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Emergent Coordination Practice in Post-Disaster Planning of Infrastructure Systems

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EMERGENT COORDINATION PRACTICE IN POST-DISASTER PLANNING OF INFRASTRUCTURE SYSTEMS

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ABSTRACT

Post-disaster contexts present one of the most challenging functional environments for organizations. The effective allocation of resources and harmonious synchronization of reconstruction activities are considered paramount factors in effective recovery. Coordination has been examined through numerous ideological lenses from scholars, however the notion of emergent practice has underscored recent trends in disaster literature. Past findings have suggested that the dynamic and adaptive structures that result from emergent coordination are more effective in handling the demands of post-disaster complexity, however there is little evidence to show how these practices develop. We examine the case of Super Typhoon Haiyan in the Philippines to demonstrate how coordination practice emerged in the planning of infrastructure systems, applying theory from emergence to explain adoption of practice that lends insight into coordinating behavior of organizations. Findings demonstrate that geography and sectors under the humanitarian clusters were most influential in shaping coordination structures while informal relationships and institutional policies were the defining factors in the emergence of communicative processes. Characterizing these organizational behaviors as they evolve in real time has yet to be documented and serves to better inform future organizational communication strategies in humanitarian contexts and theory on social movements of organizations under time-pressured environments.

KEYWORDS: Coordination, Emergence, Disasters

INTRODUCTION

Efforts to produce more effective coordination in disaster response have intensified over the last decade in the face of limited resources and increasing impacts from hazards; yet coordination among responding organizations still remains a challenge. The transition of recovery mantras from a 'return to normalcy' to 'build back better' has solidified the need for coordinated strategy among humanitarian organizations (Rodríguez et al. 2007). Hazard-resistant designs that are economically viable and socially sustainable increase the complexity of program planning and have subsequently increased demands on coordination (Ingram et al. 2006). Coupled with challenges from urbanization (Pelling 2012), increasing population vulnerabilities (Thomalla et al. 2006) and globalization (Witteborn 2010), planning for the built environment in post-disaster contexts is an increasingly difficult task for governments and civil society organizations.

Organizations are required to quickly establish long-term recovery goals in partnership with NGOs, local governments and communities early in response efforts. These strategic targets often define later recovery processes and have potential implications for disaster resilience. Understanding the means through which these objectives are established has significant potential

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in shaping future organizational strategy and effectiveness of recovery programs. This research seeks to address the following focal question:

RQ1: What factors influence the emergence of inter-organizational structures and communicative mechanisms in post-disaster coordination practice?

This paper seeks to examine inter-organizational coordination during the planning process of reconstruction projects following disasters. We first provide a brief background on existing literature in the field of organizational coordination theory which form the basis through which empirical case study findings are later elucidated to provide evidence of emergent coordination practice. Implications of these emergent behaviors are discussed and implications are presented for long-term reconstruction strategy.

BACKGROUND

Coordination has long been deemed a necessary task among organizations who perform in complex working environments. The conceptual notion of organizational coordination has been a topic of debate among scholars with numerous points of contention arising around its lack of clarity in definition and epistemology of its nature. Initially, scholars sought to characterize coordination as an organizational state that emphasized structure (Malone 1987), modeling (Crowston 1990) and organizational design (Anderson and Warkov 1961). This view of coordination in disaster literature translated to a 'command and control' model for managing interdependencies that relied on a bureaucratic model of organizational functioning (Schneider 1992). Coordination under this theoretical stance honed on hierarchies, protocols and authoritarian roles that divide labor within and between organizations. Standardization of procedures provides predictability to organizations, easing the inherent tensions with uncertainty associated with crisis environments (Cheng 1984). The structural stance of coordination still remains a steadfast discussion, however new avenues have opened that emphasize a process oriented understanding of coordination, differentiating coordination from the act of coordinating (Feldman and Orlikowski 2011).

