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Collaborative systems development in disaster relief: The impact of multi-level governance

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Abstract Disaster management information systems for international humanitarian relief are developed in contexts involving local, national and inter-governmental organizations together with local and international non-governmental organizations (NGOs). While the multi-organizational nature of disaster response is known to create challenges for information systems development, to date, less attention has been paid to their multi-level nature. This research sheds light on the implications of multi-level governance for disaster information systems development by integrating political science and information systems theories of multi-level governance. The integrated theoretical framework is then used to analyze a case study of a system development effort undertaken by a multi-organizational coordination body consisting of the headquarters of six large, international humanitarian relief agencies, together with their country offices in a Central American country. This research finds that multi-level governance can both negatively and positively influence information systems development. In a multi-level governance arrangement, authority for a systems development project may be diffuse and may change. The transfer of resources from higher to lower levels is key factor, as these resources help local organizations overcome resource constraints to collaboration. The initial outcome of coercion by higher levels of authority may be resistance, however over time the outcome can change to compliance.

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1 Introduction

Inter-organizational coordination in disaster response continues to challenge the international humanitarian relief community. In this community coordination has been shown to occur primarily among three groups: one led by the United Nations, a second led by the Red Cross/Red Crescent organizations, and the last consisting mostly of non-governmental organizations (NGOs) (Adinolfi et al. 2005). In this last group barriers to coordination are numerous and arise from factors including: the sheer numbers of NGOs, lack of resources, desire for autonomy, their need to satisfy constituents and from competition for influence and visibility amongst themselves (Uvin 1999, p. 19). To overcome these barriers formal NGO "coordination bodies" have emerged, with a number focused exclusively on information management and technology issues.

These coordination bodies seek to reduce redundancies and pool limited IT resources while at the same time promoting inter-organizational information sharing to improve disaster response. These efforts increase the likelihood of joint development of disaster management information systems among actors including the headquarters and country offices of international NGOs, together with local NGOs and national/local governments. The country offices of international NGOs are typically managed from headquarters, through multi-level governance structures defined by the level of (de)centralization of authority and decision making. Hence, their engagement with their local counterparts will in part be influenced by actors disengaged from the local context.

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The co-development of local disaster management information systems is essential to inter-organizational coordination across humanitarian relief functions (Maiers et al. 2005). Consequently, the organizations engaged in the co-development must contend not only with differences between organizations but also within these multi-level governance structures. Multi-level governance is likely to generate additional challenges for information systems development and deployment, a process already plagued by failure (Jørgensen and Moløkken 2004). However, given that effective deployment of IT projects requires technological resources, appropriate practices and policies, and skilful users (see Standing et al. 2006), it is also possible that multi-level governance structures that connect headquarters with country offices may provide benefits to local co-development and deployment efforts.

While the research on multi-level, multi-organizational governance in the development of information systems is limited, multi-level governance theory as articulated by international political scientists offers some insights. In particular, this theory integrates governance issues in the context of both multiple international organizations and power differentials between the high income nations of headquarters and the low income nations of field offices. Furthermore, as compared to the mainstream IT governance research, this literature recognizes the complex, and sometimes contradictory, authority structures found in multi-level, multi-organizational contexts. Drawing on these theories, we develop propositions to guide our analysis of a case study of a system development effort that includes a multi-organizational coordination body of the headquarters of six large, international humanitarian relief agencies, together with their country offices in a Central American country as well as the national government. Specifically, we examine how the system development process and functionality of the collaborative disaster management system is influenced by multi-level governance. As such, this research contributes to the development of theories of multi-level, multi-organizational IT governance as well as provides insights into practices that can improve the chances for success in disaster management information systems projects.

This research finds that multi-level governance can both negatively and positively influence information systems development projects. For example, whereas a headquarters-mandated collaboration project may initially face resistance from the field, over time the mandated collaboration may enable field organizations to overcome what otherwise might have been seen as insurmountable collective action challenges. In this way, coercion evolves into collaboration. In addition, the system requirements and organizational motivations may significantly differ between levels, while not so significantly across organizations at the same level. However, while outright goal conflicts appear to be a less significant issue, multi-level, multi-organizational systems may face greater challenges with goal timing, meaning that more attention must be given the time at which each partner considers the goal its top priority. Further, the multi-level context has implications for the systems development process. The first is that both the multi-level and multi-organizational nature of the project are emergent in that as the system development process continues current partners may become more or less engaged as well as entirely new partners may become involved. Second, as in intra-organizational systems development projects, the system's leader will have a disproportionate influence on the technical architecture.

The paper is structured as follows. Section 2 provides a review of the literature as well as develops the analytic framework. In section 3 we described our method which is followed by a presentation of the case data in section 4. Section 5 provides an analysis and discussion with conclusions presented in Section 6.

2 Literature review

Effective disaster management information systems, particularly those in lower income countries served by the international humanitarian relief community, are likely to be developed in contexts of multi-level, multi-organizational governance. For the purposes of this work, governance is defined as the rules or processes by which organizations or projects are operated, regulated, and controlled. Further, we are fundamentally interested in governance across– across organizations, across hierarchical levels, across stages of development and across technologies. From this perspective, information systems development projects will be influenced by both organizational and project management governance.

In the following sections we examine multi-level governance related to organizations generally and then information systems development in particular. We begin with the information systems, political science literatures and then building on their organizational insight, we examine issues of power, control, collaboration and conflict in information systems development. Subsequently, from these concepts propositions concerning the effects of multi-level, multi-organizational governance are presented.

2.1 IT/IS governance

IT governance is the authority structure that determines the ways in which IT decision rights are divided, ranging from highly centralized to highly decentralized, between corporate, divisional and business units/line managers in an organization. The decision rights are typically concerned

with infrastructure, technology use and project implementation, each of which may be managed through a different form of governance (Brown and Magill 1998; P. Weill and Broadbent 1998). The extant research on IT governance is primarily concerned with either identifying the contingencies that generate various forms of centralized or decentralized governance or provides prescriptions for effective design (Peter Weill and Ross 2005). The contingencies most commonly observed to influence IT governance are overall corporate governance, economies of scope and absorptive capacity. These contingencies have been shown to interact, in either reinforcing or conflicting ways, to produce a wide variety of governance arrangements (Sambamurthy and Zmud 1999).

While various categorizations have been proposed, archetypal governance arrangements vary from the highly centralized general corporate monarchy, in which general executives rather than IT executives make IT strategy and investment decisions, to the highly decentralized arrangement of anarchy. The level of effectiveness of these various IT governance arrangements can be assessed by how well IT can deliver on cost-effectiveness, asset utilization, business growth and business flexibility (Peter Weill and Ross 2005).

In mainstream studies of IT governance, the unit of analysis is almost exclusively a single firm (Gwillim et al. 2005; Martin et al. 2005; Mirchandani and Lederer 2004). In a slight deviation, IT governance for organizations with business units engaged in joint ventures has been considered, with recommendations for highly decentralized arrangements (Sambamurthy and Zmud 1999). This focus on IT governance constrained to the bounds of the organization is problematic. Increasing reliance on outsourcing and third party service providers suggests that the scope of IT governance may need to broaden (Raghupathi 2007). An expansion of the scope of IT governance may also necessitate a change in its goals. For example, instead of seeking to enhance the cost-effectiveness and asset utilization of a single firm, expanded governance may need to consider collective cost-effectiveness and asset utilization of multiple organizations.

Thus, while mainstream IS/IT governance research considers the division of decision rights and accountability across multiple levels of an organization, it does not fully capture the complex environment of multi-level governance in a multi-organizational environment. In addition to this limitation, three other characteristics of this research limit its applicability to the context of disaster management information system development. First, to the extent that multi-level governance is examined, it demonstrates a top-down bias (Mirchandani and Lederer 2004 is an exception). Second, it seeks to explain the existence or means of achieving different models of governance rather than their outcomes for systems development[1]. Third, despite calls for greater recognition of the multi-organizational context (e.g. Raghupathi 2007), it fails to recognize that organizations and their systems development initiatives are embedded in complex local environments that involve a variety of actors, which collectively are not governed by a single organizational IT governance arrangement.

