In-depth reasoning for those disagreements, as well as specific examples, is provided in the next chapter.

Comparisons between the views of the two types of stakeholders enable further understanding of the trust dynamics in disaster recovery projects. The owner survey illustrates owners' readiness to trust, as well as the perceived cognitive,

dispositional, and institutional trust measures that are significant. An examination

of restorers' view of the significance of the corresponding items shows the

discrepancies in the two parties' views of trust dynamics.

<div align="right">

5.2.1.4 <u>Cognitive Trust –</u>

<u>Indicators and Major</u>

<u>Themes</u>

</div>

Questions regarding cognitive trust indicators were asked in all eleven interviews.

The most repeated theme is the importance of the initiation of trust.

1. Initial interactions

All eleven participants talked about the importance of trust initiation in their work

experience, especially during the first 24-48 hours on site:

> **"First impression matters. How the customer perceive us, during the first visit, are the field workers wearing uniforms, wearing name badges, talking to them in the eyes, all going to set the perception of how professional is ABC. This perception will spread by word-of-mouth, good or bad."**

2. Integrity

Integrity is the next most frequently mentioned term in describing how to build

trust with customers. Participants talked in detail about the importance of caring

about the homeowner, getting to know the owner personally, being onsite on time,

being professional, showing courtesy ("treat the house as of your grandma"),

valuing small jobs as much as catastrophic disasters, and fixing your mistakes

effectively.

Five participants mentioned as a core value that they do not discriminate among sizes and types of jobs. They considered this core value an essential part of their work ethics. One participant mentioned that her company actually prefers smaller jobs to build trust with the property owners directly. Another participant touched on the same idea:

> **"We value smaller jobs as much (as bigger ones). We understand the emotions of homeowners. After a bad storm, a homeowner calls me in for a 10 by 10 basement (restoration). It is a small job for me, but to the homeowner it is huge."**

3. Communication

Also within the category of work integrity, the next most frequently mentioned term is communication. The participants agreed on the importance of mutual understanding about the scope of the work, and more importantly, having property owners understand that the restorers understand and will honor their concerns. The following is a typical statement:

> **"I think how much customers trust us is determined by the level of understanding (between us). Transparency is important as well, we maintain transparent and available to customers on daily basis. We also update the customers daily of the progress. Our customers are 100% satisfactory of our service and trust us."**

Another participant said her experience with poor communication caused failure in one of her projects. She mentioned that because of the poor communication – and the misrepresentation of the restorer's mission as "Superman flying around saving the world" – the work relationship deteriorated, as they could not find a way to communicate efficiently.

5.2.1.5 <u>Institutional Trust –</u>

<u>Significant Test</u>

Hypotheses 5, 6, and 7 are in regard to the institutional trust measurement.

Moderation analysis is used for each measured variable, as listed in figure 4.2.

Demographic variables in both surveys are used as moderators to detect

between-group differences in the perception of the significance of trust measures.

Table 4.8 shows the variables for institutional trust measures, as well as the

questions and variable names for both surveys. Table 4.9 presents the

moderation analysis results for the measured variables. The significance of each

variable can be tested using the critical p-value at 0.05. Any variables with p-

values smaller than 0.05 can be interpreted as statistically significant.

Table 5.5 *Institutional Trust Measures*

Variables from figure 4.2 model		Restorer survey		Property owner survey	
		Question number	Variable name	Question number	Variable name
Latent variable	Measured variable				
NFIP	NFIP covered	13	ClientNFIP	6	NFIP
	NFIP Sufficiency	8	Coverage	7	Coverage
	Awareness of NFIP	11	NFIPexp	n.a.	
	Assistance	34	AidsAsked	37	Assist
	Yrs same agent	n.a.		8	InsureYrs
Network of relationship	Means of finding restorer	19	RankBusS	22	RankBusS
	Preferred vendors	20	PreferredV	n.a.	
Profession	Certifications	18	Certification	21	Certification

Hypothesis 5 states that the network of relationships significantly affects trust dynamics in disaster recovery projects.

The network of relationships is the first latent institutional trust measure being tested. The measured variables associated with this network include the means of finding a restorer and whether the restorer is a preferred vendor of the insurance agent. From the temporal trust dynamics, institutional trust is the primary type of trust affecting the entrance level of trust. This includes whether the restorer is contacted via referral by kin relationships or close relationships, is recommended by the insurance agent, or is found directly through its marketing campaign. Overall, the network of relationships and these measures are perceived as not statistically significant in building institutional trust. For both stakeholders, both measures have quite large p-values, showing nonsignificance. Therefore, hypothesis 5 is rejected. The survey results show that the network of relationships does not significantly impact trust in disaster recovery projects.

Hypothesis 6 states that the availability of professional certifications significantly affects trust dynamics in such projects.

Only one measure is identified in the proposed trust measurement model. Both restorer respondents and property owner respondents perceived this measure as not statistically significant. Therefore, hypothesis 6 is rejected; the availability of professional certifications does not significantly impact trust in disaster recovery projects. This question is also included in the follow-up interview, and the result is triangulated from the interview results.

Table 5.6 *Institutional Trust Measures and Their Perceived Significance to Restorers and Property Owners*

Measured variables	Perceived significance for restorers			Perceived significance for property owners		
	Coefficient	P-value	Significance (yes/no)	Coefficient	P-value	Significance (yes/no)
ClientNFIP	.1586	.4308	no	.5630	.3369	no
Coverage	-.0895	.6789	no	.2475	.4523	no
NFIPexp	.2827	.055	yes	.9397	.0009	yes
AidsAsked	.1948	.2579	no	.2680	.5136	No
InsureYrs	n.a.			-.0547	.0507	yes
RankBusRes	0	.214	No	.0992	.6555	no
Preferred V	-.3842	.4064	no			
Certification	.003	.6321	no	.128	.2811	no
Total # of significant Vs		1			3	

Hypothesis 7 states that the National Flood Insurance Program significantly impacts trust dynamics in disaster recovery projects.

Both surveys contain questions regarding trust measures under the hypothesis about NFIP. Both restorers and property owners who responded to the survey perceived the property owner's number of flood damage experiences as statistically significant to trust dynamics. Both stakeholders held similar perceptions in regard to the significance of measured variables in the category of NFIP. The data therefore fail to reject hypothesis 7, and the number of flood damage experiences of a property owner has a significant impact on trust dynamics in disaster recovery projects.

NFIP is tested to be the most significant source of institutional trust, as perceived by both restorers and property owners. This is consistent with the research

assumption that the NFIP or government involvement provide one type of structural support for disaster recovery projects or institutional trust. Finally, dispositional trust measures are tested, with the results presented in the next subsection.

5.2.1.6 Institutional Trust – Indicators and Major Themes

Responses to the interview questions regarding institutional trust confirmed the analytical results from the survey suggesting that professional certification is not significant to trust building with property owners. Also, restorers did not identify NFIP as a determining factor in building trust. However, all eleven participants confirmed the importance of the network of relationships in trust building and business development. These results are detailed in the following three sections.

1. Certification

A question was designed to gather information about the perceived importance of certification to the perceived trustworthiness of a restorer. As reported by ten restorers, few customers ever noticed professional certifications on either a personal or an organizational level. As the eleventh participant put it, unless the property owner was from the restoration industry, they hardly noticed. According to one participant:

> **"No customers I worked with care about certifications. It is not important. They care more about our reputation. Their friends backed us for that. And the good words spread and we actually get more businesses in that way."**

2. Referral networks

The last statement above also connects to the next major theme within the category of institutional trust – the network of relationships. Consistent with the survey results, interview participants identified "friend and family" of their previous customers as the biggest source of referral for new business, and investigating customers' post-service satisfaction was the prevailing strategy to engage customers and spread word of mouth. One participant was able to quantify the importance of referrals from his network:

> **"We rely heavily on customer referrals. More than 10% (of the annual revenue) is from referrals. We were called in last year for the IBM facility cleaning after water damage. The facility management team was impressed by our service and we were later referred to Boeing by the IBM team. "**

The same patterns apply for the residential sector as well. Participants also identified the importance of internet searches and referrals from insurance agents. However, not all of them relied on the network of insurance agents (also known as the Preferred Vendor Program). One participant mentioned her preference for networking directly with customers:

> **"We are on no Preferred Vendor's lists, actually I prefer not working with insurance companies. Instead I know my clients personally, 80% of my customers know who I am and trust me personally for the job. My managers sign the Master Service Agreement with them, that's how we work."**

3. NFIP

Five participants did not know whether their customers had NFIP coverage or not. Three other participants replied that NFIP was not their concern as long as the

projects were paid for. Two participants confused NFIP with the direct involvement of the federal government and claimed that he had never worked with government. The last participant had more knowledge about NFIP and specified that his company serves mostly local community mostly; that region is not within the floodplain and therefore does not have mandated NFIP.