In a process focused understanding, the acts of coordination become the central tenant in theory. The means through which information, resources and knowledge are shared surface as the defining feature of coordinating (Chen et al. 2008). Theory on coordination is situated at a cross roads where there is gap between previous work that relies on structuralism and newer work that demonstrates the importance of processes. While scholars have hinted at the relationships between these two, empirical instances of their linkages are few and applicability to the disaster field has not yet been demonstrated. Further, studies have largely focused on the macro or micro level of coordination, such as isolating inter and intra-organizational communication (Gittell and Weiss 2004). Linking these differing levels can provide a better understanding of individual and collective rationale and decision-making of actors. To address this gap we will focus our analysis at the organization level to hone on specific decisions, while presenting macro-level, collective behaviors that emerge from inter-organizational coordination.

Organizational Environments and Emergence Theory

Arising from the field of organization theory, institutional logic and explanations of organization behavior surfaced with Meyer and Rowan's (1977) seminal piece on rationalized myths that constitute the institutional context that surround organizations. They explained the actions taken by organizations to fulfill these myths as driven by legitimacy among peer

organizations that lead to isomorphism in the institutional environment. Even from this early work, conformity to institutionalized rules is theorized as a conflict with an organization's ability to coordinate tasks, a result of decoupling formal structures from uncertainty. Institutions are formed through the diffusion of social practices (Tolbert and Zucker 1983) and, as Ansari el al. (2010) suggest, this process does not occur in a homogenous manner, rather mutations occur through the lifecycle of adoption. While we will not focus on the process of institutionalization directly in this paper, it is important to understand as these norms are critical in governing behavior of organizations. Further, the emergence of behavior and social practice among organizations may be considered a first step towards wider, cross-national adoption.

The manner in which organizational change occurs is a complex social process influenced by a multitude of actors and pressures. Theory on emergence spans multiple fields, but the construct itself has become a study by scholars interested in the evolution of ideas, structures and properties of systems (Goldstein 1999). The concept of emergence was born partly from the field of complexity science as a means to understand how complex systems develop order (Anderson 1999). A growing tenant of theory in the field of emergence is the importance of self-organization in systems, a directly applicable practice that surfaces in disaster response. Still relatively young, the field of emergence has gained traction in disaster literature because of its ability to describe order that is created from rapidly changing response efforts. A significant, unanswered question however remains describing factors that facilitate, or hinder, the emergence process.

Cluster Coordination

Disaster coordination has seen rise to evolutionary changes over the last decade. The literature to date has largely maintained a focus and definition of coordination that is limited to emergency response activities and there is lacking knowledge of what emerges from coordination in these early stages. The earliest traces of formalized, modern humanitarian coordination come from the United Nations General Assembly resolution 46/182, dating back to December of 1991. In these early efforts to coordinate, the UN, in partnership with the national government of the affected country, was designated as the central coordinating actor. A shift was signaled in 2005 with the introduction of the humanitarian reform agenda, a vivid change coming in the form of the humanitarian cluster system. Composed of eleven sectors, the clusters are formalized bodies that are led by a pre-designated agency, such as UNICEF for the water, sanitation & hygiene (WASH) cluster (UN OCHA 2014). A full list of the clusters and corresponding lead organizations can be found in Table 1. The clusters, while still highly structured, transitioned away from control towards guidance and collective action on behalf of responding organizations, paralleling the grassroots movement in development organizations (Willis 2011). Like early organizational theorists, traditional centralized structure was anticipated to lead to more effective coordination of activities, however empirical examples (Kellogg et al. 2006) provide evidence of decentralized behavior as the dominant force in organizational action. Managing authoritative roles remains a balancing act for current managers in cluster coordination. Investigation of strengths and weakness under current coordination systems is direly needed to address the increasing complexity and interdependence of programming.

Upon deployment, clusters typically remain active for short periods (less than 2 years), but play an influential role in rapidly disseminating knowledge and information to organizations. Efforts through the system involve program tracking that center on the '3Ws' – who, what and where. Coordination of expertise is also a central tenant that appears through direct (in-person) and indirect (published material) communication. In the context of this paper we briefly introduce

cluster coordination as much of the organizational change encountered occurred through mechanisms harbored under the clusters.