2.2 Multi-level, multi-organizational governance theory

For greater insight into multi-level governance in a multi-organizational context we turn to literature stemming from political science. The conceptualization of multi-level governance originating from political science has been adopted by the international economic development community (Achoka and Atema 2001; Booth 2003; Craig and Porter 2003), within which the international disaster relief community is embedded. In international economic development the concept of multi-level governance emphasizes the multiple levels of governance and participation in the development process (Develtere et al. 2005). Multi-level governance has thus become part of the new credo of development agencies.

Marks defines multi-level governance as, "... a system of continuous negotiation among nested governments at several territorial tiers" (1993, p.392) [in which] "supranational, national, regional and local governments are enmeshed in territorially overarching policy networks" (402-3). The main value of the concept of multi-level governance is that it allows for an understanding of complexity at and between levels.

> *A key tenet of multi-level governance is the dispersal of authority and decision-making to a wide range of bodies through a process of negotiation. The net effect is that policy-making has been transformed from being state-centered and state-driven activity to become a complex mix of hierarchies, networks and markets* (Richards and Smith 2004).

The theory has two main dimensions: vertical and horizontal. The "vertical" dimension refers to the linkages between higher and lower levels of government, including their institutional, financial, and informational aspects. The

[1] The performance-related issues considered in the IS/IT governance literature are those of the IS/IT organization generally. A more direct relationship between governance and systems development outcomes is presented in the IT project management and control literature (Henderson and Lee, 1992; Jiang et al. 2004). In that literature, IS project management is assumed to occur amid a high level of IT resources and clear lines of authority, two conditions unlikely to be found in a multi-organizational disaster management IS development context. Furthermore, critics suggest that an over-emphasis on classic notions of IS project control may be a reason for the frequency of IS development failures (Drummond and Hodgson, 2003).

"horizontal" dimension refers to co-operation arrangements between regions or between municipalities. In this sense, the vertical notion of multi-level governance, including but also seemingly "above" and "below" the nation state, goes alongside the horizontal notion of complex governance to address relationships between state and non-state actors, and new forms of public-private partnerships.

Similar to the IT realm, governance between political entities is concerned with centralization and decentralization, with modern governance trending toward the latter, wherein decision and policy making is dispersed across multiple centers of authority (Oates 1999). It is also characterized by complex patterns of interdependence, and both formal and informal institutions. The argument is that populations are better served by overlapping, and even competing, jurisdictions instead of a single continental-wide jurisdiction, and that authority is often spliced into multiple, functionally-specific, policy regimes with overlapping national memberships (Keating 1995; Lowery 2000; Ostrom 1972; Schmitter 2000).

Hooghe and Marks (2003) propose two types of multi-level governance. The first type, and the less applicable to our work, states the dispersion of authority is limited or "authority is relatively stable and analysis is focused on individual levels of government rather than specific policies" (Bache and Flinders 2004, p.39). Devolution tends to be furthered on a territorial basis with a small number of discrete units of government (each with an associated executive, legislature and court system) and no overlap of membership. Policies are "bundled in a small number of packages" at each level and the relationships are durable (Liesbet Hooghe and Marks 2003, p.237).

The far more useful type is *type two* in which we have a "complex, fluid patchwork of innumerable, overlapping jurisdictions" (Bache and Flinders 2004, p.39). Devolution takes place on a policy rather than territorial basis, with much larger numbers of authorities, memberships that span complementary policy areas and less stable relationships as the arrangements are set up/ changed in response to changing policy conditions (Liesbet Hooghe and Marks 2003, p.237). For Hooghe and Marks (2003) the identification of these two types supports a normative argument, stressing the potential benefits from the flexibility of ad hoc governance arrangements on a task basis and the logic of arrangements which foster joint working when formal decision-making arrangements cannot be enforced.

The advantages of the theory of multi-level governance applicable to collaborative disaster information systems development are (1) a greater ability to address the "heterogeneity of preferences of citizens", or local developers in our case, and (2) a closeness between decision-maker and the affected population which helps make credible policy commitments based on local knowledge (Hooge and Marks 2001). Additional advantages include (3) its suitability for flexible and collaborative relationships and (4) that it makes few assumptions about direct lines of authority or control, the importance of which will be discussed in the following section.

These advantages may also be appropriate for IT/IS management more broadly, particularly given that IS governance must contend with an increasingly fluid set of actors with varying vertical and horizontal relationships (Raghupathi 2007). These actors may exist in various jurisdictions defined not only by the task but also by the organizational, industry and national context. This more encompassing approach to governance may alter perceptions and what may once have appeared to be archetypal 'anarchy' from the perspective of traditional IT/IS governance, may instead be discerned to be a complex web of relations and controls.

2.3 Power and control in multi-level, multi-organizational systems development

While the concept of multi-level governance from political science conveys, in a broad sense, the complex nature within which disaster management information systems development occurs, one potential shortcoming is that its unit of analysis is typically the nation state and hence obscures some issues that might be salient in both multi- and intra-organizational contexts. Of particular interest here are power relations defined by multi-level, multi-organizational context and their implications for information systems development.

One potential venue for gaining insight into the power/autonomy relationships between headquarters and regional/country offices is the research on management of multinational corporations (MNCs). Unfortunately, the MNC literature concerning the centralization-decentralization balance neglects issues of power and instead concentrates on structural explanations, functional fit, and stages of development (Ferner et al. 2004). Research that does consider power has found that the degree of power a parent exercises over its subsidiary varies with the level of ownership (Balinga and Jaeger 1984; Dang 1977) and the mutual dependency of headquarters and subsidiaries on resources provided by the other (Bartlett and Ghoshal 1998; Ghoshal and Nohria 1989). Furthermore, according to Kostova and Roth (2002), the degree to which subsidiaries will adopt practices mandated by headquarters depends on their level of dependence on headquarters' resources, as well as their identification with or attachment to the parent organization, and most importantly, their trust that the parent organization will fulfill its commitments and act in good faith. Finally, the headquarters/subsidiary relationship will also be influenced by the local context. Kostova and Roth (2002) describe the position of foreign subsidiaries in a multina-

tional corporation as one of *institutional duality*: they face isomorphic pressures from both the host country and the parent organization.

The issues of headquarters/subsidiary relations and power, resources and control have also been studied in international IT management. Multinational corporations treat the IS function of their subsidiaries differently from other functional areas, and under certain conditions are granted less autonomy than their functional counterparts (Mirchandani and Lederer 2004). Similar to the general MNC management research, the availability of host country IS resources has implications for IS controls. Controls, an important component of IT project governance, are conceptualized as having both formal and informal dimensions with elements including measurement, evaluation, rewards and sanctions, and roles and relationships (Kirsch 2004). Research has shown that host country resource availability has implications for information system project control mechanisms (Rao et al. 2007). In particular, higher availability of IS resources in the host country, generates higher levels of use of informal controls. Further, in the domain of global systems development and deployment, the types of controls used were found to vary with the stages of the project and transitioned from 'collective sensemaking' to 'technical winnowing' as the project moved from requirements gathering to development (Kirsch 2004).

Finally, issues of power and control in information systems development projects may also be intertwined with organizational politics. In fact, information systems development can be seen as an inherently political activity (see KIing 1980; Kling 1996; Markus 1983). Managing the power, politics and organizational context of information systems is increasingly recognized as being of critical importance to successful information systems development (Ahituv et al. 1994; Davenport et al. 1992; Kling 1993; Pliskin et al. 1993; Rouse and Watson 1994; Sauer 1993; Warne and Hart 1996). The political process in organizations influences outcomes in terms of the way power is exercised, and this exercise of power may in itself be influenced by actions intended to change the relative power of parties in an organization (Franz and Robey 1984; Markus 1983; Orlikowski and Baroudi 1991; Sauer 1993). Hence, controlling factors in information systems projects, will include politics, institutional forces and symbolic means of control in addition to the technical/rational goals typically associated with IS projects (Gupta et al. 1994; Oliver 1991; Scott 1987).