From the responses of the majority of the participants, NFIP is not a major concern in working with customers or building trust with them. It is more of a structural component than an endogenous factor related to the ongoing work relationship between a property owner and a restorer. This also confirms the no significance of NFIP to project-based trust, as identified from the survey data.

5.2.1.7 <u>Reduced Dimension</u>
<u>– New Trust</u>
<u>Measurement Survey</u>

Based on the statistical significance test results and interview analysis results, the original survey questionnaires were revised into the second version with less questions. With the identified statistically significant indicators for trust, the new questionnaires were designed parallel which is consistent with the original version. However, after the revision the length of the questionnaires was largely reduced. Questions in the restorer's survey was reduced from 40 to 20, and in the property owner's survey, the number of questions was reduced from 35 to 17. The shorter questionnaires are less time consuming than the original ones, they would therefore have higher response rates than before. Future research might

be conducted based on the core questions contained in the revised survey questionnaires. The new trust measurement survey questionnaires are included in Appendix E and Appendix F.

5.2.2 Research Question 1b – Trust Measurement

The proposed spatial dimension of trust dynamics in disaster recovery projects is represented by the trust measurement model as shown in Figure 3.2. From that figure, three latent variables represent the three types of trust, in which the 34 measured variables cluster. The 34 measured variables were evaluated by restorers and property owners during the survey process, and the data collected from the surveys enabled the quantification of the conceptual trust measurement model. This section presents the two methods used to construct the model quantitatively. The methods triangulated each other for the consistency of the proposed model.

5.2.2.1 Equal-Weighted Model

Based on the property owners' evaluation of trust dynamics in disaster recovery projects, a linear regression model is generated based on an equal-weight assumption. Under this assumption, all measured variables within each type of trust are assigned equal weight, which adds up to 1. For example, in the proposed trust measurement model as shown in Figure 3.2, the thirteen measured variables are each assigned a weight of $w_{1j} = \dfrac{1}{13}$ so that

$$\sum_{j=1}^{13} w_{1j} = 1 \qquad \text{(Equation 5.1)}$$

The same assumption was applied to the measured variables within the categories of cognitive trust measurement and institutional trust measurement, with

$$w_{2k} = \frac{1}{12} \qquad \text{(Equation 5.2)}$$

so that

$$\sum_{k=1}^{12} w_{2k} = 1 \qquad \text{(Equation 5.3)}$$

and

$$w_{3l} = \frac{1}{9} \qquad \text{(Equation 5.4)}$$

so that

$$\sum_{l=1}^{9} w_{3l} = 1 \qquad \text{(Equation 5.5)}$$

Using the seventeen samples from the property owner survey, a linear regression was run for Item 19 in the questionnaire, which measures the respondent's assessment of the restorer's trustworthiness against the three types of trust. The model summary is shown in table 5.7. As shown in the table, the three independent variables together explain the 70.7% variance in the model. The significance test also shows that cognitive trust is the only statistically significant variable in explaining variances in the model, with the equal-weight trust measurement model as

$$\text{Trust} = 0.878 - 0.327 T_1 + 1.094 T_2 - 0.173 T_3 \qquad \text{(Equation 5.6)}$$

where

$$w_{1j} = \frac{1}{13}, \quad w_{2k} = \frac{1}{12}, \quad w_{3l} = \frac{1}{9}$$
(Equation 5.7)

and

$$\sum_{j=1}^{13} w_{1j} = 1, \quad \sum_{k=1}^{12} w_{2k} = 1, \quad \sum_{l=1}^{9} w_{3l} = 1$$
(Equation 5.8)

Table 5.7 *Equal-Weight Trust Measurement Model Summary*

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.878	2.018		.435	.671
Cognitive Trust	1.094	.350	.657	3.128	.009
Dispositional Trust	-.327	.793	-.085	-.412	.688
Institutional Trust	-.173	.262	-.139	-.658	.523
R	.707				

From the quantitative model, the initial level of trust is 0.878, as shown with the constant term in the linear regression model. Besides the statistically significant variable of cognitive trust, both dispositional trust and institutional trust have minor negative effect on project-based trust.

5.2.2.2 Principal Component Analysis-Weighted Model

To validate the trust measurement model as presented above, another variable weighting scheme is used as a triangulation of the equal-weight trust measurement model. In this scheme, the measured variables in each latent

variable, or each type of trust, are first analyzed using principal component analysis (PCA). PCA was originally used as a dimension reduction technique; it utilizes the dependencies among variables to represent a data set in a lower-dimensional model without sacrificing robustness in the model (Smith, 2002). However, it has also been used to find statistical patterns in data. Specifically for this research, multiple measured variables within each type of trust are transformed into linear combinations and represented by the top five components (five is the SPSS default number of components in PCA) that account for most of the total variance. Communality for each of these variables is derived based on the percentage of variance for each variable, as explained by all five components jointly. It shows the reliability of the indicator and is used as the weight for each measured variable in generating the sample data for the three latent independent variables – dispositional trust (T_1), cognitive trust (T_2), and institutional trust (T_3). Table 5.8 shows the communalities for dispositional trust measured variables t_{1j} (j=1, …, 13). The sample value for $T_{1\alpha}$ is then calculated using the equation

$$T_{1\alpha} = \sum_{j=1}^{13} w_{1j,\alpha} t_{1j,\alpha} \qquad \text{(Equation 5.9)}$$

Table 5.8 *Communalities of Dispositional Trust Variables*

	Communality	Weight (w_{ij})
ownership	.561	0.060
YrGroup	.640	0.060
gender	.707	0.080
eduLevel	.748	0.090
marital	.844	0.080
FldsExpcd	.833	0.040

primaryRes	.859	0.090
LossGroup	.938	0.090
NoResidGroups	.764	0.080
stressWRestorer	.373	0.070
shortageExp	.876	0.080
Preplan	.906	0.090
ClearDamScope	.891	0.090
TOTAL	9.940	1.000

For example, for sample α (α=1,…, 17 for the property owner survey), $t_{1j,\alpha}$ is simply the rating of sample α in question j under the category of dispositional trust measurement, and $t_{2k,\alpha}$ is the response of the same sample to the k-th question under the category of cognitive trust.

Following the same steps, sample values for $T_{2\alpha}$, dispositional trust, were calculated for α=1,…, 17 of the property owner samples. Table 5.9 and 5.10 below show the PCA communalities for the measured variables cluster in the latent variable of dispositional trust and institutional trust with the following equations.

$$T_{2\alpha} = \sum_{k=1}^{12} w_{2k,\alpha} t_{2k,\alpha} \ . \qquad\qquad \text{(Equation 5.10)}$$

$$T_{3\alpha} = \sum_{l=1}^{9} w_{3l,\alpha} t_{3l,\alpha} \qquad\qquad \text{(Equation 5.11)}$$

Table 5.9 *Communalities of Cognitive Trust Variables*

	Communality	Weight (w_{2k})
contract	.801	0.086
ftfCommunication	.793	0.085
permiability	.752	0.081
expectation	.812	0.087
fairness	.799	0.086

budget	.860	0.092
schedule	.682	0.073
quality	.714	0.079
safety	.798	0.086
courtesy	.751	0.081
respect	.836	0.090
precaution	.667	0.071
insuranceSide	.786	0.084
TOTAL	9.337	1.000

Table 5.10 *Communalities of Institutional Trust Variables*

	Communality	Weight (w_{3l})
NFIP sufficiency	.786	0.168
NFIP	.805	0.172
Insure Yr Group	.869	0.186
Certification	.652	0.139
Restorer found by	.814	0.174
assist	.749	0.160
TOTAL	4.675	1.000

With all the weights assigned following the above procedure, a linear regression was run to explore how the property owners' trust in disaster recovery projects varies with the three types of trust. With PCA-weighted variables, the modeling result is

$$\text{Trust} = -0.460 - 0.239T_1 + 1.190T_2 - 0.025T_3 \qquad \text{(Equation 5.12)}$$

where the three variables together explain 76% of the variance in the data set, with the weight assigned in accordance with the PCA communalities as shown in tables 5.8, 5.9, and 5.10.

Table 5.11 *PCA-Weighted Trust Measurement Model*

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.046	1.820		-.026	.980
PCACogTrust	1.190	.344	.759	3.457	.005
PCADisTrust	-.239	.727	-.062	-.328	.748
PCAInsTrust	-.025	.489	-.011	-.050	.961
R	.760				

From the numerical model, the initial trust is slightly below zero, and consistent with the equal-weight model, cognitive trust is the only statistically significant variable in measuring project-based trust. These results confirm the previous studies showing trust as a cognitive process (Castelfranchi & Falcone, 2010; Busken et al., 2012). Also consistent with the equal-weight model, both dispositional and institutional trust have a negative effect on the overall level of trust in disaster recovery projects. However, from the significance test results, such negative effects are negligible compared to cognitive trust. The explanation of this phenomenon and its implications is presented in detail in the next chapter.