Table 1: List of Cluster and Lead Organizations

Cluster	Lead Organization
Camp Coordination and Camp Management	IOM/UNHCR
Early Recovery	UNDP
Education	UNICEF/Save the Children
Emergency Telecommunications	WFP
Food Security	WFP/FAO
Health	WHO
Logistics	UNHCR
Nutrition	UNICEF
Protection	UNHCR
Shelter	IFRC/UNHCR
Water, Sanitation and Hygiene	UNICEF

METHODOLOGY

Countless disasters strike each year, debilitating economies and crippling infrastructure systems, however only a select few of these events elicit an international response. While other responses must naturally employ coordinated strategy in response and recovery efforts, those disasters where there is a multi-national presence of organizations allows for examination of cases where greater social and organizational complexity manifests, accentuating the means through which coordination must occur. In this paper, we focus on the co-created coordination space between organizations, government, and communities, selecting case study methodology to examine these communicative acts. The selection of in-depth qualitative analysis is well suited to the posed research question as it excels at investigating process oriented research (Hartley 2004), such as is the instance in complex multi-stakeholder coordination. Post-disaster contexts inherently involve rapid decision making and retrospective data collection poses challenges with participant sense making and recollection (Eisenhardt and Graebner 2007). In order to examine the coordination structures and processes employed following a post-disaster response, it was necessary to select a case where response efforts were still in their infancy so that data could be collected in real time. In examining coordinating actions, real time data was essential to capture rationale, intentions, norms and decisions that formed the building blocks in organizational coordination strategy.

Data Collection

Among the most recent hazard events to call into action the international community, Super Typhoon Haiyan smashed into the central Philippines in November of 2013 with wind speeds in excess of 300 kph (185 mph). The storm, the strongest ever recorded to make landfall, devastated housing, water, transportation, education and healthcare infrastructure. The ensuing aftermath saw cooperation between international and local partners in overseeing reconstruction. As a part of an ongoing quasi-longitudinal study of post-disaster reconstruction processes following Haiyan in the Philippines by the authors, an initial set of 32 semi-structured interviews with humanitarian stakeholders was collected starting seven months post-disaster. The gap following the disaster and

start of data collection was to allow for clearing of initial emergency services that lasted for several months. Participants included local and regional governments, 15 NGOs, cluster coordinating bodies (shelter and WASH) and local community members.

Three geographic regions – Cebu, Leyte, and Eastern Samar – were selected for inclusion based on early recommendations from government and NGO staff in order to account for differing emergent coordination practices as described by responders on the ground. It was anticipated that these differences in coordinating practice would stem partly from the local operating context but more importantly to this research, differences in normative organizational decisions and communicative mechanisms, allowing for theoretical extension of the how and why coordination practice arose. Specifically, we targeted multiple NGOs in order to ensure a diverse range of coordination approaches. In addition to interview data, field notes were recorded from daily observation of reconstruction projects, cluster coordination meetings, and internal organization meetings. Cluster policy documents, meeting minutes, organization beneficiary interview guides, recovery plans and technical communication documents were also collected.

Analysis

Following collection of data, interviews were transcribed and imported into Nvivo software for coding. In order to ensure the validity of personal accounts, interview data was triangulated with participant observation and documentation (Stake 1995). A hybrid approach to thematic analysis using inductive and deductive coding was used, deriving deductive themes from a literature review of coordination theory and inductive themes from emergent sub-topics (Fereday and Muir-Cochrane 2008). Deductive themes focused on three main topics: organizational structures, communicative processes and goals and objectives. Structures focused on rules, hierarchies and authority placed on actors within coordination networks. Communicative processes refers to the actions employed to transfer knowledge and information. Goals and objectives sought to examine one element of the planning process that foreshadowed intent of infrastructure reconstruction.

