Beyond the Myth of Control: toward network switching in disaster management

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ABSTRACT

A novel, '*net-centric'* approach to disaster management is challenging traditional forms of command and control, through technology-supported, self-directed networks of heterogeneous stakeholders including affected citizens. Citizen involvement in crisis response can strengthen the resilience of local communities, and improve the relevance and delivery of response, evidenced by increasingly important Web2.0-based platforms. While netcentric responses show promise as a principle, it remains unclear how networks can be integrated in shared response infrastructures. We draw on the concepts of 'programming' and 'switching' to suggest a different perspective by which to explore the potential and consequences of interconnected networks. Finally, we propose a research agenda that can help identify and understand switching points in disaster response, comparing a weakly formalized management structure, but strong in citizen involvement, with a strongly formalized management structure, but weak in citizen involvement. We thereby suggest how response organizations can relinquish their reliance on control and command approaches, increasing their adaptive capacity to capitalize on citizen-based information.

KEYWORDS

Networks, Switching, Disaster Management, Humanitarian Response.

INTRODUCTION

Large-scale disasters have a huge impact on society. Managing responses to such situations is highly complex: it calls for coordination between dissimilar professional response organizations, each of whom is overly-focused on their own actions, but at the same time –independently and jointly– they need to collaborate with affected citizens (Comfort, 2007; Moynihan, 2009). Hurricane Katrina and the Haiti earthquake became classic examples of failing response management: coordination between the responders, relief workers and citizens occurred haphazardly if at all (Majchrzak et al., 2007; Curtis, 2008; Van de Walle and Dugdale, 2012).

In highly prepared Western countries, attention seems to be directed toward formal response structures and planned coordination; in contrast, in humanitarian contexts, formal governmental structures are often lacking or compromised (Smirl, 2008). Yet, the different contexts show a striking parallel: citizens increasingly organize, help themselves, and inform each other through Web2.0-based platforms, generating a bottom-up network of many-to-many information sharing (Roberts, 2011). This emergent network structure provides important additional resources, but at the same time it adds another layer to the established information streams, leading to a complex information ecology. To guide actions and weave together response initiatives, there is need for mechanisms that interconnect networks of local citizens, NGOs, and governmental bodies. However, understanding *how* such interconnection actually can be most easily be accomplished is still an open research issue (Majchrzak and More, 2010).

In this paper, we explore this gap between formal command and control, versus participatory and emergent networks. By zooming in on the interconnections between emergent and formalized response networks, we suggest that *net-centric* approaches can yield organizing principles for disaster response. Net-centric response is defined as the connecting of self-directed networks of heterogeneous stakeholders, within an environment

enabled by shared technological and organizational infrastructure (Abrams and Mark 2007; Von Lubitz et al., 2008). 'Net-centric' also acknowledges that citizen participation increasingly occurs in a number of networks simultaneously, including Web2.0 platforms or social media, and that these platforms need to be included for reliable and legitimate responses.

The potential of Web2.0 platforms is a widely recognized ISCRAM debate, in which the focus often lies on the analysis and mapping of delimited Web2.0 networks, related to single networks using specific technologies, such as Twitter use to map disasters (e.g. Zielinski, Middleton, Tokarchuk & Wang, 2013; Schaust, Walther, Kaisser, 2013). These analyses have provided critical insights into the functionality of such tools in crisis situations, and provide input for follow-up questions that consider the broader network landscape.

Disaster management is likely to change in view of upcoming many-to-many information streams, drawing more strongly on shared communication platforms that enable self-organization of affected communities. In fact, disaster response and humanitarian organizations are increasingly seeking to interconnect their existing response networks with emergent information streams. This is manifested by the increasing significance of citizen-based, Web2.0 platforms like Ushahidi (Roberts, 2011) or CrisisMappers (Meier, 2013), as well as by the rise of net-centric emergency management operations in among others the Netherlands (Boersma, Wagenaar & Wolbers, 2012). However, professional response organizations differ in their approach compared to citizen-led initiatives, and their capacity to deal with these different networks is a highly complex challenge.

This Work in Progress paper sets out a conceptual framework towards studying net-centric emergency response in Western and humanitarian contexts. Our aim is to show the necessity of such a research framework, outlining how it builds on recent debates at ISCRAM on Web2.0 platform use for disaster response. So doing, we aim to expose the potential and consequences of interconnected networks, and to debunk the myth of controlled response operations in today's networked environment.