5.2.3 Research Question 2 – Stages of Temporal Trust Dynamics

5.2.3.1 Temporal Trust Dynamics – Significance Test

Hypothesis 8 states that trust improves over time in a disaster recovery project. Question 38 in the property owner survey asks the respondent to evaluate if the relationship with the restorer improved over time. The mean score for the

seventeen samples is 2.85, in the middle of the range based on the five-point Likert scale, and leaning toward the lower end. This implies that property owners are neutral regarding trust dynamics in their disaster recovery experiences. The interview results support this – restorers who participated in the interview 100% agreed that the initial interactions determine the level of trust throughout the project. More details are presented in the next section.

5.2.3.2 Temporal Trust
Dynamics – Major
Themes

Three questions are included in the interview questions regarding the temporal trust dynamics, or how the level of trust varies over time. The most mentioned theme was that trust is dynamic and its level varies. All eleven participants mentioned the importance of building trust on the first day of the job. As one participant said, the initial meeting with the customer sets the "tone of the job." In extreme cases, this participant's company had to leave the job because of the "terrible experience we have with the homeowner"; he claimed that although building trust is vital, "knowing when to walk away," or when not to abuse trust, is also vital to the survival of his company.

1. Initial level of trust

As previously mentioned, a typical property owner is likely to have short-term shock from the detrimental event and to thus demonstrate high levels of stress and anxiety. However, as confirmed by interview participants, these conditions

did not last long if restorers managed to establish a trustworthy first impression during the first 24-48 hours of interaction. Positive first interactions determined whether the restorer got the job or not and set the tone of the work relationship later on.

2.   Sustaining project-based trust

This will be talked in more details in the sociogram as well.

3.   Rebuilding trust once it has been damaged

One participant put that it is not retainable at all based on her observation. Others all agree that it is really hard. Instead of relying on the feedback mechanism during the project operation phase, participants agree on the following strategy:

> **"That is almost impossible. Trust breaking down because of poor communication or bad attitude of one person in the field. It is impossible to rebuild trust (in such cases). What we do is changing out managers on that case (to enable new trust development), don't make the case worse."**

The other theme emerged as participants talked about detrimental trust is strategies to fix mistakes a restorer made at work. agreed on distinguishing making mistakes in recovery projects to damaging trust relationship with customers:

> **"We of course make mistakes. I believe all contractors do. But mistakes are not necessarily damage trust, actually if we fix it right and quick, the customer trust us more (for our integrity and expertise). So it is really how we react to the mistakes we made that affect the relationship (with customers). Are you being honest? (Did you) let the homeowner know what has happened? Did you talk with homeowner and insurance adjuster about how to fix it? Or try to cover your mistakes up with more mistakes?"**

It confirms the results on cognitive trust indicators – open communication and mutual understanding were identified as significant variables in both the quantitative analysis and the qualitative analysis.

5.2.4 Research Question 3 – Time-space Integrated Trust Dynamics

The survey demographic questions are designed to identify the dispositional trust as the preexisting conditions of property owners as the endogenous factors determining initial level of trust. The trust-related items are designed to identify the cognitive process of trust dynamics during the project. Interview questions address the temporal transition of the trust dynamics directly. Both data were organized into the following themes.

1. Entrance Trust

Before the interaction starts, the intrinsic features of a property owner, together with his or her network of connections, as shown in the sociogram in Chapter 6, determines the level of trust, which is referred to as entrance trust in this research. At this stage of the temporal trust dynamics, the property owner's experience with similar disasters has been identified from both the survey item quantitatively and the interview data qualitatively. Both group of samples agreed on the significance of this variable in determining the trust relationship between the property owner and the restorer – the first-time disaster survivors, both business owners and private homeowners are more difficult to build trust with. This is partly because of their especially high level of stress and anxiety. Such mental states have been concluded by psychologists as hard to build trust with.

Interview data shows the significance of the other factor – the socio-economic status of a property owner. Previous studies in trust have concluded this factor is the determinant for an agent's capacity for trust. In this group of research, scholars concluded that agents with higher education levels, higher income levels, higher powers and other aspects in their socio-economic lives have greater capacity for trust (Luhmann, 1979; Cook, 2003). This research confirmed this capacity for trust theory with specific variations to it. In disaster recovery projects, property owners with higher socio-economic statuses, especially with higher education levels tend to be easier to build trust relationship with. However, such greater capacity also means higher expectations of recovery work quality and standards, which requires restorers to work with extra care and integrity when compared with lower-end customers.

As shown in this result above, the entrance trust once reached, does not stay static. Instead, as a disaster recovery project starts, the two agents have increasing interactions. Cognitive knowledge is gained in the learning and feedback mechanisms by both agents, which dynamically change the level of trust. This lead to the next stage of the temporal trust dynamics.

2. Project operation and trust development stage

3. Sustained trust

In both survey questionnaires for restorers and property owners, one item was designed to assess the trust sustaining from short-term, project-based into long-term trust in term of business alliances or interpersonal relationships. Both data

set shows positive evaluation of this item, which means both sectors have experienced such optimal level of project-based trust sustained into long-term relationships. Such result was triangulated from the interview data. Participants in the interview described their experiences with well-built trust over one or several disaster recovery projects with property owners. At the end they either build up personal relationships or get into recovery service agreement with the customers. Such conclusion is able to validate the proposed temporal trust dynamics of trust sustained into business alliance and interpersonal relationships. From the spatial dimension of the trust dynamics, once two agents reach into long-term trust, both cognitive trust and dispositional trust dominate to shape new levels of trust as they interact more interpersonally or professionally. They are able to connect more agents in bigger networks and circles, which lead to new business opportunities for restorers, and strengthen trust relationship between them at the same time.

5.3   Summary

This chapter presents the survey data and interview data analyses in detail. Survey data sets were first analyzed for hypothesis testing item by item, then using two different item-weighing methods. The trust measurement model is presented quantitatively with approved consistency. Interview data were analyzed for patterns, either to confirm survey results or to come up with new themes. These data managed to triangulate the majority of survey results, with three new conclusions regarding both spatial and temporal trust dynamics.

In the next chapter, the results of this research are deepened using SNA based on relational data from both surveys and interviews. This visualizes the structural embeddedness of trust in disaster recovery projects, and it illustrates the infusion of trust as social capital beyond a single project. This could be interpreted as the transition from short-term to long-term trust.

CHAPTER 6. CONCLUSIONS AND DISCUSSIONS

6.1 <u>Discussions</u>

This research set out to investigate the nature and characteristics of trust relationships in disaster recovery projects. The research began based on the premise that special challenges from both insurance adjuster involvement and special care are needed for property owners as disaster survivors. This dissertation addressed trust as a dynamic rather than static mechanism; trust is studied in the context of disaster recovery projects. By studying trust in this way, this dissertation attempted to build a bridge between trust theory and disaster recovery and to integrate them into a theoretical framework addressing gaps in both areas of literature. As did the complete time-space trust dynamics presented in Chapter 3, Chapter 5 described how the dynamic model was tested and triangulated using survey and interview data. In this chapter, the connection between the temporal and spatial dimensions of the trust dynamics was built through a social network analysis. Both dimensions of the trust dynamics are largely integrated in the sociogram of the disaster recovery network. Discussions of research contributions and possible future research are also presented in this chapter.

6.1.1 Trust Measurement Model for Disaster Recovery Projects

In this research, the author has presented an empirically grounded time-space integrated trust dynamics model that extended the results of trust theory to study the impact of time and space on trust development. The results showed that cognitive trust is a statistically significant parameter in explaining trust relationship development. In other words, the research showed that the endogenous interaction between a property owner and a restorer shapes the trust dynamics the most.

This shows that project-based trust relies more on interaction experience than on network structure or pre-existing features of the two agents. However, for long-term trust, the structural embeddedness in the disaster recovery network becomes the most significant aspect of infusing the trust, which is illustrated by the wide-spread practice of formal and informal business referral systems in the disaster restoration industry.

Both the equal-weight model and the PCA-weight model show that cognitive trust is the only statistically significant variable in measuring the level of trust in disaster recovery projects. This discovery is inconsistent with other research in trust, including that of psychologists studying trust as a cognitive process with learning mechanisms, sociologists studying trust as a social capital with structural embeddedness, and business scientists studying trust as competitive advantages for organizations.

Furthermore, both models show that dispositional trust and institutional trust actually have a slightly negative effect on project-based trust, which is an

interesting but insightful conclusion based on the many unique challenges and situations that both restorers and disaster-affected property owners are likely to confront. Figure 6.1 below shows the reduced trust measurement model based on the survey and interview results.

6.1.2 Temporal Dimensions of Trust Dynamics in Disaster Recovery Projects

The unique challenge of long-term trust building in disaster recovery projects lays in the low frequency of repeated services for the same property owner, especially for private home owners. From a dynamic perspective, in conventional construction, as well as many other forms of economic transactions, the level of uncertainty decreases over time as agents gain knowledge about the trustworthiness of each other. A major goal of disaster recovery projects is to recover what has been damaged and to get the property and its owner better prepared for similar disasters and to make the property more disaster-resistant. An ethical restorer would operate in such a way as to restore and improve the disaster resistance of the property in question. This method, in return, leads to less likelihood of repeat business from the same clients. However, multiple research participants point out that referrals and the network they create due to their trustworthy performance with previous customers is very beneficial in terms of obtaining clients. These customers either left positive reviews or referred the restorer to other agents in their network of relationships, which lead to new clients as well as an enlarged network or space for the restorer.