Qualitative coding yielded 271 references to organization structures, 620 references to communicative processes and 319 references to goals and objectives. The first and fourth authors completed coding independently prior to inter-coder comparison testing to verify themes in the data (Campbell et al. 2013). Inter-rater reliability scores in the form of Cohen's Kappa coefficient were calculated within Nvivo software. Kappa coefficients, statistical measures of inter-coder reliability, represent a more robust measure over simple agreement measures as they take into consideration the amount of agreement between coders that is likely to occur by chance. Values in excess of 0.75 represent excellent agreement between coders, greater than 0.4 is generally considered acceptable and lower than 0.4 is consider poor agreement (QSR 2015). For the three macro-themes considered, inter-coder reliability scores were as follows: 0.54 for organizational structures, 0.47 for communicative processes and 0.76 for goals and objectives. There was an overall kappa coefficient of 0.56, suggesting sufficient inter-coder agreement was achieved. Each interviews was given equal weight in averaging individual kappa coefficients. The complete set of combined coding from both coders was used for final analysis purposes. Inductive coding was conducted in multiple iterations until a defined number of codes could be agreed upon between coders. The above Kappa coefficients are the result of the final agreed upon coding structure from the authors. The primary means of analysis was using logic models (Yin 2009) to link structuring and process patterns between organizations to goals and objectives for recovery.

KEY FINDINGS

Findings from the case study analysis are presented in two sections – organizational structures and communicative processes. These sections seek to address the research question of what factors influence the emergence of inter-organizational structures and communicative mechanisms in coordination practice, supported through empirical evidence from field data. These sections are separated to bridge different bodies of knowledge on coordination, namely structural and process oriented perspectives, demonstrating the co-dependence of each in organizational behavior. A conceptual framework is then discussed in the conclusion about how this practice is influential in shaping infrastructure system planning decisions for recovery.

Organizational Structures

Geographic proximity and sector boundaries were found to be the most prominent factors in inter-organizational structures during planning that dictated how organizations chose to coordinate. The relational boundaries between organizations in disaster contexts is important because it provides a foundation for expectations of joint behavior and co-created meaning of communication. Prior to an actual hazard event, an early structure is already in place through international and local disaster response policies, NGO networks and ongoing development and disaster response programs. Confronted with an uncertain environment, these organizational linkages rapidly change to confront the demands of a new crisis.

Emergence of Boundaries and Hierarchies from Geography

The geographic distancing of organizations from each other arose as a key element of early efforts. A comment from management of the WASH cluster highlights how crucial this was in structuring of organizations: "*I mean to me, the biggest thing in coordination in the first one month is geographic separation of people. I think if you can get that right in the first week, it is easier because you don't have people duplicating, people just spread. Make that the one theme if you are going to a meeting.*" This stance was observed to be widely adopted by organizations who were eager to find communities untouched by other aid organizations. NGO staff, often veterans of several large disaster response efforts such as the 2004 Indian Ocean tsunami and 2010 Haiti earthquake, commonly referred to this organizational isolation as necessary to avoid duplication, one of the most criticized shortcomings from past responses. Following expansion from urban hubs, geography bound organizations to common challenges, political contacts, and logistical chains. This was accentuated by the large number of islands in the Philippine context, but evidence to support more widespread generalizability came from the consolidation of cluster hubs in several locations. It was not uncommon for aid workers to have to travel four to six hours during the early weeks in order to connect with other organizations working in the same region, limiting interaction and frequency of communication. Rapidly, this devolved to regional hubs of coordination under respective clusters which further broke down to coordination at the municipal government level.