THE MYTH OF CONTROL

The international disaster management literature has questioned the reliability and legitimation of formalized response organizations (Comfort, 2007). Response organizations typically organize their efforts in terms of the '3-C' emergency governance model. The assumption is that disasters cause 'Chaos', which can be put under 'Control', by a strict 'Command' structure (Quarantelli and Dynes, 1977). This control model has proven to be unrealistic decades ago (Dynes, 1994; Quarantelli, 1997). Disaster sociology vividly describes how governments tend to resort to means of control for protecting the established social structures and to restore public order (Quarantelli and Dynes, 1977; Tierney, et al. 2006). The paradoxical result is that the resilience of communities during disasters tends to be hampered, rather than supported by government responses, due to their quest for control (Solnit, 2010).

Research on emergency response shows that control and centralization is unrelated or even destructive to actual response capacity (Moynihan 2009). Moreover, Tierney et al. (2006) show that engaging in a militaristic command style of disaster response can literally have lethal consequences; for instance, citizens affected by Hurricane Katrina were symbolically regarded as the enemy that needed to be defeated, instead of victims that needed help (Curtis, 2008). This astonishing notion is well-illustrated by the title of a salient National Guard article, describing the military response to Katrina as: *'Troops begin combat operations'* (Chenelly, 2005; Tierney, et al., 2006).

We propose an alternative *'C3' model*, which comprises *networked* responses that include communities, instead of top-down, bureaucratic organizing. This alternative model is based on a '*continuation*' of societal and institutional structures after a disaster occurs, despite the severe pressure on these structures. In order to deal with the disaster effects, responses must be '*coordinated*' by different stakeholders, in '*cooperation*' with citizens (Dynes, 1994; Helsloot and Ruitenberg, 2004). This means stronger bottom-up involvement, local ownership, and participation (Telford and Cosgrave, 2007). Yet, how to best incorporate citizen participation and other stakeholders into a coordinated form of emergency response is still an open research and management issue (Majchrzak & More, 2010).

Recent discussions in disaster management indicate that merely confronting command and control (Quarantelli & Dynes, 1977) with coordination and cooperation approaches (Dynes, 1994) is too limited (Moynihan, 2008). Namely, both approaches have virtues and limitations. The command and control paradigm is known for its hierarchical decision capacities and clear role structures, and is a powerful instrument for accomplishing tasks characterized by repetition and uniformity. Yet, it insufficiently accounts for the decentralization and flexibility that are required during turbulent response operations, and increasingly so for the incorporation of Web2.0, citizen-based information streams. A virtue of the coordination and cooperation approach is its decentralized

flexibility, but it underestimates the consequences of slow consensus building in a turbulent environment where fast decisions are necessary to organize coherent and sustainable response operations (Moynihan, 2009).

Overall, despite its recognized limitations, the traditional 3-C governance model still dominates the disaster management agenda, partly because it is difficult to yield control (Tierney et al., 2006), and partly because the consequences of citizen participation and Web2.0 platforms remain unexplored (Roberts, 2011). Therefore we propose that it is relevant to consider an alternative, net-centric framework that is more comprehensive and less hierarchical.

ADAPTING TO VOLUNTARY ACTION IN MULTIPLE NETWORKS

During disasters, emergent and unforeseen collaborations appear, especially when demands are not met by existing response organizations, or when responses are insufficient or inappropriate (Drabek & McEntire, 2003). Emergent networks fill an important void that cannot be filled by command and control approaches to disaster response (Tierney et al., 2001). Namely, they comprise adaptive, networked partnerships that did not exist before the disaster struck, and can continuously adapt to an environment in flux. At the same time, emergent networks are also characterized by fleeting membership, dispersed leadership, unclear boundaries, and unstable task definitions (Majchrzak, et al. 2007). Moreover, these initiatives emerge in a situation where different types of networks co-occur. These networks have varying functions (e.g. logistical, neighborhood, institutional) and partly (re)organize in response to disaster, or are reconfigured by key emergent actors to interconnect with one another. Their initiatives are therefore difficult to recognize, govern and support from within existing response organizations. As a result, the functioning of distributed, emergent coordination is not yet fully understood (Topper & Carley, 1999).

A promising development to discover how and where emergent networks function and interact, is by following how their interactions occur, increasingly enabled through many-to-many, Web2.0 information sharing and communication platforms (Roberts, 2011). The self-contained, highly decentralized components of Web2.0 applications encourage individuals to not only passively accept information posted on web sites, but to contribute to them in ways that leverage the information (Majchrzak & More, 2010).

