Towards More Relevant Research on Humanitarian Disaster Management Coordination

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ABSTRACT

Humanitarian crisis require a responsive and agile response. The number of professional and volunteer organization involved in the response to humanitarian disasters has increased over the past year, making coordination more important than ever before. This paper discusses the main issues of Humanitarian Disaster Management (HDM) coordination and the different modes applied on the field. We argue that while these challenges have been addressed by scientific literature with dedicated solutions, there is still a considerable gap between humanitarian best practice and academic state of the art.

This paper proposes a field-oriented methodology to bridge this gap. We analyze the findings from field research on the Typhoon Haiyan response (Philippines, 2013) and deduce practitioners' requirements for HDM coordination support systems. Then we suggest a research agenda from a gap analysis comparing requirements with the existing solutions and the scientific approaches.

Keywords

Coordination, Disaster Management, Field-oriented research, Typhoon Haiyan

INTRODUCTION

Lack of coordination has often been listed as major challenge for efficient humanitarian disaster management (HDM) (Balcik et al., 2010). In large-scale sudden onset disasters, typically, several hundred humanitarian organizations are on site, and activities are not always coordinated between them. In addition, communication, information sharing, and division of work could be more performant.

Many coordination modes exist, ranging from self-organizing to centralized systems. There are many factors that contribute to coordination difficulties, like a high number and variety of actors, or the huge amount of information that is produced. The actors do not have the capacity to process it, so there is a lack of situational awareness (Comes and Van de Walle, 2013).

For over a decade, researchers have proposed solutions, tools and systems to improve coordination in HDM. In this field, developing quantitative decision-support systems is the most frequently-used research methodology (Galindo and

Batta, 2013). The problem is that when a crisis occurs, the environment changes so quickly and drastically that, most of the time, such systems are not agile enough. There is also the risk of adopting an inappropriate technology (Franko *et al.,* 2008). Consequently, few humanitarian organizations use such solutions, as they have no confidence on the usability or relevance.

It is clear that a real gap exists between HDM coordination research and the practices in the field. The most influential school of thought to bridge this gap proposes to develop more realistic research methodologies by considering real problems and real data, combining past and future trends (Galindo and Batta, 2013). Landgren (2010) defined a radical research approach that "embeds the idea of already being highly connected to a range of response organizations before a major event happens".

This paper tackles this challenging issue by proposing an original methodology to support the design of such realistic research on HDM coordination.

This paper is divided into four main parts. First, we will provide a literature overview on coordination issues in HDM to frame the research purpose, revealing a lack of practically relevant research. In a second section, a field-oriented research methodology will be formalized. The third section will be devoted to the application of the proposal to the 2013 Typhoon Haiyan. We draw conclusions and discuss perspectives in the fourth and last section.

RESEARCH POSITIONING

HDM Coordination Issues

Malone and Crowsten (1994) have stressed the difficulty of defining coordination and also the variety of possible starting points for studying the concept. Coordination in HDM context can be defined as the relationship and interactions among different actors operating within the relief environment (Balcik et al., 2010) and in disaster response takes place in various levels:

- *Intra-Organizational Coordination* concerns the internal relationships and interactions within an organization. The organizational structure is a key element.
- *Inter-Organizational Coordination* concerns the coordination between organizations at national (field) and international (headquarter) level. As illustrated in Figure 1, there are many elements limiting the possibility of having a clear coordination framework wherever and whenever a disaster strikes because
    - The large number and diversity of organizations turn the relations to be managed into a complex network;
    - The incentives of actors vary as a crisis evolves as well as from one crisis to another;
    - Procedures, tools and methods are not interoperable;
    - The allocation of costs, benefits and risk is often unbalanced.

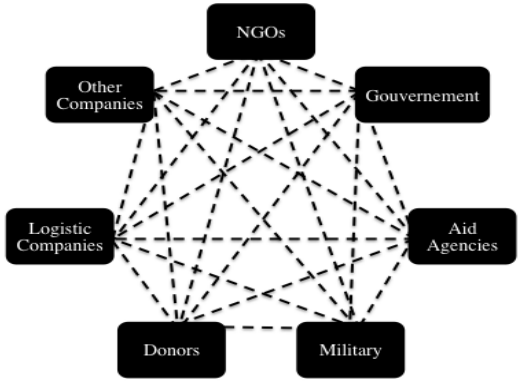

Figure 1 Horizontal coordination complexity (Cozzolino et al., 2012)

Basically, both types of HDM coordination result in complex and dynamic systems. Charles and Lauras (2010) have demonstrated that HDM coordination should have three complementary properties to be effective:

- Balancing: mobilize and properly allocate funds and skills for different crises at a given time;
- Synchronization: guarantee coherence and efficiency of relief operations;
- Training: facilitate the empowerment amongst network members and the implementation of best practices.