Initial lead agencies under the cluster system were dictated but coordination structures shifted several months into the response when new leadership for each municipality was appointed. This shift occurred as organizations finalized locations for programming following a highly uncertain initial response period. From the onset the clusters had been the authoritative figure in coordinating, however regulative controls set under the UN mandate started to transition this responsibility to local municipalities and a counterpart lead NGO. Selection of lead organizations was done on a voluntary basis, but the resulting structures that were generated in the aftermath of this transition were tied closely to the operational location of the lead organization. For example, one NGO volunteered to lead shelter coordination efforts for a municipality; protocols such as

meeting frequency and location, reporting and inter-organizational linkages shifted to align with internal structures and location-specific practices that NGO employed. From a structural perspective of change, diffusion behaviors occurred at this critical transfer in leadership mirroring that of the lead agency. The initial separation of organizations can be seen as the spark that ignited the evolution of structures prior to contraction of boundaries and consolidation of roles.

Division of Labor through Sectors

Sector boundaries was another crucial element in the structuring of coordination, manifesting primarily under the humanitarian cluster system. These coordinating bodies improved information, resource, and knowledge exchange within their respective communities of practice, however, they often created barriers to integration of programming within organizations and resource demands for inter-organizational efforts. In interviews, NGOs focused on shelter reported that the time and resources needed to participate in multiple clusters was too demanding as time elapsed, resulting in a disconnect between the construction of shelter and WASH facilities. A NGO staff member made the following comment: "*The problem is I cannot go to follow all the clusters, it takes a lot of time and too many documents to fill. If I would follow all the clusters I would spend 50% of my time only on this.*" The result was organizations were forced to gravitate towards a single sector, whether this fit their programming or not. Boundaries became defined for many organizations though the cluster sectors where organizational language, strategy and resources were proliferated. This effect was amplified for smaller organizations who possessed even fewer staffing resources to meet coordination demands, as observed through field observations. From these resource burdens, hierarchical structure emerged where larger organizations possessed greater decision-making power and inclusion in coordination actions. Scholars have suggested that division of labor and specialization are necessary as the complexity of tasks increase (Becker 1993). The current system may demonstrate one instance where coordination costs have exceeded the benefits of specialization and compartmentalizing tasks in the current manner are negatively impacting the ability of organizations to exchange resources and knowledge.

Communicative Processes

Informal Coordination

Literature has highlighted that coordinating appears in both formal and informal processes (Tsai 2002), suggesting that informal means lead to greater innovation and adaptability – both elements shown to be critical in dynamic decision contexts. The informal relationships, more so than formal ones, constituted a critical component in the development of how organizations overcame communication barriers and exchanged knowledge in early recovery. Formal coordination meetings, either bi-lateral or multi-lateral, were scheduled weekly or bi-weekly however informal communication was observed to occur daily. Not only did higher frequently occur, but staff commonly cited these informal gatherings as more beneficial to achieving meaningful dialogue. The most common instance of this was after-work gatherings of NGO staff, and occasionally government officials. Paralleling the emergent nature of informal coordination, one such site was a street food truck and bar that opened in the aftermath of the disaster. A singular site of informal coordination was encountered at each of the three regions studied. Several of the interview respondents cited that these locations allowed them to open up and share ideas without worry of being "judged" or "criticized" for critical analysis of their own and others' programs. As actors navigated the complexity associated with their respective organization's response efforts, it became clear that communicating at these informal sites was a strategy to manage the uncertainty

facing organizations. It was through these assemblies that mimetic isomorphism took hold, leading to larger changes in inter-organizational behavior.