Trust building actions in such a challenging environment can be explained by the long-term expectation from the restorer as to sustaining the project-based trust in future business alliances or personal relationships that lead to new business opportunities. With such future business in mind, they rationally choose to be trustworthy and provide services based on their technical expertise with integrity.

6.1.3   Trust Sociogram in Disaster Recovery Projects

As this research focuses on the inter-agent work relationships between stakeholders, and especially between restorers and property owners, with the appropriate data and technique, a social network analysis was adopted to visualize the ongoing trust dynamics spatially. This section presents the data processing, the sociogram generation, key results, and their interpretations.

6.1.3.1   Data Processing

SNA uses graph theory methods to identify structures of relationships within formal and informal groups (Fredericks, 2005). This research was designed to collect such relational data. Survey questions #23 in the property owners' survey and #19 in the restorers' survey asked respondents to rank the given sources of informants by the frequency of information acquisition and information usefulness in finding a restorer and developing new business, respectively. Such data were the primary relational data for the SNA.

To validate such information, several interview questions were designed to generate more relational data demonstrating both direct and indirect inter-agent relationships. Such multi-degree relationships inspired the researcher to seek a

technique for representing the spatial dimension where trust relationships, both project-based and alliance-based, are included.

SNA was adopted for this research in representing the spatial dimension of the trust dynamics because of its capability of showing the patterns of relationships between agents rather than simply showing individual characteristics. As the previous chapter presented much on the individual characteristics in the trust dynamics, especially in the section about dispositional trust measurement, such analysis complemented the spatial dimension results.

More specifically, UCINET was used in this research for data manipulation and SNA. UCINET integrates data management and multiple network analytic routines including centrality measures, dyadic cohesion measures, positional analysis algorithms, clique finders, stochastic dyad models, and general statistical and multivariate analysis tools (Borgatti et al., 2012).

Relational data from the survey data sets were combined and adjusted in accordance to the interview data. Such data were then validated and processed into UCINET to create necessary matrices for each of the research parameters.

6.1.3.2 <u>Sociogram</u>

<u>Generation</u>

Once the adjacency matrix was generated and processed into UCINET, a sociogram demonstrating the trust infusion network was created. This sociogram is shown in figure 6.1 below. The sociogram was comprised with a certain hierarchy structure. The position of each agent in the network was decided by the

relational data and derived density from such data. The hierarchy structure was derived from research data and tested using centrality analysis.
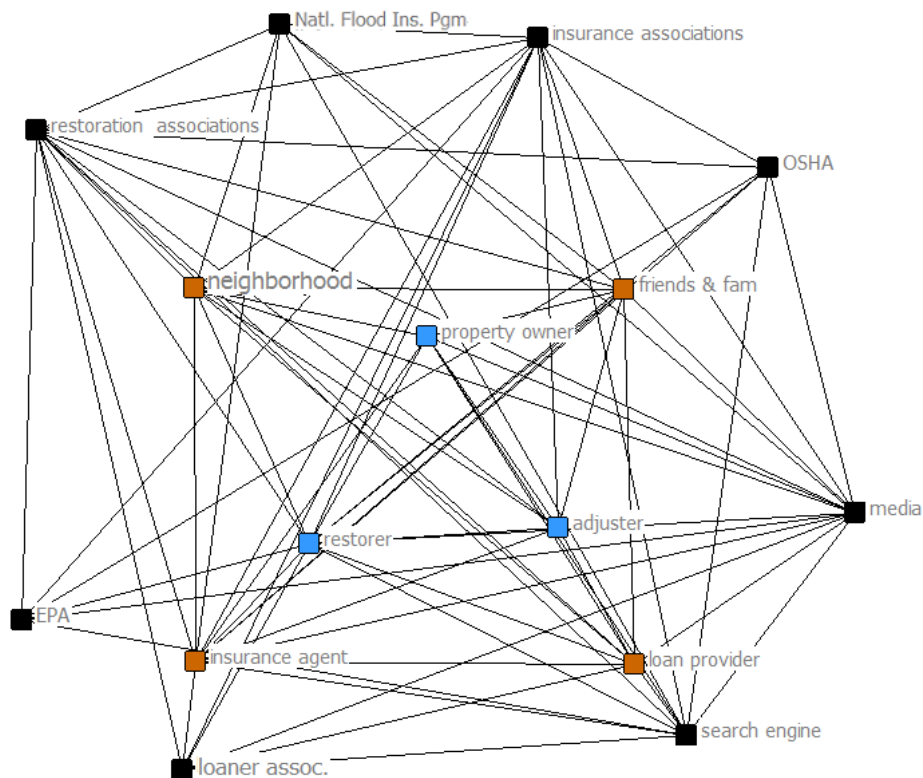
Figure 6.1 Trust Network in Disaster Recovery Projects

The three color-coded layers of circles were recognized by centrality analysis. The inner clique is equivalent to the Restoration Triangle; they are the core agents in a disaster recovery project. The next level of network is the community level of the trust network in a disaster recovery project. It consists of the local neighborhood, friends and family of the property owner, the local insurance agent who provide insurance policy to the property owner and has formal or informal alliance with local restorers. The insurance adjuster also works with him for the

same insurance provider. He is therefore of the highest centrality value as that of the restorer and media. The node "media" include traditional and new media where property owners and restorers communicate one-way or two-way, together with industrial associations and government agencies relevant to disaster recovery projects and directly connected to one or several agents in the Restoration Triangle shape the outer level of the trust network in disaster recovery projects. Centrality describes the closeness of one agent to the rest of agents in the network. The agent with the shortest distance to all other agents has the highest centrality, and is referred to as globally central agent. Table 6.1 below shows the centrality scores of each agent in the trust network of disaster recovery projects.

Table 6.1 *Centrality of Agents in the Trust Network of Disaster Recovery Projects*

Position	Name of Agent	Closeness Centrality
center	Restorer	93.33
	Insurance Agent	93.33
	Media	93.33
	Restoration Associations	87.50
	Insurance Associations	87.50
	Search Engine	82.35
	Loan Providers	77.78
	Neighborhood	77.78
	Friend and Family	77.78
	Adjuster	70.00
	Property Owner	70.00
	NFIP	66.67

Loaner Assocations	66.67
OSHA	66.67
EPA	63.64

Centrality shows the closeness of each agent to others in the same network. Based on the results as shown in Table 6.1, three agents have closeness centrality scores above 90. They are the restorer, the insurance agent, and the media.

Three agents have closeness centrality scores above 80 but below 90. They are restoration associations, insurance associations, and search engines.

The insurance adjuster and the property owner are on the same level in terms of their closeness to other agents in the network.

The institutions associated with disaster recovery and loaner associations are of the lowest closeness to other agents in the network. They locate in the outer layer of the disaster recovery network, and this closeness centrality result is consistent with their location identified from survey and interview data.

This sociogram illustrates the interrelationship of temporal dimension and spatial dimension of the trust dynamics in disaster recovery projects – as long-term trust is able to be built among agents, the network becomes increasingly stable as this long-term trust encourages more endogenous interactions which in turn promote trust building.

6.1.3.3 Conclusions of the SNA

For this research, SNA were conducted to generate centrality, density, and cluster analysis. Centrality analysis has been presented in the previous section; the density and cluster analysis results are to follow.

Density measures the general level of linkage among agents in the network (Scott, 2002). A higher number of agents being connected, means a higher density of the network. In this research, density was calculated from the adjacency matrix showing the direct connections between agents. 13 agents were identified in this network. The adjacency matrix uses "1" for existing direct connections and "0" for pairs of agents without direct connections.

The purpose of density analysis here in this research is to show the community structure in the disaster recovery projects. It shows how agents in the network clustered. A network becomes more stable as the density between agents of the network increases. Increased density shows that the inter-agent connections are becoming more stable and therefore provide more stability for the whole network. For insurance adjusters and many other third parties involved in the network trust is embedded in the individual network that is formed around him or her. Property owners learn about the previous trustworthiness from their network of relationships including the insurance adjuster in the inner clique, the community within their network in the second-level clique, and the independent review agencies on the outer layer. Additionally, such a network serves as the control mechanism for the trust dynamics between the property owner and the restorer.

This is because news of any the not-trustworthy actions will spread throughout the network through direct and indirect ties between participants, and the damage to both agents can be detrimental.

This research identified the three-level hierarchy trust network of disaster recovery projects. Based on the closeness of agents, the three layers are: inner clique of the Restoration Triangle; the second-level clique of the regional community network; and the third-level clique of the structural network.