Some initiatives have already been developed by HDM practitioners to improve coordination. The most well-known is the humanitarian Cluster Approach. Clusters are groups of humanitarian organizations, both UN and non-UN agencies, in each of the main sectors of humanitarian action, e.g. shelter, health and logistics. One of the core functions of a cluster at country-level is to inform strategic decision-making, coordination of needs assessment, gap analysis and prioritization (UN OCHA, 2014).

Not all organizations join the UN cluster system, because they feel that this is contradictory with the humanitarian principles of independence, impartiality, and neutrality (Humphries, 2013). Other reasons are performance, most notably the overhead and lack of agility. Delaunay, the MSF-USA Executive Director, declared in 2012, "*Coordination should not be an end. It should be a means and too often, especially what we have learned over the years in emergency situations, the coordination mechanism itself is an obstacle to intervene. It slows down the process*" (Labbé, 2012).

HDM Coordination Research Background

In the extant HDM literature, three main categories of research approaches can be distinguished.

Firstly, as shown by (Galindo and Batta, 2013) the great majority of HDM coordination papers are use-case oriented. These contributions aim to explain the main difficulties of HDM organizations during the response (descriptive). Most of these contributions are based on a posteriori analysis of large-scale disasters. Thus, the data is usually collected few months after the end of the response and the most critical shortcomings are revealed. Landgren (2010) highlight that one of the key aspects missing in this approach is the temporal aspect to adopt a design perspective.

Secondly, other contributions focus on the design of HDM decision support systems (Van de Walle and Turoff, 2008). In this category, we find numerous contributions dedicated to relief supply chains (design and management). The main objective is to facilitate the coordination capabilities and improve the overall performance (Rongier et al., 2012; Macé Ramète et al., 2012). Nevertheless, most of these contributions are not commonly used on the HDM field because they do not responds to the constraints of time pressure, limited resources, high staff turnover, or limited funding (Altay and Green, 2006). Galindo and Batta (2013) complete this analysis by exposing the too unrealistic, too simplistic, too deterministic, and too static of a nature of a majority of the proposed decision support systems.

Thirdly, more and more research contributions in HDM stem from Computer Sciences. The traditional predetermined workflows and disaster plans are not enough to support coordination in emergency response as shown by Yu and Cai (2012). The performance of the response is contingent to knowledge integration, situation awareness and adaptation capabilities (Faraj and Xiao, 2006). To address this problem few researchers have proposed using new information technologies such as Service-Oriented or Event-Driven Architecture and Cloud-Computing (Yu and Cai, 2012). Particularly, they underline that the use of an event-based approach offers a high potential for coordination support in emergency response operations (Pottebaum et al., 2011). Although these approaches are promising, this relatively new field still requires further research to provide reliable and stable support.

Across approaches, and despite an extensive body of literature, there is a gap that separates today's academics and practitioners in HDM coordination.

Research Statement

Considering all previous elements, it appears that HDM organizations have to improve their coordination capabilities to be more efficient. There is a lack of inter- and intra-coordination, particularly in the initial response phase. Moreover, the literature review highlights the lack of practical relevance and applicability of current research.

The objective of this research is to contribute to bridging this gap by proposing a field-oriented research methodology targeted at identifying future research guidelines on HDM coordination support systems.

RESEARCH PROPOSITION

Research Scope

We consider here only the response phase of sudden-onset disasters. Further research will cover the HDM coordination issue for slow-onset and conflict disasters, where the coordination issues are not exactly the same.

Research Proposition

The proposed methodology is divided into two steps, summarized in Figure 2. The first step consists in directly collecting data onsite to capture 'live' all relevant characteristics and properties of the response. Often, researchers tend to abstract and simplify in their models. The reality of HDM coordination, however, is a maze of details and sensitivities that need to be taken into account. Our main assumption is that model or theory building can be improved a lot by an understanding of the full complexity. Practically, this step requires researchers to conduct field research during the disaster response. Basically, academics need to be very responsive to organize and deploy in such a program; because of the short time pre-existing methodologies need to be adapted and recombined instead of developing new ones (Chan and Comes, 2014). During this step, the researchers have to extract the HDM organization requirements and understand the most important challenges to suggest steps towards an improvement of coordination capabilities. Actually, as Van de Walle and Comes (2014) show, HDM organizations are not able to do that by themselves because a lack of time to develop deep analysis or understanding of the situation and important trends.