One instance encountered was the proliferation of actor mapping as a core element of program assessment. Barley and Tolbert (1997) present a sequential model for how we can examine the process of practice diffusion through four steps: (1) encode; (2) enact; (3) replicate and (4) externalize. Actor mapping is a visual aid to conceptualize relationships between stakeholders. The idea to use this mapping tool started at an informal, bi-lateral meeting between two organizations. The co-creation process led to encoding of practice between the two initial organizations, supported through informal means of communication. Enactment in implementation and eventual repetition led to diffusion to more prolific organizations which then disassociated the behavior from its initial actions, leading to adoption by other organizations. Highly structured initial communication gave way to informal means of communication which in turn reshaped inter-organizational practice. The initial actor describes the process: *"So first it was a daily basis coordination meeting among everyone and apparently that went really well. After that when we moved, phased out of the real emergency, it was a lot less structured. So that was quite informal because I started doing that only with [NGO] early because we were just getting along quite well and then from that, [UN Agency] heard about it and asked us to replicate and to expand a little bit. So it started as personal, informal communication and then it grew up. So that was in March and we replicated the exact same for this new project so the same way all the partners involved and for this one we also involved the shelter partners who said at that time that they were including WASH as a part of their shelter project. So we sat down with [UN Agency] partners plus any other WASH partners including shelter in the coverage area. This is still a process going on since some shelter programs don't know yet if WASH is going to be part of or not. So we drew a baseline but this is a tool that will be evolving hopefully within the next two weeks to have something more concrete and structured."* Informal mechanisms also appeared to occur more frequently as bi-lateral communication and were commonly seen as more effective in the eyes of organization and government staff.

Institutional Polices

Early in recovery efforts, the Shelter Cluster adopted guidelines for the use of coconut lumber. In particular, cluster language in documents integrated and paired notions of locally available material with cultural identity, a cultural-cognitive behavior. This became the definition of an 'appropriate' shelter solution from recovery guidelines and had a significant impact on the decision process of organizations. This appearance of standardized procedures and legitimized textual sources for material selection carried significant agency that set the stage for later decisions. It appears that early adoption of coconut lumber was driven by necessity, logistics, convenience, and fulfillment of donor perceived requirements, namely use of local materials. Later decisions do not seem to reflect this same rationale and take for granted the underlying assumptions of the context where expert knowledge surfaced. In reality, many community members admitted that they had not used coconut lumber for construction prior to the typhoon and their materials were not local – imported from another island or even across international borders in some cases where materials could be more sustainably sourced. Even in the face of this knowledge many organizations chose to ignore this information. Diffusion through textual sources, a key communicative mechanism, saw the rapid adoption and uptake by organizations. The Philippine coconut industry and the severe losses inflicted following the storm meant that this discussion was front and center in publicized media. The limited time allowed for this material to sit unused resonated with many western ideas of lost project efficiency. In addition to a connection between

local materials and local identity, NGOs appeared to also be driven by the need to not waste the resource, even given its less than ideal applications.

As mentioned, initial rationale for selecting coconut lumber became lost in later decisions. In this manner, the early emergence of choices had significant implications for processes in the future. Troublingly, many organizations held to collective organizational ideas in the decision process over immediate communication with communities, even in the presence of potential economic and time savings. This serves to demonstrate the influence that the cluster system and other inter-organizational procedures hold in the post-disaster decision context. It also speaks to the manner in which early response efforts were communicated. Textual sources held immense agency in conveying messages, allowing for individual translation by organizations that eventually led to the shift described above. Organizations spoke of the immense autonomy that they have had in previous disasters as well as in the early stages of Haiyan efforts, such as one NGO worker here: *"It was explained that during the emergency and recovery there was a lot of autonomy on regards to decision that refers to the project manager, as the activities scale down moving to the next phase somehow that autonomy has been a little bit controlled."* As efforts transitioned to long term rehabilitation and recovery, the need to alter communicative practices with other NGOs and communities changed, driven by the return of local capacities.

While these protocols have provided predictability for experienced disaster response organizations, they have created obstacles for local governments and new organizations that lack familiarity with these decision procedures. Humanitarian responders found communication among themselves to be easier than with local populations and correspondingly sought out validation from their peers more than from their beneficiaries, self-reinforcing knowledge that was communicated within the NGO community. Not all organizations were consumed by collective information on material selection however. It was during this transitional period that many NGOs found ways to innovate and reframe the decision process. Some of the most success examples highlight that those organizations that adopted high levels of integration with communities and local socio-cultural identities saw the most significant gains. Rather than viewing local knowledge as something that could be extracted, they changed their decision practices in sometimes counterintuitive ways. Rather than decrease the number of stakeholders, one NGO actually brought in additional parties and perspectives, sub-contracting work to both additional international NGOs with technical expertise and to local businesses, in this case an architecture firm.