The trust network presents the boundaries formed by the set of nodes and the relationships among them. The nodes and lines present the virtual spatial dimension of the trust dynamics graphically.

Also the network is a social system that the participants in it together generate social outcomes (Huang, 2009). For the network as shown in Figure, participations of stakeholders are voluntary. From this point, trust is the social capital and is able to infuse among the network. On the other side, trust as the tie explains the restorer selection – why is the specific restorer hired for the recovery projects among many others.

6.2 Contributions

Disaster recovery projects are characterized by greater exposure of both the property owner and the restorer to uncertainty and vulnerability. Such uncertainty and vulnerability have four main sources. First it has to do with unfamiliarity. Not always does a property owner suffer from repetitive disasters; therefore, it is less likely that he or she is familiar with a restorer. Not to say in catastrophic disasters,

nationwide restorers are mobilized to the affected area for restoration, they are way out of the networks of the property owners. Homeowners are uncertain about the restorers' intentions and competence in such cases (Messick & Kramer, 2001).

Second is the unbalanced power between property owners and restorers. In disaster recovery projects for home owners, it is typically an individual property owner working with a large restoration company or companies. Based on the power mechanism, the restorer in such cases is more powerful than the property owner, so great inequality exists (Heimer, 2001). Trust develops easier in reciprocal relations than in unequal, non-reciprocal cases (Hardin, 2004).

Third is the vulnerability of the property owners to restorers. Homeowners survive after disasters of different scales. Such scale can be measured by the destruction of the property owner's kin and friend networks and by the extent of property damage (Perry & Lindell, 1978). Kates and Pijawka (1977) observed that the reconstruction, in general, is space extensive and irrespective of the magnitude of losses. It is, however, closely correlated with the financial status of individuals and organizations before the disaster. In other words, the richer a family is, the faster will it recover from a disaster.

The psychological reactions of a property owner and other possible residents on site are significantly correlated to these factors. Norris et al. (2002) reported that 121 of the 160 samples studied, equivalent to 77%, show varied levels of disaster syndrome. Several researchers agree on the symptoms of disaster syndrome, including three stages of initial shock, a later stage of a generalized

anxiety state characterized by docility and obedience, and the final state of mild euphoria or depression (Drayer, 1957; Wallace, 1957; Norris et al., 2002). Special cares and courtesies are needed when interacting with customers that display symptoms of disaster syndrome.

Last but not least is the substance of the trust relationship itself. In the aftermath of a major flood, frequently the survivors and restorers suffer from utility and goods shortage, lack of resources widely exists, and the lack of network support adds to the severity of the vulnerability of a property owner. According to the same research conducted by Norris et al. (2002), 9% of the sample show long-term or chronic disaster syndrome. In disaster recovery projects, it is important to take into consideration the physical, emotional, and economic situation of each client before planning a disaster recovery project (Alexander, 2002). During the recovery phase, the property owners need to deal with multiple parties. Such situations exhaust the property owners, impacting their expectation of others (Nooteboom, 1996), especially the "outsiders" (Sattler et al., 1995) that enter a house or a community to help recovery. Also, there are common needs for security among disaster survivors (Rubin, 2009). The suffering of economic and emotional losses leads to greater tendency of the property owners to distrust others.

6.2.1   Theoretical Contributions

Trust is of more importance in disaster recovery projects than in conventional projects. This is because of the greater risks and uncertainties that the property

owner and the restorer involved in a disaster recovery project are exposed to. Such high levels of uncertainty and vulnerability of stakeholders provide the opportunity for both agents to demonstrate their trustworthiness (Bravo et al., 2012). These research results confirm such understanding of trust in economic transactions.

Furthermore, the SNA results validate the previous results about network effects on trust building, also known as the structural embeddedness of the trust traits in forming business alliances.

The research not only considers the network effect in terms of trust on contractor selection, but it also looks at such a dynamic as a sequence of time. The temporal dimension of the trust dynamics captures the project-based trust development, and more importantly, it fills the gap of the "shadow of the future" aspect of long-term trust, which has its root in project-based short-term trust. The sociogram constructed based on the relational data from this research confirmed the link reciprocity theory which explains fairness and efficiency in an economic system.

6.2.2 Applications of the Research Findings

The disaster restoration industry can benefit from these research results in two different ways. Firstly, the trust measurement model demonstrates the most efficient way of trust building. This research proposes a linear relationship of trust building actions that restorers can adjust their business integrity to. The negative constant terms in both models indicates the expected difficulties of working on the disaster recovery projects from the perspective of property owners. The

model also validates the significance of technical expertise especially on how restorers present their expertise – based on the survey results, work to meet standards, high-quality work, and simply being on time are integral to developing a trust relationship with property owners. These all fall into the trust definition about restorers meeting the expectations that property owners set for them to restore the properties professionally.

Secondly, the network model indicates the importance of the structural embeddedness in building trust and contractor selection. The constructed trust-based network shows the multi-layered virtual space of a disaster recovery project. Trust is able to infuse among the participants of the network, and impact the contractor selection of the property owner in the inner clique. A restorer needs to capture the characteristics of the infusion effects within the network and develop business strategies that could maximize such effects. The goal is to convince the property owner, or A in the trust dynamics, that B has no incentive to cheat. Once A is convinced, he or she enters the recovery project with B. If the project gets completed with A's expectation about B's performance, trust built between A and B will infuse through ties of A into other agents in the network. The network will potentially grow in that way.

6.3 Suggestions for Future Research

Few dispositional trust measures have been tested to be statistically significant. The small number of significant measures of institutional trust and dispositional trust is likely to be caused by the dominating influence of cognitive trust after the initiation stage of the trust dynamics. This result also shows the limitation of the

research design, as the results indicate the design performed better at identifying explicit measures of trust compared to implicit measures such as affections, psychological states, feelings, relationships, etc.

The revised survey questionnaires for property owners and restorers might be helpful for future research in disaster recovery regarding trust measurement or other similar social capital indicators. The new survey questionnaires are more focused on significant indicators already identified by data in this research. Future research can be done to validate such research conclusions with similar settings.

The sociogram visualizes the transitivity of trust in the network. However, further research is needed to identify the degree of transitivity as a factor of cognitive and dispositional reasoning.

Finally, the social network analysis of trust as a social capital among disaster recovery networks suggests a new scheme of studying community resilience. The network is the structure embedding many social capitals. With the identified key capitals and gatekeepers, central cliques, studies can be conducted to propose community-level resource allocation network.

6.4 Summary

This chapter here summarized the dissertation research and results. It presented the social network analysis enabled by processing relational data collected from the research. The sociogram visualizes the disaster recovery network as the structure where the trust is embedded. The sociogram together with the time-

space trust dynamics contribute to both theoretical studies of trust and practice. This chapter of the discussion showed that the research met the goal as stated in Chapter 1. It also pointed out how this dissertation would contribute to the disaster recovery practitioners by allowing them to better understand their customers and present themselves professionally. Following this, the chapter concluded this dissertation by outlining possible directions for future research and thus demonstrating the research framework's heuristic potential.

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APPENDICES

Appendix A   A Survey for Property Owners to Study Trust in Flood Restoration and Reconstruction Projects

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Objective

Flood damage is one of the most frequent events that cost losses to one's property. The research aims to understand the trust mechanism in disaster restoration and reconstruction projects that involve property owners, insurance agents, and restoration contractors. This survey is designed therefore to document the perspectives of property owners countrywide as they deal with the loss and the recovery work together with other stakeholders like restoration contractors and National Flood Insurance Program (NFIP) agents.

Duration

The survey contains 40 multiple-choice questions. It may take around 15 minutes to complete.   For each question, please select the response that best describes your situation. Where ever possible, please answer on the basis of your most recent flood loss experience.

Thank you for participating in the survey. The investigators of the research will not disclose your responses to any third parties.

 Please click the button below (right corner) as you finish reading the instructions and agree to participate in the survey voluntarily.

The survey contains 3 sections and 40 multiple-choice questions in total. It may take around 20 minutes to complete. For each question, please select the response that best describes your situation. Where ever possible, please answer on the basis of your most recent flood loss experience. Thank you again for your participation.

I. About the Respondent

1. What is the ownership of the flood-damaged property?

- ❍ Private home.
- ❍ Apartment owner.
- ❍ Small or Midsized Business (A business with 200 or fewer employees is generally considered SMB).
- ❍ Large business (with more than 200 employees).
- ❍ Other, please specify: _____

2. How long have you owned/lived in this location?

_____ Please specify the number of years by moving the slide bar until the right

number shows.

3. What is your highest education level?

○ no High School/GED.
○ High School/GED.
○ Associate's Degree.
○ Bachelor's Degree.
○ Graduate/Advanced Degree.

4. What is your gender?

○ Female.
○ Male.

5. What was your marital status at the time of the property damages/losses?

○ Single.
○ Married.
○ Divorced.
○ Widowed.

II. Exposure to Disasters For each question, please select the response that best

describes your situation. Where ever possible, please answer on the basis of

your most recent flood loss experience.