The second step consists in analyzing all the collected information with respect to academic literature and professional practices. This gap analysis should allow:

- Extracting a relevant research agenda on the studied topic (HDM coordination). By construction this agenda should fit with practitioners' expectations and needs while constituting a valid scientific contribution.
- Disseminating more efficiently the existing tools and methods that fit the current needs of HDM professionals. The current proposition should allow associating concrete field needs with state-of-the-art in HDM coordination. As Galindo and Batta (2013) showed, HDM practitioners often are not aware of the potential contributions of research.

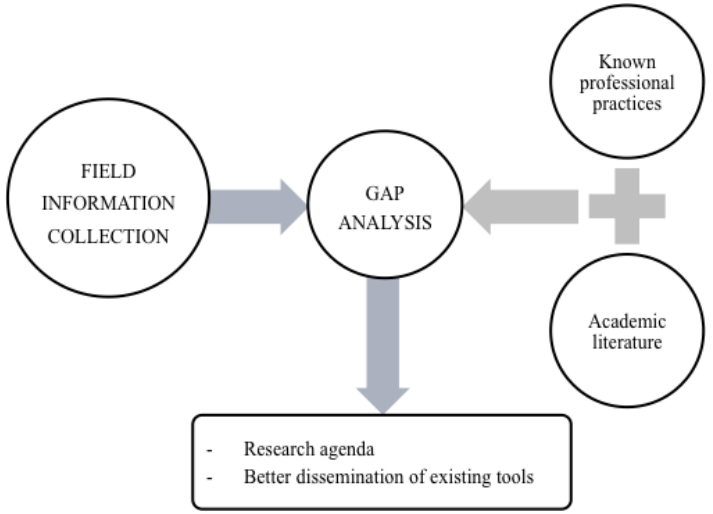

Figure 2 Proposed methodology

APPLICATION TO THE HAIYAN DISASTER

Our approach has been tested during the response to Typhoon Haiyan (Yolanda), a Level 3 disaster that hit the Philippines on 8th November 2013, affecting more than 14 million people (UN OCHA, 2014). The humanitarian response involved a large number of organizations that created networks at different levels: local, provincial, national and international.

Step 1: Gathering the needs and requirements

Field Research Organization

A multidisciplinary team from the Disaster Resilience Lab (DRL) embarked in December 2013 to investigate Information Management and Decision Making (Chan and Comes, 2014), with an emphasis of the HDM coordination. The field investigation was based on interviewing practitioners from different NGOs, most of them coordinating within the UN cluster system.

HDM Coordination Needs and Requirements

It was apparent that information overload and many data collection efforts brought redundancy and duplication of efforts for practitioners. Additionally, it became difficult to pinpoint information that addressed specific needs, or on near real-time basis (for more details see Van de Walle and Comes, 2014). Extrapolating from the findings in Haiyan we can derive four key requirements.

Future HDM coordination systems should:

(1) Facilitate information acquisition and interpretation, and be interoperable between the many organizations and actors involved;

(2) Support decision making to understand emerging risks and share information about them in due time and accessible format, to improve agility;

(3) Support reassigning decision power to where the action takes place, but also the reverse flow of accountability and status information upward and sideways throughout any responding organization;

(4) Systematically identify and reveal information that has the most significant implications for disaster response.

Step 2: Gap Analysis

Regarding the previous requirements, we have studied scientific literature and field practices in order to find potential existing solutions. Humanitarian organizations are already using many tools to support HDM coordination. These tools are tailored to support specific functionalities, and we classify them here into two main families: Disaster Information Management Systems (DIMS) and the Humanitarian Supply Chain Support Systems (HSCSS).

DIMS support collecting and distributing information. A representative example is 'Reliefweb.org', which is an internet platform dedicated to information sharing in humanitarian disasters, basically providing a data warehouse, bringing together situation reports, maps and analyses from a plethora of organizations. Other platforms provide more specialized types of information or products (such as maps provided by MapAction or the Humanitarian OpenStreetMap Team). Most of these information products are meant to support coordination by providing information about humanitarian needs or the activities of responders (e.g., 3W maps). Another kind of DIMS is project management oriented, like Sigmah 2.0, a document management web tool for intra-organizational coordination which provides functions like: monitoring project progress and funding; creating, sharing, analyzing and mapping indicators for monitoring and assessment; or centralizing project documents (Sarrat and de Geoffroy, 2011).