2.4 Collaboration and conflict in multi-level, multi-organizational systems development

Effective disaster management information systems requires collaboration between multiple organizations, which implies that organizations have a shared goal and will achieve that goal by undertaking a shared task (Hveinden 1994; Olson et al. 2001). However, while the collaborative effort may have a single overarching goal to produce a communal system, the goals of the individual collaborating organizations, of the subunits of those organizations and of the individual participants may not be perfectly in line with the form, approach or process adopted by the high-level goal initiators.

These conflicting goals, together with interpersonal and functional conflicts, create challenges for both intra- and multi-organizational information systems initiatives (Harrel and Harrison 1994). Conflict is defined generally as "a dynamic process that occurs between interdependent parties as they experience negative emotional reactions to perceived disagreements and interference with the attainment of their goals" (Barki and Hartwick 2001, p.198), and, in particular, functional group conflict in the IS domain is the conflict between departments or groups within an organization (see also Lamp et al. 2003; Robey and Newman 1996; Yeh and Tsai 2001).

In multi-level governance, where levels can be associated with principals and agents, the latter may have private goals that conflict with the overall objectives of the firm (Baugh and Roberts 1994). When goals between principals and agents differ, the agents will typically engage in self-promoting actions (Eisenhardt1989). That is, agents may seek to achieve their own goals instead of working in the best interests of the principal. This naturally brings up the question of how to reduce goal conflict between the principal and agents, as well as between agents, in an information systems development setting. This question is even more salient in an inter-organizational context without clear contractual agreements between the parties. Mahaney and Lederer (2003) offer the solution of contractual rewards for compliance and goal adherence, but in their absence what serves to bring various divergent parties with divergent goals who are outside of an organizational hierarchy into goal harmony?

In the following section we address this question through a series of propositions that apply concepts of multi-level, multi-organizational governance to disaster management information systems development contexts. The propositions seek to clarify the implications for this form of governance for local collaboration by examining its impact on relationships, incentives and technical choices.

2.5 Multi-level, multi-organizational governance of disaster management information systems

The ability to overcome goal divergence in disaster management information system projects will be determined in

part by the multi-level, multi-organizational governance arrangements. As described by political science researchers, this environment is one that has varying sources and levels of authority, overlapping and sometimes conflicting jurisdictions, and is subject to change. In such an environment the effects of the separation of what are generally (but not always) higher levels of authority at headquarters from the local context, being the context for system development, will be difficult to predict. However, within each individual, multi-level organization, per the research on multinational corporations (Balinga and Jaeger 1984; Bartlett and Ghoshal 1998; Dang 1977), power and control are likely to be somewhat centralized as field offices of humanitarian relief organizations tend to have fewer resources than their headquarters counterparts. In such contexts, where there is a separation of authority or decision making from the local context, systems development is likely to face challenges. In a published account an NGO field office manager described these circumstances as creating a 'disconnect' between information systems mandated by headquarters and what is available or even usable in their field office (Maiers et al. 2005, p. 84). However the willingness to overcome these issues and comply with headquarters mandates will depend on the balance of resources between the local office and headquarters, as well as the identification with and trust in the headquarters (Kostova and Roth 2002).

In addition to their multi-level nature, disaster management information systems are frequently multi-organizational and consequently headquarters will not be the only influence on the local office. According to the concept of institutional duality (Kostova and Roth 2002), in a multi-level, multi-organizational governance arrangement local offices will be influenced both by headquarters as well as other NGO and government offices in their local context. The similarity of context between local offices may generate greater goal congruence between local offices of different organizations than between the headquarters and local offices of the same organization. Given these conflicting indications for the effects of multi-level, multi-organizational governance, we propose:

P1: **Multi-level, multi-organizational governance separates authority from the local context, thereby creating challenges for local collaboration.**

P2: **Multi-level, multi-organizational governance separates authority from the local context, thereby providing an impetus for local collaboration.**

The development of a multi-organizational disaster management information system must overcome the conflicts that arise among members of a group with differing goals. Further, while NGOs may be willing to join a collaborative project, they are not likely to be directed by its governance if it limits their organizational independence (Strand, 2003)[2].

In addition to overcoming these typical multi-organizational challenges, disaster management information systems development must also contend with multiple levels within these organizations. In such a context if all of the headquarters exercise control over their local offices, multi-level governance may facilitate local collaboration. However, other local actors such as local/national governmental agencies will be generally isolated from these principal/agent relations. In contexts of multi-level governance where headquarters have greater access to resources than their local counterparts, in the absence of the recommended contractual rewards (Mahaney and Lederer 2003), access to these resources by the local project organization can serve as a mechanism to overcome goal conflicts. This is particularly relevant in the IT function within the humanitarian relief sector where resources are scarce (McEntire 2003). Hence, we propose:

P3: **In multi-organizational information systems projects, multi-level governance provides access to resources available beyond the local context, thereby facilitating collaboration.**

In a strict organizational hierarchy that might characterize multi-level but not multi-organizational governance, information technology choices can be difficult. However, in multi-level, multi-organizational governance characterized by authority structures that are a complex mix of hierarchies, networks and markets (Richards and Smith 2004), these decisions become even more difficult. This challenge is due in part to one of the recognized benefits of multi-level governance, namely its ability to address the "heterogeneity of preferences of citizens" (Liesbet Hooghe and Marks 2001), or in this case the technical preferences of a multi-organizational development team. Hence, we propose:

P4: **Multi-level, multi-organizational governance creates diverse and contending information technology environments, thereby creating challenges for co-development of information systems.**

These propositions will guide our analysis of a case study of disaster management information system development between a coordination body consisting of several international NGOs, their local offices and a government office. In the following sections we first explain our method, which is then followed by a presentation of the case data.

[2] Even in cases where coordination has occurred, it is unclear the extent to which these gains can be sustained over multiple disaster responses (Riddel, 2007, p.347). While this paper is not focused on the use of the system and does not address these coordination efforts in the long term, it is interesting to note that efforts at coordination need to be sustained throughout the lifecycle.

3 Methodology

This research is part of a broader effort that seeks to develop models of collaborative efforts, examining horizontal collaboration between headquarters-level technology initiatives. Within this broader effort, the case study presented here focuses on the multi-level nature of collaboration, in other words, examining both horizontal and vertical collaboration around information technologies, management and data. This more focused study also has adopted a case study as its research design, but unlike the broader study that focuses on collaboration in general, it focuses on a single period of collaboration activities toward a single goal.

The research question driving this part of our research is:

> **How does multi-level governance impact collaborative IT systems development projects between disaster relief organizations?**

In order to answer this question we used three methodologies. We conducted in-depth interviews with key informants, textual analysis on documents produced by the project, and observations of several meetings and events concerning the project. This triangulation of methods provides a rich picture of multi-level governance in this setting.

In terms of interviews, we conducted in-depth, semi-structured interviews that lasted approximately one-hour each. We conducted these interviews with key informants relative to the project. At first we interviewed headquarters IT staff from three participating organizations that were participating in ITEA who were part of the organization, which decided to fund the NERC project (see below). Next we interviewed the in-country manager of the NERC project. She was the central, key informant of the entire project. We interviewed her three times, each associated with one of three stages of NERCs development. Next, we interviewed two of the participating, in-country collaborators representing other NGOs. These were interviewed during the process of development. Lastly, we interviewed the overall leader of the ITEA after the NERC development project had come to a close, just after the final launch event. Despite our desire, we were unable to interview anyone from the national government. They were both unwilling to participate in the NERC project and our research to any great degree due to many factors, including national elections and changes to high level governmental staff. In all we conducted nine interviews. These interviews were recorded, transcribed, and coded using an open coding system.

The documents that were collected for this study included the original project proposal and all of its iterations and revisions by the ITEA project team, the project timetable, minutes of all project meetings, presentations made at all meetings, and a document created after the final evaluation of the initiative. Observations were conducted via telephone during two project teleconferences in which the project was discussed as well as of the final project kickoff event. The documents were analyzed using the same codes as developed by the interviews as well as some open coding. The observations led to better quality coding of both the interviews and documents in that they provided much-needed context.