6. Does your most recently damaged property have flood insurance coverage? If

your answer is YES, please select the description of coverage that fits.

○ Yes, my policy covers flood damage to building/house and its contents.
○ Yes, my policy covers flood damage to building/house only.
○ Yes, my policy covers flood damage to the contents only.
○ No

7. If you answered YES to #6, was the coverage sufficient to pay for all of the

contractor's work (besides the deductible amount)?

❍ Yes.

❍ No, but I received financial aid from FEMA, which covered the rest.

❍ No, although I receive dfinancial aid from FEMA, it was not sufficient for the rest.

❍ No, and I received no governmental financial aids.

8. If you answered YES to #6, how long have you been insured to the same

(latest) company?

_____ Please specify the number of years by moving the slide bar until the right

number shows.

9. How many flood damages/losses have you ever experienced?

_____ Please specify the number of cases by moving the slide bar until the right

number shows(AT THE CURRENT ADDRESS)

_____ Please specify the number of cases by moving the slide bar until the right

number shows(YEARS of LIFETIME TOTAL)

10. Did you do any of the work yourself in restoring your property after the

flood?Please select all that applied to your most current experience.

❑ Yes, I enjoy self-performing work on my property, no matter other reasons such as time, cost , or quality.
❑ Yes, time was critical to mitigate damages.
❑ Yes, time was critical to get the property back into use (so my life/business can be restored soon).
❑ Yes, budget provided by insurance was insufficient to fully restore the property to original condition.
❑ Yes, budget provided by insurance was insufficient to restore the property to the better-than-original condition.
❑ Yes, quality of labor or materials would have been unacceptable, if I had not self-performed some or all of the work.
❑ No.

11. If you answered yes to #10, please select the percentage of the restoration

work that you performed yourself in your most recent flood damage recovery

experience.

_____ Please specify the percentage by moving the slide bar until the right

number shows

12. Was the most recently flood damaged property your primary residence

property? If not, please select the most applicable answer or specify.

❍ Yes.
❍ No, it is a vacation/seasonal house.
❍ No, it is a rental property.
❍ No, others, please specify: _____

13. Was the most recently flood damaged property your primary business

property?

❍ Yes.
❍ No.

14. How many residents or employees were affected by the most recent flood

damage?

_____ Please specify the number by moving the slide bar until the right number

shows

15. What is the approximate dollar value of your most recent flood damage?

Please write in the number:

16. Did you recall suffering from unusual levels of stress as a result of the flood

loss before the restoration contractor arrived?

○ Yes
○ No
○ I cannot recall.

17. What about your levels of stress during and after the restoration contractor

arrived and proceeded?

○ My stress level became higher as the restoration work took place.
○ My stress level stayed the same before and after the restoration work took
   place.
○ My stress level returned to normal after the restoration work took place.
○ I cannot recall.

18. Have you experienced any utility and goods shortages (electricity, water, gas,

food, etc.) after the flood took place?

○ Yes
○ No

FOR THE FOLLOWING STATEMENTS, PLEASE SELECT ONLY ONE

ANSWER FROM THE LIKERT 5-POINT SCALE THAT BEST DESCRIBED

YOUR SITUATION. IF POSSIBLE, PLEASE ANSWER ON THE BASIS OF

YOUR MOST RECENT FLOOD LOSS EXPERIENCE.

19. I was clear about the amount and type of damage of my property before the

restoration contractor or the adjuster arrived.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

20. I had an effective plan of recovery for my flood loss before the restoration

contractor arrived.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

III. Restoration and Reconstruction Service Evaluation For each question, please

select the response that best describes your situation. Where ever possible,

please answer on the basis of your most recent flood loss experience.

21. Did you notice any professional industry certifications that your restoration

contractor holds? Choose all that applied.

○ None.
○ Structural Drying Remediator by American Council for Accredited Certification (ACAC)
○ Institute of Inspection, Cleaning and Restoration Certification (IICRC)
○ Indoor Air Quality Association (IAQA)
○ Restoration Industry Association (RIA)
○ Others, please specify: _____

22. By which means did you find the restoration contractor to work on your most

recent flood damage?

❍ Insurance company recommended.
❍ Friends and family recommended.
❍ From commercials or published advertisements.
❍ Others, please specify: _____

23. What was the main means of communication with your restoration contractor?

❍ Face to face.
❍ Telephone or voice mail.
❍ Text or email.
❍ Corresponding (traditional, written).
❍ Others, please specify: _____

FOR THE FOLLOWING STATEMENTS, PLEASE SELECT ONLY ONE

ANSWER FROM THE LIKERT 5-POINT SCALE THAT BEST DESCRIBED

YOUR SITUATION. IF POSSIBLE, PLEASE ANSWER ON THE BASIS OF

YOUR MOST RECENT FLOOD LOSS EXPERIENCE.

24. The restoration contractor's actions agreed with my expectations of

appropriate restoration.

❍ Strongly Disagree
❍ Disagree
❍ Neither Agree nor Disagree
❍ Agree
❍ Strongly Agree

25. The work authorization document or contract that the restoration contractor

offered was clear to understand and complete.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

26. The restoration contractor met with me face to face before starting work, to

explain details of what would be done, work schedule, etc.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

27. The restoration contractor communicated promptly and honestly with me

throughout the restoration process.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

28. I found the restoration contractor's decisions regarding repair, restoration,

and reconstruction objective and fair.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

29. The restoration contractor staff worked as a team to reduce conflicts,

misunderstanding, delays, and work shifting.

- ○ Strongly Disagree
- ○ Disagree
- ○ Neither Agree nor Disagree
- ○ Agree
- ○ Strongly Agree

30. The restoration work to my property was completed within budget.

- ○ Strongly Disagree
- ○ Disagree
- ○ Neither Agree nor Disagree
- ○ Agree
- ○ Strongly Agree

31. The restoration work to my property was completed on schedule.

- ○ Strongly Disagree
- ○ Disagree
- ○ Neither Agree nor Disagree
- ○ Agree
- ○ Strongly Agree

32. The restoration contractor took adequate precautions to prevent further

damages.

- ○ Strongly Disagree
- ○ Disagree
- ○ Neither Agree nor Disagree
- ○ Agree
- ○ Strongly Agree

33. The restoration work to my property was completed to specified standards of

material and workmanship.

- ○ Strongly Disagree
- ○ Disagree
- ○ Neither Agree nor Disagree
- ○ Agree
- ○ Strongly Agree

34. The restoration work to my property was completed in a safe manner.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

35. The restoration contractor and staff respected any cultural or religious

requirements of me and other victims at my property.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

36. The restoration contractor was professionally courteous to me and other

victims at my property.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

37. The restoration contractor helped me apply for financial aid to cover part or

all of the uninsured loss.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

38. My relationship with the restoration contractor improved throughout the

restoration process.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

39. I would be pleased to hire the same restoration contractor again, if needed.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

40. The restoration contractor seemed to have worked with the adjuster or

the insurance company on previous disaster restoration projects.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

IV. Please write in this section any special conditions or events that influenced

your answer to the previous questions, or your additional comments regarding

the restoration contractor that you have recently hired.

Appendix B   <u>A Survey for Restoration Contractors to Study Trust in Flood</u>

<u>Restoration and Reconstruction Projects</u>

Investigators

Randy R. Rapp, Ph.D., Associate Professor, Building Construction Management,

Purdue University

Robert F. Cox, Ph.D., Professor & Department Head, Building Construction

Management, Purdue University

J. Eric Dietz, Ph.D., Associate Professor, Computer & Information Technology,

Purdue University

Bryan J. Hubbard, Ph.D., Assistant Professor, Building Construction

Management, Purdue University

Jing Pan, Ph.D. Candidate, Building Construction Management, Purdue

University

Objective

Flood damage is one of the most frequent events that cost losses to one's

property. The research aims to understand the trust mechanism in disaster

restoration and reconstruction projects that involves property owners, insurance

agents, and restoration contractors. This survey is designed therefore to

document the perspectives of property owners countrywide as they deal with the

loss and the recovery work together with other stakeholders like restoration

contractors and National Flood Insurance Program (NFIP) agents.

Tasks

You will be asked to complete a confidential survey developed by Purdue University about your professional experiences in disaster restoration and reconstruction. Some general questions about your backgrounds (education level, employer info, position, etc.) will be asked, and you will also get the opportunity to write in your opinions and suggestions regarding restoration services. The survey will be conducted anonymously with no individually identifiable information collected. However, you will have the option of sharing personal contact information with the investigators at Purdue University to participate in researches investigating disaster recovery in the future. Duration The survey contains 35 multiple-choice questions. It may take around 15 minutes to complete. For each question, please select the response that best describes your most typical experience in restoring water damage from flooding. Thank you for participating in the survey. The investigators of the research will not disclose your responses to any third parties. Please click the button in the right corner below as you finish reading the instructions and agree to participate in the survey voluntarily.