TOWARD NET-CENTRIC MANAGEMENT: THE ROLE OF SWITCHERS AND PROGRAMMERS

The rise of a variety of Web2.0 platforms points us toward an important notion that has not yet found its resonance in the debate at ISCRAM, namely the need to study the *interconnections* between multiple networks, thereby extending the prevalent orientation toward distinct (single types of) networks. In our focus on network interconnections, we draw on Castells' (1996) perspective on organizing principles of networks, whereby he indicates that distinct networks comprise their own logics and social systems thus comprise more than one relevant network. Consequently, where interconnections between networks occur, inevitably a tension between these logics is generated. Castells conceptualizes this tension as (positive of negative) power, which can flow from one network to the other. In this respect, the relevant networks and their interconnections within a social context –such as the complex domain of disaster management– becomes crucial, and rests on two capabilities. On the one hand, each network can be 'programmed' to a fuller or lesser degree, and on the other hand connected to other networks through 'switches' (Castells, 2009). Programming is *"the ability to constitute network(s), and to program/reprogram the network(s) in terms of the goals assigned to the network*" (Castells, 2009: 45). Switches "*connect and ensure the cooperation of different networks by sharing common goals and combining resources, while fending off competition from other networks by setting up strategic cooperation*" (ibid.).

When we translate Castells' notion to networks governance in the context of disaster management, we see that 'programming' and 'switching' become the crucial assets to develop. Indeed, these are key organizational (not technological) features of networking in the net-centric approach, based upon the acknowledgement that dealing with disaster management in today's interconnected world inevitably calls for a way of organizing that takes into account multiple networks.

CONTRIBUTIONS TO THEORY AND PRACTICE: A RESEARCH AGENDA

To discover the potential of net-centric governance toward more legitimate and reliable disaster response, our proposed framework involves acknowledging the differences between networks, their 'programs', and 'switching' between them. An important starting point is the vast array of evidence on disasters highlighting the convergence of emergent and unforeseen collaborations with official planned and response oriented networks, resulting in misunderstandings when these interconnections occur. These collaborations emerge in particular

when demands are not met by existing response organizations, or when responses are insufficient or inappropriate (Drabek and McEntire, 2003).

First, to discover how and where emergent communities function and interact, Web2.0 information sharing and communication platforms can provide useful information on the connections and 'programs' of these networks (O'Reilly, 2011). The self-contained, highly decentralized components of Web2.0 applications encourage individuals to consult information posted on websites, and to contribute to them in ways that can leverage information (Majchrzak and More, 2010). Moreover, actors engage within communities and groups they understand and know of. This opens a new spectrum of self-organized network governance because it makes actions and actors visible, allowing quick traces of information to be shared, and responses acknowledging and recognizing each other (Majchrzak and More, 2010). Thus, understanding the capacity and 'program' of networks that self-start into action is crucial for a robust response.

Second, the interconnection of different networks will enable response organizations and communities to interact, and will allow researchers to explore the information ecology and switching dynamics. Especially in the era of technological innovations, there is an urgent need to explore governance forms that better fit and support the dialogue in many-to-many, multi-layered information streams. Both existing (e.g. emergency response rooms) and spontaneous coordination points that arise when these official connections fail, are important nodes where switching takes place, and are therefore crucial research sites.

Third, our proposed netcentric framework requires disaster managers to develop *adaptive capacity* (Staber and Sydow, 2002) to govern heterogeneous networks. Since communities continuously adapt to an environment in flux, their initiatives are difficult to recognize, govern and support by formal response organizations (Majchrzak et al., 2007). Increased understanding of the 'program' robustness and the identification of critical 'switches' will help response organizations to understand the nature and content of information flows deriving from communicative practices. At the same time, it will also help them to include social network information in their operations, to chart patterns in information streams among and between different networks.

In sum, the net-centric framework provides the foundation for an important theoretical development and practical contribution, both for the researcher and the practitioner. Namely, exposing how response networks in participatory, citizen-based, versus over-regulated, controlled organizing contexts can join forces, creates an opportunity to generate a strengthened and flexible adaptive capacity toward meeting the demands of today's networked environment. Indeed, through our introduction of the netcentric framework, we hope to make some first steps toward a future-proof, network form of disaster management, yielding benefits to practitioners and managers across the spectrum of disaster response. The framework offers an alternative for response organizations to relinquish their reliance on control and command approaches, eventually increasing their adaptive capacity to capitalize on citizen-based information.

REFERENCES

1. Abrams, S. and G. Mark (2007). Network-Centricity. Hindered by Hierarchical Anchors. *Proceedings of the 2007 Symposium on computer human interaction for the management of information technology,* ACM: 1-9.
2. Boersma, K., Wagenaar, P. and J. Wolbers (2012). Negotiating the Trading Zone. Creating a Shared Information Infrastructure in the Dutch Public Safety Sector*, Journal of Homeland Security and Emergency Management,* 9(2): 1-25.
3. Castells M. (1996). *The rise of the Network Society*. Malden: Blackwell.
4. Castells M. (2009). Communication Power. Oxford, New York: Oxford University Press.
5. Chenelly, J.R. (2005). Troops begin Combat Operations, *Army Times*, issue of 4 September.
6. Comfort, L.K. (2007). Crisis Management in Hindsight: Cognition, Communication, Coordination, and Control. *Public Administration Review*, Special Issue: 189-197.
7. Curtis, R. (2008). Katrina and the waves: bad organization, natural evil or the State. *Culture and Organization*, 14(2): 113-133.
8. Drabek, T.E. and D.A. McEntire (2003). Emergent Phenomena and the sociology of disaster, *Disaster Prevention and Management*, 12(2): 97-112.
9. Dynes, R.R. (1994). Community emergency planning: False assumptions and inappropriate analogies. *International Journal of Mass Emergencies and Disasters*, 12: 141–158.