The following section describes the NERC project and our interpretation of the three stages of the project: planning, development, and evaluation.

4 Case

4.1 ITEA

The Information Technology for Emergencies Alliance group (ITEA)[3] is a collaborative effort of seven large international NGOs enabled by a two-year grant from an international foundation. The membership of the ITEA consists of representatives from the large international NGOs that operate multi-level organizations. Together these members defined projects to be carried out jointly by their field/country offices. The local and regional offices did not participate directly in the decision making process.

The ITEA's main goal was "tackling common problems in emergency response and preparedness". In order to achieve its goal, the ITEA staff identified four specific areas of work: Staff Capacity Development; Accountability and Impact Measurement; Disaster Risk Reduction; and Information and Technology Requirements. This last initiative, also known as ITEA-4, is the parent initiative of the National Emergency Response Collaborative (NERC) project.

NERC brought together six of the seven ITEA organizations (one of the organizations did not have a local presence in the country) and the National Body for Coordination on Disasters (CNCD in Spanish) of a Central American Country. The purpose of the project was to provide an online environment for the sharing of disaster-related information. The next section will describe the NERC project and the phases of the initiative.

4.2 NERC

The National Emergency Response Collaborative (NERC) platform is an online tool for emergency -related content management. The platform is closed, thus access is restricted to people associated with the project. The system

[3] The names of the participating organizations and the coordinating body have been changed to protect confidentiality.

is intended to be a repository of documents from each ITEA agency and their field partners. This is supposed to be accomplished by each organization adding information related to its activities (i.e. geographical presence, emergency procedures, resources, training events, community related events, etc.). The intent is to help agencies stay informed of each others' activities, such that in times of an emergency it will be easier to make decisions related to collaborative activities.

The NERC platform has seven "work spaces": (1) *cooperation*, a section dedicated to the plans and geographical presence of each agency; (2) *strengthening capacities*, a section to announce courses, workshops and other training activities; (3) *library*, a space for documents with general information about the emergency and relief sector; (4) *expressive space*, a section for asynchronous communication among the users; (5) *responding to emergencies*, a space to report activities carried out during specific emergencies ; (6) *contacts*, a space with information on users; and (7) *useful links*, a section including contact information of providers and other external actors to the emergency relief sector.

Although the platform is a product of the initiative, its value is determined in part by the amount of information that it holds. According to NERC internal documentation, the amount of information will also be a key criterion in the decision of whether to continue the project. In the long term, ITEA expects to transfer the management of the platform to the national government, enabling other agencies' involvement. The next sections detail the origins/planning, development, and evaluation of the initiative.

For all intents and purposes *Hurricane Stan* (2005) gave rise to the NERC project. The preponderance of informational and coordination problems that occurred during the hurricane relief effort prompted the country and the local NGOs to seek aid. According to the initial NERC proposal document, similar ideas for such a platform were discussed as early as 2006. At that time, the project was named the Emergency Information Centre (EIC). The EIC was intended to be a mechanism that could (1) promote the ITEA-3 initiative (risk reduction) in a pilot country, and (2) combine with the ITEA-4 initiative (Information Technology Requirements) in a single concrete project.

By mid 2006, an ITEA coordinating body manager visited the Central American country to study the feasibility of the project. The coordinating body manager found great interest among the ITEA agencies and also in a governmental emergency body (CNCD) to collaborate on a joint systems development effort. After some discussion with ITEA stakeholders, the headquarters of one of member (NGO1) agreed that its regional offices in the country would lead the project. The project was intended to take six months.

4.2.1 Planning

The planning phase includes all the activities that were carried out before the NERC staff was hired in May 2007. The first milestone of the platform was the creation of a preliminary proposal. The early drafts of the proposal were created after the visit of the ITEA coordinating body manager to the country in July 2006. The document was conceived by headquarters' personnel, but took into account the input of all agencies. The information for the proposal was gathered during the previously mentioned one-week visit of the ITEA coordinating body manager. After that visit, a Steering Committee consisting of one headquarters- level representative from each of the six agencies was created. Due to their disparate locations, their meetings to discuss various aspects of the project were typically held via teleconference. At the beginning, the intention was that the Steering Committee would fully participate with the local management team, but their direct participation in the project diminished once the NERC initiative began in 2007. The authority structure of the NERC project is depicted in Fig. 1.

The objective of the platform as stated in the first proposal was:

> *To promote the exchange of information and the sharing of knowledge between various organizations involved in all aspects of disaster management, making it simpler and quicker for agency staff to share and access knowledge and expertise.* (NERC Project Proposal)

The proposal made it clear that NGO1 would be the lead agency, and it would manage both the ITEA funds and the human resources associated with the initiative. In addition, NGO1 would "provide senior management support acting as an advocate for the project to other organizations (whether ITEA or non-ITEA) and leading the Steering Committee in its decision making process" (NERC Project Proposal).

Technical requirements also were considered in the proposal. The document acknowledged that each organization used different content management software, so it became clear that the NERC platform would be a web-based tool. This requirement would solve the problem of having to provide each agency with specific software and facilitate access to the platform. With regard to this point, NGO1 was especially interested in promoting the technology used at its headquarters.

By the end of 2006, NGO1 gave a demo of its system. The system is based on an Open Source Software platform named PLONE. The proposal left the option open to use a commercial software package from a third party vendor (purchased or donated), but the final decision of the

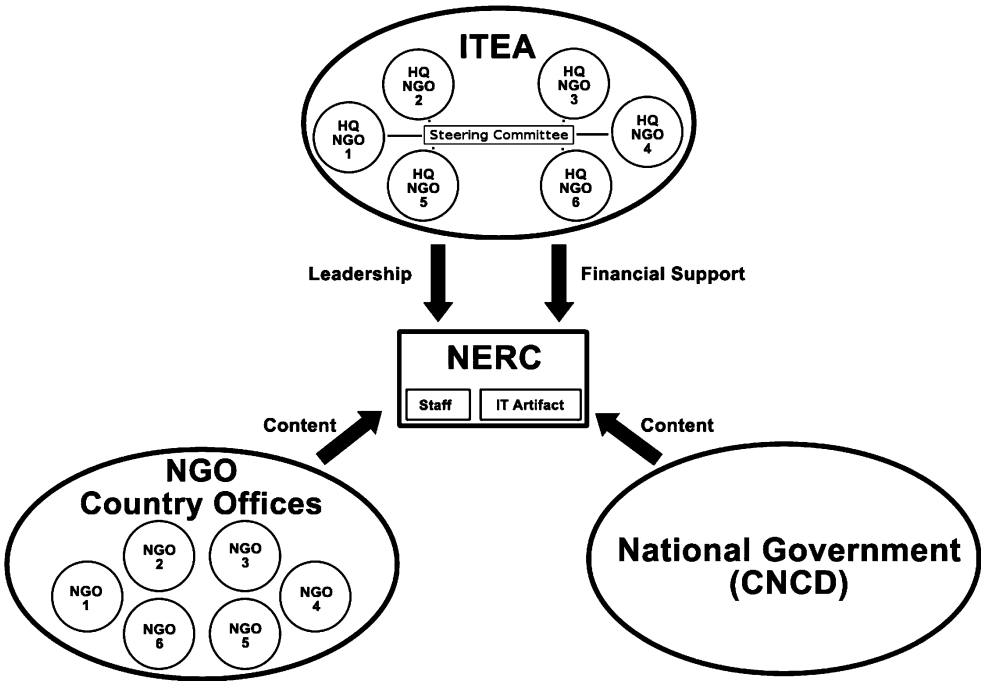

Fig. 1 Representation of the Governance structure of the NERC project

Steering Committee was to use the solution recommended by NGO1. Thus, NGO1 local offices were in charge of hiring both the web manager with PLONE competence and the *Liaison Officer*, as specified in the proposal. These two people were the staff of the NERC project.