In general, DIMS meet part of requirements presented in 'step 1', but there is a lack of interoperability (no standards to exchange information between systems) and they have a poor added value regarding the selection and the use of relevant information.

Concerning HSCSS, most of them are inspired by commercial solutions (Blecken et al., 2008). An example is the Supply Chain Management tool that MSF developed recently to improve material and financial information flows between its various operational levels; one of the authors has been involved in the development and roll-out with the MSF Brussels International Office. MSF relies on a decentralized decision making organization, composed of 5 Operational Centers (OCs). Each OC deals with different geographical areas. Several European and Regional Supply Centers, strategic pre-positioned emergency stocks, and external suppliers provide material. The solution chosen is based on OpenERP (web application). The main benefit is that instances can work offline and synchronize despite poor Internet connection. This system has been designed for MSF's regular operations in slow-onset disasters. Since in these settings, country coordination and relief projects have time to anticipate the needs, standard business processes are applied.

The challenges for HSCSS are:

- During emergency operations, standard business processes are shortcut (also in the system), so the information is not available or not processed in due time, impeding monitoring and planning, and often resulting in push-based strategies.
- Since there are no standards for sharing information or synchronize processes (or activities) across organizations, inter-organizational coordination is difficult.

Let's now move to academic contributions. Many authors reported on successful cases of collaboration networks like partnerships with private Supply Chain companies, and listed some potential enablers (still missing in practice), like the "Support of adequate Information Management" (Charles et al., 2010),

One trend in literature is the development of an "added-value" for HDM coordination support systems. HDM coordination publications for the response phase have recently increased (Kunz and Reiner, 2013). This is notably the case within the ISCRAM community in which the number of papers on this subject has considerably increased during the last five years (www.iscramlive.org). Amongst others, simulation and modeling approaches (Calderon et al. 2014), and cases and prototypes were presented (Rongier et al. 2012, Macé Ramète et al., 2012).

All contributions acknowledge partially the requirements in 'step 1' concerning interoperability or detection of emerging risks, but further work is required to turn these approaches into mature methods or products, accessible and helpful for practitioners.

Research Agenda for HDM Coordination

Based on the previous gap analysis, we have extracted key topics researchers should explore in the near future to improve HDM coordination capabilities. Actually, all topics correspond to an articulated expectation from the field and provide a scientific added value, as for the moment no or very few approaches have been developed in a HDM context.

1. Developing *Interoperability Systems* dedicated to HDM issues. HDM organizations use more and more IT systems, but those are mostly specific to each organization. Consequently, systems need to be developed that ensure interoperability to support coordination efficiently. This includes the following capacities:

- Acquire, interpret and share information between actors;
- Real time risk identification to support operational decision-making;
- Distribution of decision-power and reverse information flows;
- Highlight crucial decision-making information as a dynamic process.

2. Using the potential of *Big Data*. As for any business sector, humanitarians can access a lot of information from Internet, IT systems, Social Networks, etc. This impressive mass of data is currently not fully exploited by practitioners during the response while this could be very useful particularly to get local information in near real-time. Consequently, we suggest that systems should be able to:

- Increase the reliability of information by eliminating superfluous, inaccurate or irrelevant information;

- Automate analyses to interpret raw data;
- Reduce the time of information transmission between devices, stakeholders and decision-makers by spreading the right information to the right person at the right time.

3. Design and control of *Collaborative Business Processes* of the response. Basically, up to now, each HDM organization follows its own instructions and processes to respond. The problem is the lack of coherence and synchronization across processes. That is why researchers should investigate the ways to design and control relevant, efficient, responsive and effective collaborative business processes in order to avoid this limitation.

4. Proposing concrete *Agile Coordination Systems* able to detect quickly (in real-time or by anticipation) potential failures in the response, and adapt it in real time This is maybe the most important limitation in the current scientific propositions as they are almost always static. The reality of the field is a continuous adaptation of the environment, the information about it, and consequently the decisions and actions taken. While the experience of practitioners is a most crucial resource to respond to humanitarian disasters, it is clear that the growing complexity of disasters however requires the further use of DIMS and HCSS.

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