Instruction:

The survey contains 3 sections and 35 multiple-choice questions. It may take around 15 minutes to complete. For each question, please select the response that best describes your most typical experience in restoring water damage from flooding. Thank you again for your participation.

I. About the respondents

1. How long have you been working in restoration industry?

_____ Please specify the number of years by moving the bar until the right

number shows.

2. What is your position in the company that you currently work for?

○ Manager or other administrative positions.
○ Office coordinator.
○ Project planner.
○ Field engineer.
○ Field worker.
○ Other, please specify: _____

3. How long have you worked for the same company?

_____ Please specify the number of years by moving the slide bar until the right

number shows.

4. How many people are there in the company that you currently work for?

○ 1-15.
○ 16-30.
○ 31-100.
○ 101-250.
○ 251-1000.
○ Over 1000.

5. Which one of the following best describes your company?

○ My company serves mainly residential properties.
○ My company serves mainly commercial properties.
○ My company serves residential and commercial properties equally.
○ None of the above applies.

6. What is your education level?

○ No high school/GED.
○ High school/GED.
○ Associate's degree.
○ Bachelor's degree.
○ Graduate/advanced degree.

7. What is your gender?

○ Female
○ Male

II. Experience with Customers/Property Owners   Please select the response that

best describes your most typical experience in restoring water damage from

flooding.

8. Which of the following situations regarding flood insurance (NFIP) have you

ever experienced?

○ The damaged property is covered by NFIP, and the coverage is enough to
  pay the restoration work.
○ The damaged property is covered by NFIP, the coverage is insufficient to pay
  for all the restoration work, but the client received financial aid from FEMA,
  which covered the rest.
○ The damaged property is covered by NFIP, the coverage is insufficient to pay
  for all the restoration work, but the client received financial aid from FEMA, it
  was still not sufficient for the rest.
○ The damaged property is not covered by NFIP, and no governmental financial
  aids are received to cover the restoration costs.
○ Other, please specify: _____

9. How many flood damages/losses recovery projects have you ever worked on

as a contractor or subcontractor before?

_____ Please specify the number of cases by moving the slide bar until the right number shows.

10. Have you experienced any utility and goods shortages (electricity, water, gas, food, etc.) during the recovery process?

❍ Yes
❍ No

FOR THE FOLLOWING STATEMENTS, PLEASE SELECT ONLY ONE ANSWER FROM THE LIKERT 5-POINT SCALE THAT BEST DESCRIBE YOUR MOST TYPICAL EXPERIENCE IN RESTORING WATER DAMAGE FROM FLOODING.

11. Customers claimed that they were not aware of the NFIP as a separate insurance coverage until their insurance agents told them so after the floods.

❍ Strongly Disagree
❍ Disagree
❍ Neither Agree nor Disagree
❍ Agree
❍ Strongly Agree

12. With the above situation, my customer has asked me or my company to help him or her negotiate with the insurance adjuster.

❍ Strongly Disagree
❍ Disagree
❍ Neither Agree nor Disagree
❍ Agree
❍ Strongly Agree

13. Customers that had flood insurance coverage tend to be more cooperative overall.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

14. Customers with different levels of psychological stress act differently during

the work.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

15. Customers with different experience to disasters act differently during the

work.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

16. Customers with different levels of knowledge in building science act

differently during the work.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

III. About the company Please select the response that best describes your most

typical experience in restoring water damage from flooding.

17. My company has clear goals and objectives that I am familiar with and am

working towards.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

18. What professional industry certifications does your company hold? Choose

all that applied.

❑ None.
❑ Structural Drying Remediation by American Council for Accredited
   Certification (ACAC)
❑ Institute of Inspection, Cleaning and Restoration Certification (IICRC)
❑ Indoor Air Quality Association (IAQA)
❑ Restoration Industry Association (RIA)
❑ Others, please specify: _____

19. Rank the frequency (from 1 to 6, with 1 the most frequent and 6 the least

frequent) of how the customers get in contracts with your company basing on

your knowledge:

_____ Recommended by insurance agents.

_____ Recommended by public adjusters.

_____ Recommended by friends and family.

_____ Found on yellow book.

_____ Found through online or TV/radio advertisements.

_____ Found online through searching engines.

20. Is your company a preferred vendor for any insurance company? If your

answer is yes, please specify the insurance company.

○ Yes, _____
○ No

21. What are the main means of communication with customers?

❑ Face to face.
❑ Telephone or voice mail.
❑ Text or email.
❑ Corresponding (traditional, written)
❑ Others, please specify: _____

FOR THE FOLLOWING STATEMENTS, PLEASE SELECT ONLY ONE

ANSWER FROM THE LIKERT 5-POINT SCALE THAT BEST DESCRIBE YOUR

MOST TYPICAL EXPERIENCE IN RESTORING WATER DAMAGE FROM

FLOODING.

22. I find the above means of communication selected (in #21) to be effective

during the recovery process.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

23. There were no conflicts or disputes that arose from unclear or incomplete

work authorization documents or contracts.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

24. My company met with customers face to face before starting work, to explain

details of what would be done, work schedule, etc.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

25. My company kept on communicating promptly and honestly with customers

throughout the restoration process.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

26. My company provided objective and fair decisions regarding repair,

restoration, and reconstruction.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

27. The customers worked with my company as a team to reduce conflicts,

misunderstanding, delays, and work shifting.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

28. My company uses a very thorough project control system to keep the work

within budget.

❍ Strongly Disagree
❍ Disagree
❍ Neither Agree nor Disagree
❍ Agree
❍ Strongly Agree

29. My company uses a very thorough project control system to keep the work

within budget.

❍ Strongly Disagree
❍ Disagree
❍ Neither Agree nor Disagree
❍ Agree
❍ Strongly Agree

30. My company uses quality control procedures that prevent further damages at

the properties under work.

❍ Strongly Disagree
❍ Disagree
❍ Neither Agree nor Disagree
❍ Agree
❍ Strongly Agree

31. My company uses a very thorough project control system to keep the work to

specified standards of material and workmanship.

❍ Strongly Disagree
❍ Disagree
❍ Neither Agree nor Disagree
❍ Agree
❍ Strongly Agree

32. My company uses a very thorough project control system to keep the work be

completed in a safely manner.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

33. My company remains professionally courteous to the victims at the property

during recovery.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

34. My company were always asked by customers to assist in applying for

financial aids to cover part or all of the uninsured losses.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

35. The relationship of my company with the customers continues improving

throughout the restoration process.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

IV. Please write in this section any special conditions or events that influenced

your answer to the previous questions, or your additional comments regarding

your experience in flood damage restoration works. Use reverse side if

necessary.

Appendix C   <u>Invitation to Interview</u>

Dear Sir/Madam,

My name is Jing Pan. I am currently a Ph.D. candidate in Department of Building Construction Management at Purdue University. I am doing a research project to investigate how and why trust is important in restoration projects. My faculty advisor for this research is Dr. Randy Rapp, an associate professor in Building Construction Management at Purdue University. The aim of our research is to identify scientifically the trust mechanism and a list of strategies for restoration companies in building up trust and sustain it at an optimal level.

As a part of our research, we plan to interview industrial practitioners. We hereby kindly invite you to participate in the research. The interview will be a 30-minute one-on-one telephone interview, and I will ensure that your information and answers to the interview questions remain confidential.

Please let us know if you are willing to participate and what is the best way to schedule a convenient time for the interview. Also, feel free to forward this message to people who may be interested in participating in this research project.

We hope to get a positive response from you. We shall be glad to mention you and your company's participation and assistance in any publications that will result from this research, if you so choose. But if you prefer, your participation can remain confidential and is, of course, entirely voluntary.

Thank you,

Dr. Randy R. Rapp,   Jing Pan

Associate Professor,   Ph.D. Candidate,

College of Technology,   College of Technology,

Purdue University, West Lafayette, IN.   Purdue University, West Lafayette, IN.

Email: rrapp@purdue.edu,   Email: jingpan@purdue.edu,

Phone: 765-494-8420   Phone: 765-418-4211

Appendix D   <u>Interview Questionnaire</u>

[Demographic]

1. Please describe your current position in the organization that you are working for.
2. Is your company specialized in residential restoration, commercial restoration, or both?
3. Please describe the number of experience you have with dealing with flood insurance.

 [Defining trust]

4. Please describe the typical home owner that you have worked with.
5. Please describe the typical commercial property owner that you have worked with.
6. How does the scale of damage influence your work relationship?
7. How does the social status of property owners influence your work relationship?
8. How do the National Flood Insurance Program and other FEMA initiatives influence your work relationship?
9. What are some other factors that influence your work relationship?
10. Based on your above experience, how you evaluate the overall customer satisfaction?
11. Please assess your trustworthiness and specify reasons of such assessment.
12. Please rank order the importance of these aspects in building trusting customer relationships:
    state the goal early to the customer, open and effective communication, make

    clear contracts, be honest, make fair decisions, initial interaction, professional

    project control, courtesy towards customers.