NERC staff responsibilities were, according to the proposal, acquiring and managing content on the platform, as well as to support the rest of agencies in their duties. The rest of the agencies were asked to contribute in the following four specific ways:

1. *Uploading documents to the collaboration space.*
2. *Participating in online discussion in the space.*
3. *Working together within the space to develop new content.*
4. *Encouraging and educating government partners on platform use. (NERC Project Proposal)*

The proposal also identified performance metrics. The metrics included general statistics of the website (number of active users, number of documents posted, etc.), responses from users, and changes in inter-agency information sharing procedures. Finally, the project proposal also described the ideal circumstances that would ensure the sustainability of the project following its sixth months of funding. The commitment of the agencies to contribute content and the role of the local actors were determined to be the critical factors that would contribute to the longevity of the project.

4.2.2 Development: First phase

The Development Phase includes all the activities that were carried out during the six months of project funding. We have divided those activities into two segments: the first phase that includes the first three months of the project, and the second phase including all activities completed prior to the final evaluation.

The first activity was hiring the two NERC staff, both of whom had experience in the emergency relief sector, and familiarizing them with the project details. By the end of May, the NERC team was able to create an Operational Plan for the next three months (June, July, and August).

By June of 2007, the NERC staff had held more than twenty-five individual meetings with all the agencies involved. The objective of those meetings was gathering information about the expectations of each participant, their technological capacities, field partners, and identifying the kind of information that could be shared on the platform. The conclusions from the diagnostic study were shared in a meeting in mid June with representatives from most of the agencies. By the end of July, the NERC staff had held four formal meetings, however only one of them was carried out with representatives from all participant agencies.

Interviews with the Liaison Officer and two representatives, each from a different agency, revealed that the level of participation was lower than had been expected by the Steering Committee. As described by the Liaison Officer:

> *Although we have been working together without any problem,(...) I think they* [the representatives from each agency] *are not taking an active role in the project. We* [the NERC staff] *are proposing most of the agenda.*

Also, the Liaison Officer reported that she and the website manager had been making all the decisions.

Further, she described the reasons for the relatively passive participation:

> *First, I think that they expect us to be active. They believe that we were hired to do that job. I also believe that although everybody is a professional, people from our country are not proactive enough. Also, the project is not a priority for them.*

According to the NERC proposal "it was agreed by the member agencies that the project should be an explicitly interagency endeavor at the national level". In addition and despite the fact that NGO1 was the leading agency "the other ITEA member agencies must have a voice in the implementation of the project, particularly in ensuring that it meets their needs. This right comes with the responsibility of agencies to actively participate in that implementation" (NERC Project Proposal).

Interpreting the words of the Liaison Officer, it is clear that the rest of the ITEA agencies were not exercising their rights to propose their own ideas. There are two possible reasons for this behavior: (1) the project, as was presented, satisfied all agencies' requirements, or (2) the project represented extra work for already overworked IT staff. When asking about other issues, the Liaison Officer highlighted some institutionalized practices:

> *That culture of sharing and producing information is not something that you would find in the sector. It demands time and resources to produce information and the systematization is something new in most places. (...) For example, the people have not figured out the potential of having a public web page.*

According to the Liaison Officer, it seemed that local/regional offices still had some work to do on their internal procedures for generating content. When subjects from other agencies talked about the barriers they had varying views.

When asked about the issues that the NERC initiative had faced, a local IT representative from NGO2 stated, "I would have chosen a more well known technology. There are not too many people in [the country] that could offer support to that kind of system…" As was said before, the technological platform chosen was based on an Open Source Software that was not popular in the country but well-used by NGO1 at headquarters. Thus, technology choice, namely the decision to use PLONE, likely sparked some resistance by local agency users.

Further, a representative from NGO3, indicated that the poor decision-making procedures during the meetings were the biggest barrier. He described the problem as "Reunionitis." He stated "… there is the risk of having too many and too extended meetings (…) in the meetings the people do not specify, and we spend too much time trying to agree on something." According to Subject 3, the problem at the meetings was not caused by disagreements on core issues, but the practice of spending time on minor details.

In addition to the technical barriers and the decision-making procedures, both subjects talked about the issue of planning related to the amount of time that each agency could invest on the project. Subject 2 used his experience as example;

> *These initiatives* [such as the NERC] *are not scheduled on the agendas of most participants. For example, I have several projects here in the organization, at the local and the regional level. When I was asked to get involved in this project, I have to make room on my schedule to be able to participate. So I think, there should have been some pre-coordination work in order to plan this kind of activity within our annual schedule. Obviously, my case is not unique; most of the participants are in the same situation. Other than that, I have not seen any other issue in the project.*

Thus, Subject 2 identified time constraints as an issue, and categorized the problem as originated by a fault in the coordination process. Subject 3 also mentioned the lack of time as a barrier to honor NERC's commitments but justified this situation using the packed agenda of the agency.

> *Another obstacle is the lack of follow-though. Sometimes we all agree to have some product on a determined date, but some people do not do it. (...) I would say that the accumulation of activities of each agency could be a cause of this problem.*

Thus, the project experienced lower than expected participation which was likely due to a variety of factors including a lack of institutionalized practices for generating sharable content, resistance due to technology choice, poor meeting management, and a lack of time. Despite these, all subjects agreed that the NERC initiative was worthwhile and that the NERC staff's work was of very high quality.

4.2.3 Development: Second phase

In the beginning, the project experienced a challenge in finding support for the PLONE-based platform, as no Internet Service Provider (ISP) in the country offered the service. With the assistance of the PLONE community (http://plone.org), the NERC staff hired the services of a European ISP. This caused some delays in the development of the platform. However, on a more positive note, the foreign service was less expensive than domestic service would have been. By early September 2007 the NERC platform was operational. The next step consisted of

training agency personnel so they could add content to the platform.

The training sessions were scheduled to accommodate the availability of the agencies. The NERC's staff counted 54 users from participants' agencies and 50 users from the agencies' partners. Their goals, according to their operational plan, were to train at least 75 users, have 60% of those users adding content to the platform, and to have at least one user per agency with administrative expertise. The training sessions were carried out during the months of September, October, and part of November 2007. Although the NERC project was conceived as a six-month project, the ITEA-4 committee decided to extend the project for two more months.

The second interview with the Liaison Officer took place in the middle of October. The enthusiasm of the Officer seemed diminished, likely due to the lack of participation by the agency users: "Every day we understand better that the agencies did not have a lot of interest on this project. So, that is what is pushing back this thing. (…) On the other hand it is understandable; really they have a packed agenda."

The training sessions were seen as complex for two reasons; scheduling and content. According to the Liaison Officer,

> *The training activities also have been a problem. They don't have time, and we are asking for at least three hours for the induction. We hope that after that induction they would be able to contribute. (...) For example, today we had an appointment with XX agency and at the last minute it was cancelled. We already have all the logistics for the induction, but at the last moment it was cancelled. It has not been easy. (...) About the information, I have been really hard to get them to share it. I don't know if they don't have it or it is disorganized. But we have not been successful in making them post at least the minimum information.*

The Liaison Officer mentioned the time factor and agencies' apathy as the main problems. Also the issue of poor information management practices was again cited as an issue. The Officer mentioned how even those who were already trained failed to post even the most basic information, such as geographical presence, agencies projects, or contact information. In addition, "[E]ven when we insisted, their answers were: we don"t have time, the person in charge is not here, or that is too much information."

The Liaison Officer also indicated problems with the profile of the personnel involved in the project and their technological capacities. According to the Liaison Officer, on some occasions the people invited to participate in the project did not have access to the most valuable information. In addition, the people that could add important knowledge to the system, field people, did not have the time to do it. For the Liaison Officer, "office" people that felt comfortable with the training "can use the tool without problems, but they don't have the required data. And the people that have the data, people from the field, have low technological profile and don't have access to the Internet. (…) And of course, these people [field people] would have more information to share." To illustrate the point, the Liaison Officer narrated an anecdote,

> *Someone in a meeting told me: "If the people that you want to work on the platform are people in the field, they are not seated at a desk. They are in the field organizing communities, empowering the communities. These people do not take more than one day for desk businesses, and that day is saturated with prior administrative duties."*

According to the Liaison Officer, external factors such as (1) emergencies in the country, (2) changes in the government, (3) the coming end of the year, and (4) coming elections, also have affected the project in a negative way. The participation of the government representatives was especially disrupted by several events: national emergencies required government officials to focus on other projects; the changes in the government resulted in replacements of the government officials working since the beginning of the project; and the coming end of the year as characterized by holidays, vacations and a significant lack of attention to work and elections reduced the enthusiasm of the government officials given the political uncertainty that those events brought.