CONCLUSIONS

In the words of Dwight D. Eisenhower, "Plans are nothing; planning is everything." This is certainly true for the case of post-disaster construction, where the complexity and dynamic environment demand for flexibility, ingenuity and collaboration. The goals and objectives of program planning were inherently linked to emergent structures and communicative processes, portrayed through the key elements above. A theme that surfaced in analysis was that many organizations focusing on reconstruction were faced with immense uncertainty and risk. This came in the form of land ownership, design standards, future relocation potential, cultural acceptance, scheduling and cost. Not only did the communicative processes employed emerge to face this

uncertainty, organizational goals were driven by minimization of risk. One of the Shelter Cluster managers summarized this: *"Every disaster is unique so this idea of using a blue print from one mission to the next is limited, it is quite limited because I think the issue arises with the transition between emergency and transitional. When you are doing emergency response nobody knows if there will be a recovery phase for example, I think that was a bit the case here and then the recovery phase became apparent that it was needed so the funding was there and these projects are going on so you can't judge that in the planning phase or in the emergency phase."*

In particular there was a rapid inter-organizational adoption of goals that centered on provision of temporary and transitional shelter, rather than permanent solutions. This behavior drew from boundaries established though organizational structures and communication processes during planning such as diffusion of coconut lumber

Figure 1: Diffusion Framework

guidelines and uncertainty of the organizational environment. Stemming from internal forces within the cluster system, goals that emerged were often driven by localized dialogues that proliferated inter-organization systems. This served to exemplify a core lesson from present institutions: "strategies that are rational for individual organizations may not be rational if adopted by large numbers" (DiMaggio and Powell 1983).

In analyzing the emergence of coordination structures and practice, we provided evidence of the manner in which organizational behavior evolves following a complex crisis. In particular, this answers calls in the literature to provide rapid cross-national study of complex coordination (Drabek 2007). Investigating diffusion of practices, we have presented a framework (shown in Figure 1) which extends and validates a sequential model of adoption that includes structures, processes and goals that support rapid changes in humanitarian response. This supports recent research that periods required for practice change may be shortening for organizations that are increasingly faced with dynamic socio-political environments. Additionally, the findings suggest the need for policy makers to re-evaluate coordination systems to allow for more emergent means of communication and innovation in disaster response and recovery. Touched on briefly, one example of this is limiting resource demands for multi-lateral coordination mechanisms and considering bi-lateral means when efficiency needs prioritization.

LIMITATIONS AND FUTURE WORK

While this study was able to collect data in real time, a limitation of the study was its start date seven months after the disaster due to logistical considerations of entering a post-disaster context. Participants were asked not only to recount ongoing events at the time of collection but also retroactively account the initial months of the response that were influential in ongoing coordination. Additionally, this study presents one contextual case that should be validated with future studies across different national contexts for comparison. While we have presented and linked the emergence of coordination structures and practice to early goals and objectives, further
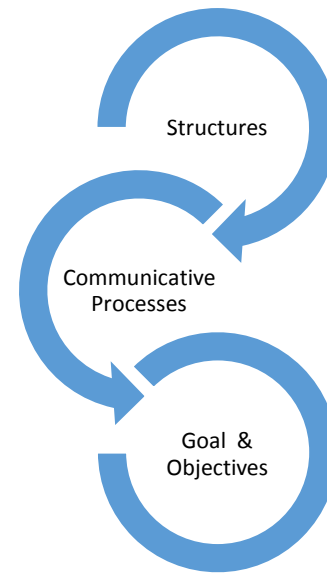
work should look to link the emergence of coordination to longitudinal outcomes of infrastructure. The authors are currently continuing to follow ongoing coordination in the design and construction of twenty shelter programs in the studied regions for cross-case comparison of coordination, stakeholder participation and training with the goal of linking strategies in the planning, design and construction phases to sustainability and resilience outcomes of completed infrastructure.

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