[Trust as a dynamic process]

13. How important is the initial level of trust in your experience?
14. What are some experiences you have that detriment the trust relationship?
15. Is it as easy to damage trust as to rebuild trust?
Did you experience well-established trust that sustained beyond a restoration

project? Is it true that it either turns into interpersonal trust or turns into strategic

alliance?

Appendix E   <u>A Survey for Property Owners in Disaster Recovery Projects</u>

<u>(Revised)</u>

The survey contains 20 multiple-choice questions. It may take around 10 minutes
to complete. For each question, please select the response that best describes
your situation. Where ever possible, please answer on the basis of your most
recent flood loss experience.

I. About the Respondent

1. What is the ownership of the flood-damaged property?

❍ Private home.
❍ Apartment owner.
❍ Small or Midsized Business (A business with 200 or fewer employees is
     generally considered SMB).
❍ Large business (with more than 200 employees).
❍ Other, please specify: _____

3. What is your highest education level?

❍ no High School/GED.
❍ High School/GED.
❍ Associate's Degree.
❍ Bachelor's Degree.
❍ Graduate/Advanced Degree.

4. What was your marital status at the time of the property damages/losses?

❍ Single.
❍ Married.
❍ Divorced.
❍ Widowed.

II. Exposure to Disasters For each question, please select the response that best

describes your situation. Where ever possible, please answer on the basis of

your most recent flood loss experience.

5. Does your most recently damaged property has flood insurance coverage? If

your answer is YES, please select the description of coverage that fits.

❍ Yes, my policy covers flood damage to building/house and its contents.
❍ Yes, my policy covers flood damage to building/house only.
❍ Yes, my policy covers flood damage to the contents only.
❍ No

6. How many flood damages/losses have you ever experienced?

_____ Please specify the number of cases by moving the slide bar until the right

number shows(AT THE CURRENT ADDRESS)

7. What is the approximate dollar value of your most recent flood damage?

Please write in the number:

8. Did you recall suffering from unusual levels of stress as a result of the flood

loss before the restoration contractor arrived?

❍ Yes
❍ No
❍ I cannot recall.

9. What about your levels of stress during and after the restoration contractor

arrived and proceeded?

❍ My stress level became higher as the restoration work took place.
❍ My stress level stayed the same before and after the restoration work took place.
❍ My stress level returned to normal after the restoration work took place.
❍ I cannot recall.

III. Restoration and Reconstruction Service Evaluation For each question, please select the response that best describes your situation. Where ever possible, please answer on the basis of your most recent flood loss experience.

10. By which means did you find the restoration contractor to work on your most recent flood damage?

❍ Insurance company recommended.
❍ Friends and family recommended.
❍ From commercials or published advertisements.
❍ Others, please specify: _____

FOR THE FOLLOWING STATEMENTS, PLEASE SELECT ONLY ONE ANSWER FROM THE LIKERT 5-POINT SCALE THAT BEST DESCRIBED YOUR SITUATION. IF POSSIBLE, PLEASE ANSWER ON THE BASIS OF YOUR MOST RECENT FLOOD LOSS EXPERIENCE.

11. The restoration contractor's trustworthy for restoring my property.

❍ Strongly Disagree
❍ Disagree
❍ Neither Agree nor Disagree
❍ Agree
❍ Strongly Agree

12. The work authorization document or contract that the restoration contractor offered was clear to understand and complete.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

13. The restoration contractor met with me face to face before starting work, to

explain details of what would be done, work schedule, etc.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

14. The restoration contractor communicated promptly and honestly with me

throughout the restoration process.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

15. I found the restoration contractor's decisions regarding repair, restoration,

and reconstruction objective and fair.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

16. The restoration work to my property was completed to specified standards of

material and workmanship.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

17. I will seek a restorer who offers a warranty of at least a few years on the work

performed on my property.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

18. The restoration contractor was professionally courteous to me and other

victims at my property.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

19. My relationship with the restoration contractor improved throughout the

restoration process.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

20. I would be pleased to hire the same restoration contractor again, if needed.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

IV. Please write in this section any special conditions or events that influenced

your answer to the previous questions, or your additional comments regarding

the restoration contractor that you have recently hired.

Appendix F   <u>A Survey for Restorers in Disaster Recovery Projects (Revised)</u>

The survey contains 3 sections and 17 multiple-choice questions. It may take around 10 minutes to complete. For each question, please select the response that best describes your most typical experience in restoring water damage from flooding. Thank you again for your participation.

I. About the respondents

1. How long have you been working in restoration industry?

_____ Please specify the number of years by moving the bar until the right number shows.

2. What is your position in the company that you currently work for?

❍ Manager or other administrative positions.
❍ Office coordinator.
❍ Project planner.
❍ Field engineer.
❍ Field worker.
❍ Other, please specify: _____

3. How long have you worked for the same company?

_____ Please specify the number of years by moving the slide bar until the right number shows.

4. How many people are there in the company that you currently work for?

❍ 1-15.
❍ 16-30.
❍ 31-100.
❍ 101-250.
❍ 251-1000.
❍ Over 1000.

5. Which one of the following best describes your company?

❍ My company serves mainly residential properties.
❍ My company serves mainly commercial properties.
❍ My company serves residential and commercial properties equally.
❍ None of the above applies.

6. What is your education level?

❍ No high school/GED.
❍ High school/GED.
❍ Associate's degree.
❍ Bachelor's degree.
❍ Graduate/advanced degree.

II. Experience with Customers/Property Owners   Please select the response that

best describes your most typical experience in restoring water damage from

flooding.

FOR THE FOLLOWING STATEMENTS, PLEASE SELECT ONLY ONE

ANSWER FROM THE LIKERT 5-POINT SCALE THAT BEST DESCRIBE YOUR

MOST TYPICAL EXPERIENCE IN RESTORING WATER DAMAGE FROM

FLOODING.

7. Customers that had flood insurance coverage tend to be more cooperative

overall.

❍ Strongly Disagree
❍ Disagree
❍ Neither Agree nor Disagree
❍ Agree
❍ Strongly Agree

8. Customers with different levels of psychological stress act differently during

the work.

❍ Strongly Disagree
❍ Disagree
❍ Neither Agree nor Disagree
❍ Agree
❍ Strongly Agree

III. About the company Please select the response that best describes your most

typical experience in restoring water damage from flooding.

9. Rank the frequency (from 1 to 6, with 1 the most frequent and 6 the least

frequent) of how the customers get in contracts with your company basing on

your knowledge:

_____ Recommended by insurance agents.

_____ Recommended by public adjusters.

_____ Recommended by friends and family.

_____ Found on yellow book.

_____ Found through online or TV/radio advertisements.

_____ Found online through searching engines.

FOR THE FOLLOWING STATEMENTS, PLEASE SELECT ONLY ONE

ANSWER FROM THE LIKERT 5-POINT SCALE THAT BEST DESCRIBE YOUR

MOST TYPICAL EXPERIENCE IN RESTORING WATER DAMAGE FROM

FLOODING.

10. There were no conflicts or disputes that arose from unclear or incomplete

work authorization documents or contracts.

- ○ Strongly Disagree
- ○ Disagree
- ○ Neither Agree nor Disagree
- ○ Agree
- ○ Strongly Agree

11. My company met with customers face to face before starting work, to explain

details of what would be done, work schedule, etc.

- ○ Strongly Disagree
- ○ Disagree
- ○ Neither Agree nor Disagree
- ○ Agree
- ○ Strongly Agree

12. My company kept on communicating promptly and honestly with customers

throughout the restoration process.

- ○ Strongly Disagree
- ○ Disagree
- ○ Neither Agree nor Disagree
- ○ Agree
- ○ Strongly Agree

13. My company provided objective and fair decisions regarding repair,

restoration, and reconstruction.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

14. My company uses a very thorough project control system to keep the work to

specified standards of material and workmanship.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

15. I will seek a restorer who offers a warranty of at least a few years on the work

performed on my property.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

16. My company remains professionally courteous to the victims at the property

during recovery.

○ Strongly Disagree
○ Disagree
○ Neither Agree nor Disagree
○ Agree
○ Strongly Agree

17. The relationship of my company with the customers continues improving

throughout the restoration process.

❍ Strongly Disagree
❍ Disagree
❍ Neither Agree nor Disagree
❍ Agree
❍ Strongly Agree

IV. Please write in this section any special conditions or events that influenced

your answer to the previous questions, or your additional comments regarding

your experience in flood damage restoration works. Use reverse side if

necessary.

VITA

VITA

Jing Pan
Graduate School, Purdue University
(Do not include your personal information: Address, Email, Phone#, etc.)

Education
B.A., Project Management, 2006, Tianjin University, Tianjin, China
M.S., Construction Management, 2008, Tianjin University, Tianjin, China
M.S., Economics, 2012, Purdue University, West Lafayette, Indiana
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Research Interests
Disaster recovery management.
Economics of disaster recovery
Social capital in disaster management