The issue of inadequate information management procedures on the part of the agencies was brought up again during the interview: "They have not understood that this [the platform] is not a site for consulting, but a site for work. (…) The people do not have a culture of generating content; they are used to going to web sites only to download information."

Finally the Liaison Officer questioned the initiative, "I have discussed with my partner: Why did they get involved in this project if really they did not have the time, if they were not able to dedicate themselves 100% to it? Why did they do it?" Later, the Liaison Officer provided another anecdote that seems to answer part of the question. There is the possibility that the agencies were not mature enough as a community to go ahead with an initiative such as NERC.

> *A person from the agency* [NGO1] *with years of experience told me: "We, in a Central American country, have been getting together for three or four years trying to create a common agenda among several agencies. We have achieved little things. We have gotten some concrete outputs. But even after*

almost four years of work, we have not seen the need of a platform like this. Now, you are creating the platform in order to create the community, so I think that it is a wrong approach."

4.3 Evaluation

The evaluation of the system took the form of an event. The event gathered 88 people in a convention center in the Country's capital city. The list of participants included all the directors of the ITEA-4 related agencies, personnel and partners of the agencies, observers from more than twelve other humanitarian and relief agencies, and personnel from CNCD (the government body for the coordination of disasters). The organizers divided the audience into four groups using the aforementioned typology. Each group was assigned a specific set of activities, and the organizers (mainly NGO1 personnel) drew some conclusions. The report of the evaluation activities generated by NGO1 reflects the level of user acceptance as follows:

The NERC platform, although it is a relatively new tool, has acceptance among the users. The process has brought a novel, high quality, and effective platform. The fact that the platform exists is an achievement by itself.

The platform is so obviously valuable, it does not need to be discussed. (NERC Evaluation Report, 2007)

Nevertheless, the evaluation was helpful in pointing out the issues that the project faced.

There is a perception that in some cases the agencies did not give the attention required by the platform. About that, it was indicated that there were special situations that did not allow a more focused effort. The condition that the agencies were not able to make decisions on institutional affairs, the lack of technical knowledge about PLONE, and the fact that the platform was not considered a priority during 2007 were some of the issues. (NERC Evaluation Report, 2007)

During the exercises, it was obvious that the majority of agency personnel had no familiarity with the use of the platform (with the exception of those directly related with the project). Despite this, during and after the exercises, the agencies were moved to promise to adopt the platform as an intra-agency communication tool, and to devote themselves to the addition of content to improve the platform.

After the exercise, we were able to interview the ITEA coordinating body headquarters leader of the project, a person appointed by consensus among the participating NGOs and working for NGO1. He gave us another view of the objectives of the platform and the results from the evaluation event. He explained the two levels of expectations the stakeholders had at the beginning of the project:

At first, they expected to get a concrete, practical good, some kind of direct benefit. What is the most direct form of benefit that this kind of collaboration platform will provide for them (…). The second point, I think is a more nebulous idea, they thought that somehow building networks would help them in the future. My overriding impression from my meetings in [the country] *was very positive.*

Although the ITEA coordinating body headquarters leader was very positive about the outcome of the initiative, he acknowledged one of the problems described by the Liaison Officer and other Subjects. For him it was clear that the planning of similar initiatives should involve the local/regional offices to a greater extant. He stated, "the single biggest issue, historically of this and the other ITEA groups, was that they were essentially designated. In other words, the decisions were not made at the country level". As he observed:

At the beginning, I think they felt that they had this thrust upon them. Rather than making an active decision by themselves to be part of this project, they received instructions from the head offices [or their international NGOs] that they would be participating in this, and that is an important lesson for us. That is something that we are changing completely in the second phase. In the future, potential consultants in countries such as the one in [country in Central America] must jointly apply and must indicate their willingness and interest in becoming a part of the [project].

So we flipped around if you like. Instead of having the center designating, we are encouraging expressions of interest from the field.

The new policy, according the ITEA coordinating body headquarters leader, will propose projects to the field offices, and they will decide if they want to participate or not.

5 Discussion

The development of information systems for disaster management, as well as in many other domains, is increasingly being undertaken in contexts defined by multi-level, multi-organizational governance. Despite this trend little is known about the effects of these governance arrangements on information systems project processes and

outcomes. Whereas such initiatives may face resistance in the for-profit sector as competitive pressures create challenges for collaborative systems, in the non-profit sector there is a great incentive for collaborative systems. Thus, despite the fact that NGOs compete for donor dollars, collaborative systems that provide more efficient and effective help to beneficiaries generate a common benefit for all agencies.

The case of NERC is a perfect example of the demand and desire for collaborative information systems across organizations, across hierarchical levels, across stages of development and across technologies, and the complexities associated with the development and deployment of such a system. After Hurricane Stan in 2005 the providers of disaster relief in this Central American Country including international and local NGOs and governmental agencies, identified response problems as, in part, informational problems. Simultaneously, the donors and leaders of international NGOs also demanded increased levels of accountability in terms of dollars spent, services provided and goods delivered. This was also framed as an informational problem. Thus the informational problem was simultaneously defined at both the headquarters and country level, suggesting a multi-level informational problem.

The complexities of multi-level, multi-organization collaboration are depicted in Fig. 2. The hub of the wheel represents the collaborative system itself, the artifact. The spokes of the wheel represent the individual, autonomous organizations (NGOs) participating in the ITEA and NERC development. Each of these spokes is multi-leveled, representing both the headquarters and country levels within each organization. The double, concentric circles represent the coordinating bodies, the outer being the ITEA headquarters-level body and the inner being the in-country NERC development coordinating body. Through this figure it is possible to visualize both the coordination across levels and organizations and envision the potential advantages and disadvantages this might offer to collaborative information systems development efforts like NERC.

Drawing from our case study data of the NERC initiative, we can elaborate further on the four propositions introduced at the beginning of this paper.