10. Helsloot, I. and A. Ruitenberg (2004). Citizen response to disasters: a survey of literature and some practical implications. *Journal of Contingencies and Crisis Management*, 12(3): 98-111.

11. Majchrzak, A., and P. H. B. More (2010). Emergency! Web 2.0 to the Rescue!, *Communications of the ACM*, 54(4): 125-132.

12. Majchrzak, A., Jarvenpaa, S.L. and A.B. Hollingshead (2007). Coordinating Expertise among Emergent Groups Responding to Disasters, *Organization Science*, 18(1): 147-161.

13. Meier, P. (2013). Opening Key Note Address at CrisisMappers 2013. *iRevolution Blog*: http://irevolution.net/2013/11/20/opening-keynote-crisismappers-2013/.

14. Moynihan, D.P. (2008). Combining Structural Forms in the Search for Policy Tools: Incident Command Systems in U.S. Crisis Management, *Governance*, 21(2): 205-229.

15. Moynihan, D.P. (2009). The network governance of crisis response: case studies of incident command systems. *Journal of Public Administration Research Theory*, 19: 895-915.

16. O'Reilly, T. (2011). Government as a Platform, *Innovations*, 6(1): 13-40.

17. Quarantelli, E.L. (1997). Ten criteria for evaluating the management of community disasters. *Disasters*, 21(1): 39-56.

18. Quarantelli, E.L. and R.R. Dynes (1977). Response to social crisis and disaster. *Annual Review of Sociology*, 3: 23-49.

19. Roberts, N.C. (2011). Beyond Smokestacks and Silos: Open-Source, Web-Enabled Coordination in Organizations and Networks, *Public Administration Review*, 71(5): 677-693.

20. Schaust, S., Walther, M., and M. Kaisser (2013). *Avalanche: Prepare, Manage, and Understand Crisis Situations Using Social Media Analytics*. Proceedings of the 10th International ISCRAM Conference, Baden-Baden, Germany. T. Comes, F. Friedrich, S. Fortier, J. Geldermann and T. Muller, eds.

21. Smirl, L. (2008). Building the other, constructing ourselves: spatial dimensions of international humanitarian response. *International Political Sociology*, 2(3): 236-253.

22. Solnit, R. (2010). *A paradise built in hell: The extraordinary communities that arise in disaster*. New York: Viking.

23. Staber, U. and J. Sydow (2002). Organizational Adaptive Capacity. A Structuration Perspective. *Journal of Management Inquiry*, 11(4): 408-424.

24. Telford, J., and J. Cosgrave (2007). The international humanitarian system and the 2004 Indian Ocean earthquake and tsunamis. *Disasters*, 31(1): 1-28.

25. Tierney, K.J., Bevc, C., and E. Kuligowski (2006). Metaphor Matters: Disaster Myths, Media Frames, and Their Consequences in Hurricane Katrina, *The ANNALS of the American Academy of Political and Social Science*, 604(1): 57-81.

26. Tierney, K.J., Lindell, M.K. and R.W. Perry (2001). *Facing the Unexpected. Disaster Preparedness and Response in the United States*, Joseph Henry Press, Washington.

27. Topper, C. M., and K.M. Carley (1999). A structural perspective on the emergence of network organizations. *Journal of Mathematical Sociology,* 24(1): 67-96.

28. Van de Walle, B. and J. Dugdale (2012). Information Management and Humanitarian Relief Coordination: Findings from the Haiti Earthquake Response. *International Journal for Business Continuity and Risk Management*, 3(4): 278–305.

29. Von Lubitz, D.K., Beakly, J.E. and F. Patricelli (2008). Disaster Management: the structure, function, and significance of network-centric operations, *Journal of Homeland Security and Emergency Management*, 5(1): 1-24.

30. Zielinski, A., Middleton, S. E., Tokarchuk, L., and X. Wang (2013). *A Fine-Grained Sentiment Analysis Approach for Detecting Crisis Related Microblogs*, Proceedings of the 10th International ISCRAM Conference, Baden-Baden, Germany, T. Comes, F. Friedrich, S. Fortier, J. Geldermann and T. Muller, eds.