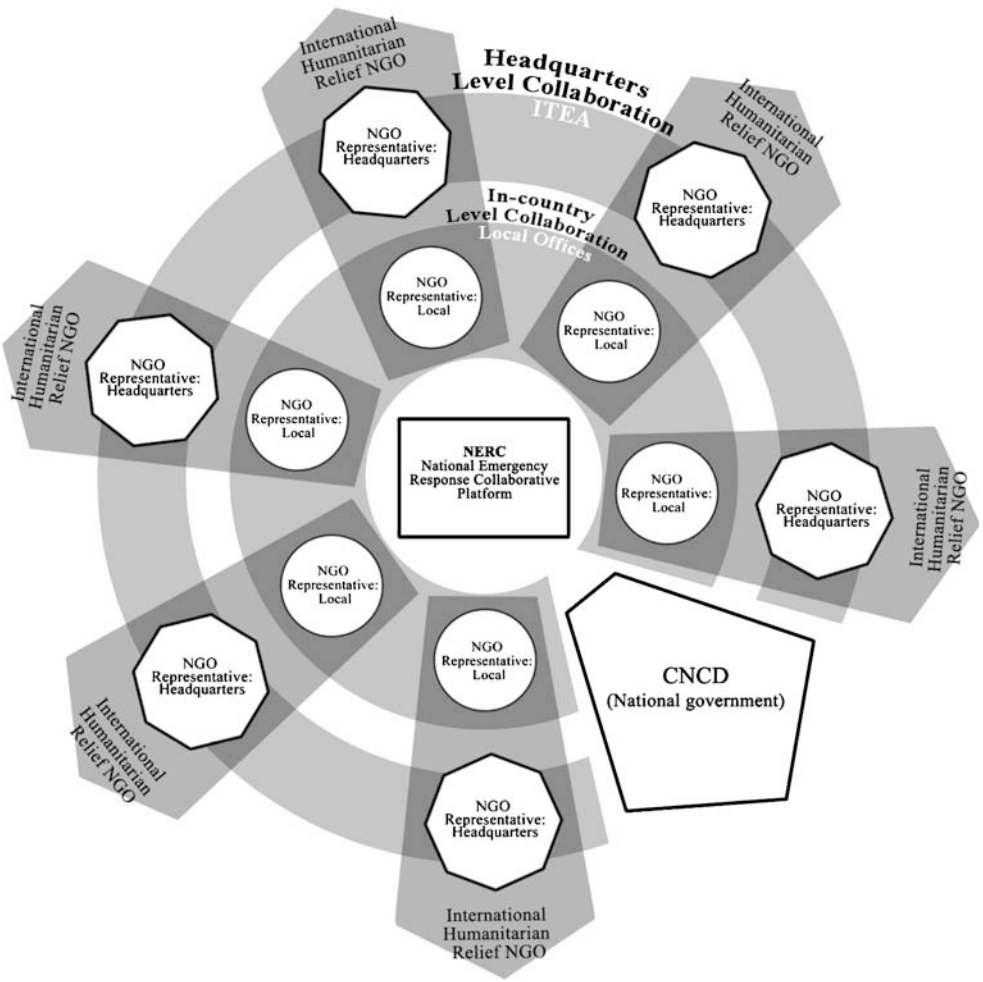

Fig. 2 NERC: Multi-level and multi organizational IS coordination

P1: Multi-level governance separates authority from the local context, thereby creating challenges for local collaboration.

The NERC case study provides data that support this proposition and finds that the multi-level governance contributed to a lack of awareness of the local context and operating conditions with three specific outcomes related to planning activities. In particular, the ignorance of headquarters' staff led to planning activities that (1) did not fit the agenda/priorities of the agencies, (2) required information-related procedures that were unfamiliar to the agencies, and (3) required extra effort for field people. These circumstances became natural challenges for the initiative. While the original desire for a collaborative disaster response information system may have originated with the Central American Country in question after Hurricane Stan, nearly all decisions to create NERC and the form it would take were made outside the country, at the headquarters level, by NGO1. NERC became a top-down initiative in which local participation was mandated by parent NGOs as well as the ITEA. The mandatory nature of the collaboration led to both apathy and resistance on the part of the local agency representatives, forcing NERC staff into the role of persuader, recruiter and marketer, cajoling the other agencies' participation in the project.

P2: Multi-level governance separates authority from the local context, thereby providing an impetus for local collaboration.

As may exist in any organization, being removed from day-to-day operations can help foster long term vision. Accordingly, with the local authority focused on local, individual issues, the incentive to undertake projects to foster collaboration is minimal. Collaborative practices arise at specific moments, where the needs exceed agencies' individual capacities (this is especially true in the field). Although these practices have their value, they are isolated and do not contribute to a permanent and systematic collaborative environment. On the other hand, authority occupying positions in the organizations with responsibilities for strategic planning could have a long-term view, and they are able to conceive plans to foster more solid forms of collaboration.

Although this proposition could seem contradictory with the first one, they are not. They are complementary. High-level authorities with a good understanding of the situation in the local offices (proposition one) might find opportunities to collaborate that are not evident to local agencies. If the local agencies realized the value of the collaborative activities, they might become more receptive to the project.

This is exactly the case with NERC. In all of the interviews with local agency staff and NERC staff, the issue of time pressure and overwork were brought up as barriers to participation. All representatives stated that they were very focused on their day-to-day activities within the silos of their organizations and had no time to devote to external efforts like collaboration. In essence they were focused on the details of their work, not the big picture of the overall problem they were trying to solve. This all changed at the final NERC evaluation event. All participating agencies expressed overwhelming, universal support for the collaborative NERC project and promised to contribute actively to populating the system. All agreed that the NERC system was a solution to a problem for all agencies, and for the country in question. In the case of NERC, without the strategic thinking and the coercion from outside the country the local offices might never have truly seen the value of the NERC system. In this case, the initial coercion subsequently generated enthusiasm for the collaborative initiative.

However, while mandates from higher levels can provide an impetus for local collaboration, the real problem is how to create the circumstances that make sustainable incentives for collaboration at lower levels. The first requirement to achieve this situation is to take into account proposition one, namely the active participation of local actors from the outset. From there, the remaining factors are primarily those concerned with the planning and development of the project.

P3: Multi-level governance provides access to resources available beyond the local context thereby facilitating collaboration.

There is no way to know if the local agencies participating in the initiative could have launched a project such as NERC by themselves. Considering the high workload and the inward focus of most of the local NGO representatives, it is unlikely that any of these local offices could have provided the human and technological resources needed to develop this or any IS project (see Standing et al. 2006). Resources both from the headquarters-level ITEA coordinating body and the headquarters-level for each individual NGO were essential to make NERC function. Scarcity of resources is a widely recognized barrier for the development of collaborative IS efforts.

The multi-level governance structure enabled interaction of the agencies with funding sources and local offices that would have been difficult otherwise. Local planning of a similar project would have involved budget arrangements between all the involved agencies. The feasibility of these events seems low. The ITEA, a headquarters-level coordinating body, effectively became a third party funding source for the collective aspects of the NERC project, while the 'in kind' resource contributions of the time of each agency's local staff were made individually. The

funding of the collective elements triggered the beginning of the project but was limited to the hiring of the NERC staff and the funding of the technological and user training components. Therefore, Proposition 3 is supported as the resources facilitated a large portion of the collaborative activity.

P4: Multi-level governance creates diverse information technology environments thereby creating challenges for co-development of information systems.

Although the use of different technologies could be a challenge for the development of a common information system, in the particular case of the NERC initiative the system used was not a significant problem. Although PLONE was not known by the technical personnel of most local agencies, and there were problems finding local providers that could support the platform, those issues were solved in a short period of time. In terms of the platform itself, it was decided that the tool would be web-based and thus not require any of the individual agencies to change their institutionalized standards or procedures. This choice facilitated involvement by lowering the barriers to participation. Hence we found little support for proposition 4.

The problems experienced with the tool/platform were not technological ones. Instead they were organizational and information management problems. The local agencies were not accustomed to sharing their information and had no operational mechanisms to do so. Each NGO was faced with the question of what to share, often confronted with fears of information errors and inaccuracy, intellectual property and data ownership issues, internal mismatched policies between headquarters and in-country offices in terms of sharing policies, and increased workload to put information in a form that was shareable. According to the interviews, people did not add content to the system due to a lack of time or a lack of organized information suitable for the system. That problem is not caused by the diversity of information technology environments, but for the absence of guidelines for the selection, organization, and storage of data.

In the following paragraphs we discuss these findings in light of the literature we addressed in the earlier parts of this manuscript.

The decision making and control processes of the NERC initiative support our contention that the governance in multi-organizational humanitarian relief IS projects is best described by the theory of multi-level governance. In particular, the NERC project can be classified as type two multi-level governance (Bache and Flinders 2004), in which authority is exercised on the basis of a policy instead of individual, stable government/organization levels. This can be observed in the development of the initial guidelines for the NERC platform (the policy) by the ITEA representatives of each agency, which was then implemented by local agencies with the collaboration of a staff exclusively dedicated to the project. The governance was also emergent and flexible to entry and exit of organizational participants, as witnessed by the decline in participation of the government. This emergent and project/policy-specific governance arrangement can be contrasted with traditional single organization project governance, which, even if undertaken by temporary teams, occurs within the realm of well-established organizational governance mechanisms.

Further, since there was no single repository of authority, neither the actors nor the mechanisms of exercising control were evident. Multi-level governance was also distributed along multiple organizations, and those organizations were participating on a voluntary basis. Looking back at the literature concerning mechanisms of exercising control in IS development, most control efforts can be placed in three categories: ownership, resources and political control. Because of the multi-organizational and voluntary aspects of the NERC project, ownership was not a mechanism of control exerted on the development process (Balinga and Jaeger 1984). In addition, because the funding for the NERC project came from ITEA, a third party, coordinating body at the headquarters-level, there was also no clear use of funding or resources, such as the threat of reductions in future funding streams, as a mechanism of control over the NERC project (Ghoshal and Nohria, 1989). This leaves us with the third category of control mechanisms, political control mechanisms (see KIing 1980; Kling 1996; Markus1983) in which coercive and persuasive mechanisms were used both within NGOs and across them. Furthermore, multinational IT project manager literature suggests that the higher the availability of host country resources, which resulted from the transfer of funds from ITEA to NERC, increases the likelihood of use of informal control mechanisms (Rao et al. 2007).

This authority exercised during the development of the project relied on mechanisms that we have deemed coercive and persuasive. It is coercive in that at the headquarters level for each individual NGO required the in-country representatives to participate in the NERC project. Effectively, they were ordered to participate by their organizational leadership. However, because of the remoteness of that leadership and the lack of sanctions for non-compliance, most local NGO representatives chose not to participate fully. Intra-organizational coercion was met with resistance and apathy. However, local NERC staff strongly encouraged the participation of local agency staff, regardless of their coercive relationship with their headquarters. The NERC staff employed persuasion and peer pressure during face to face and phone meetings to enlist the participation of the agency representatives. Ironically, it was at the final NERC evaluation event in which all agency representatives were pressured to attend and use the NERC system that they

became willing participants and saw the true value of the system. This dual nature of control, combining intra-organizational coercion with inter-organizational persuasion, is similar to the institutional duality (Kostova and Roth 2002) by which foreign subsidiaries in a multinational corporation face isomorphic pressures from both the host country and the parent organization.

In examining the literature concerning goal conflict in information systems development, one might attribute the problems that arose in the collaborative NERC development to that of goal mismatch. The literature emphasizes that the differences between overarching goals and the goals of collaborating institutions (Hveinden 1994; Olson et al. 2001) as well as functional group conflicts (Lamp et al. 2003; Yeh and Tsai 2001) are the major causes of conflict in system development projects. However, this was not the case with NERC. Most conflicts were not around the goals of the NERC initiative. As a matter of fact, during the final NERC evaluation event the goals of the project were unilaterally supported across all organizations and all levels. The origin of the conflicts in NERC was about priority setting and timing. Hence, goal mismatch is not a useful construct in describing the kind of conflicts found in NERC case. Headquarters and local offices agreed on the goals of the project (overarching and individual ones), but local offices were not prepared to carry out the tasks. Hence, different *prioritization* of goals in multi-level, multi-organizational structures is a source of conflict, as opposed to direct conflict of goals.

These findings suggest a theory of multi-level governance for collaborative information system development that upon further development can be used to explain and predict systems development success. The theory is inherently dynamic, recognizing that, for example, the initial outcome of coercion by higher levels of authority may be resistance however over time the outcome can change to compliance. Also, the theory recognizes that in a multi-level governance arrangement authority for a systems development project may be diffuse and may change. Further, the transfer of resources from higher to lower levels is key factor in multi-level governance for information system development as these resources help local organizations overcome resource constraints to collaboration. It may be critical to use those resources for collaborative elements such as to establish a local project manager, independent from the local collaborating organizations, and having a relationship with the higher levels. As such the third party can also reduce the demands put on individual organizations and can also fulfill reporting requirements for the project, providing a measure of accountability.

However, despite the availability of resources, not all projects will be successful and once again dynamic elements come into play. Whereas goal conflicts can plague a project, in multi-level governance outright goal mismatch is less likely to be a problem as interactions are occurring either at the same level (and hence similar contexts) across organizations, and in hierarchical systems within organizations. Hence, a greater level of goal alignment is likely to be achieved. However, *timing* is likely to be a greater issue as it requires a project to be at the top of all entities' lists of priorities in the same window of time. While less severe than a goal conflict, mismatched prioritization can delay projects.

This work is a significant departure from previous IS/IT governance research in that it is concerned with a multi-level, multi-organizational form of governance. While such forms are common in disaster relief systems and perhaps in the public sector, they differ from the single organization systems typically found in the private sector (save for vertical information systems). Further, as compared to prescriptions for IT governance for organizations with business units involved in joint ventures, which recommends a highly decentralized arrangement (Sambamurthy and Zmud 1999), here the evidence suggests that centralization at least to some degree provides two important incentives, namely resources and coercion. It is unclear the extent to which the provisioning of resources by higher levels of authority would influence actors in a for-profit environment where (at least as reflected in the IT/IS system development literature) resources do not appear to play a significant role in determining project success.

6 Conclusion

In the past several years the world has experienced several major natural disasters. These tragedies have highlighted the need for greater levels of collaboration in disaster response and humanitarian relief, particularly in the area of information and communication technologies (ICTs). One approach taken by non-governmental organizations (NGOs) has been to organize 'coordination bodies," whose goals are to improve the efficiency of ICT use in disaster relief through greater collaboration.

One example of these collaborative efforts is the development of disaster management systems developed and deployed in multi-organizational, multi-level environments. For international humanitarian relief these organizations include national, local and inter-governmental organizations, as well as local and international non-governmental organizations (NGOs). While research has examined the multi-organizational nature of disaster response and its implications for information systems, to date, less attention has been paid to their multi-level nature. This multi-level nature is particularly important in international

humanitarian relief, where organizations manage country or field offices from headquarters. These organizational structures of multi-level governance are defined by the level of (de)centralization of authority and decision making. Consequently, the co-development of information systems between international humanitarian relief organizations must contend with these multi-level governance issues.

This research sheds light on the implications that multi-level governance has for multi-organizational systems development in the domain of international humanitarian relief. This research finds that multi-level governance can both negatively and positively influence information systems development projects.

Whereas a headquarters-mandated collaboration project may initially face resistance from the field, over time the mandated collaboration may enable field organizations to overcome what otherwise might have been seen as insurmountable collective action challenges. In this way, coercion evolves into collaboration. While one would expect that with multi-level governance, coercion would generate only grudging participation, we found that coercion can lead to a collaborative effort. This transformation may originate in the fact that coercion provides the incentive for collaboration in those cases where no other incentives have been successful. Nevertheless, the evolution from coercion to collaboration is a process that happens over time, and it depends on the value the project presnts to its participants.

We speculate that this move from coercion to collaboration is especially salient in the arena of disaster response and humanitarian relief. Within the private sector coercion is expected, happens naturally and is directly tied to ownership and resource control. However in the arena of disaster response and humanitarian relief the concept and use of coercion is often distasteful. It is likely this is due to international NGO headquarters staff feel it is inappropriate to coerce those who are both disadvantaged in terms of resources and context but also are doing the "real" work of the organization. However, we believe that in this context, coercion may serve to prime the collaborative pump, bringing local NGOs together, outside of their inward-looking day-to-day activities, forcing them to think strategically across organizations to solve big problems.

There are two fundamental limitations to this study. The first is scale, being based on a single case study. While the case study provides significant validity in terms of providing in-depth and contextually based knowledge, it may lack generalizability. Future research demands that more collaborative IS projects be studied and compared, and, in particular, that they undertake systematic analyses to identify the circumstances in which coercion facilitates collaborative initiatives.

The second limitation is in terms of the nature of the project considered. The NERC project was focused on building a platform in which multiple organizations could share data. None of the core competencies, standards, operations or structures of the participating NGOs were challenged to change via participation in NERC. Participating agencies in future collaborative IS development efforts may behave very differently when individual organizational processes are challenged.

Finally, the research presented here is constrained to project development phase and should be extended to examine system use. In the future it is essential that research examine the effects of multi-level governance on system use. It must be asked whether systems built across organizations for the purpose of disaster and emergency response function better than those designed and managed centrally by a single organization. Such an investigation will help establish the extent to which collaborative efforts achieve their underlying goal, that of improved services for disaster relief.

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