Smart Governance
Part of the Social Infrastructure Agenda
Full Proposal 2014

Netherlands Organisation for Scientific Research
Social Sciences

REGISTRATION FORM (BASIC DATA)

1. Details of the main applicant (Principal Investigator)

Main applicant			
Name, title(s)	**Dr.ir. Kees Boersma**		male
Date of PhD	March 2002		
Position	associate professor		
End contract	tenured		
University	VU University Amsterdam		
Department	Organization Sciences	Section	Faculty of Social Sciences
Postal Address	De Boelelaan 1081	Zip/city	1081 HV Amsterdam
Telephone	020-5986769	E-mail	f.k.boersma@vu.nl

2. Details of the co-applicant(s)

Co-applicant			
Name, first name, title(s)	**Dr. Julie Ferguson**		female
University	VU University Amsterdam		
Department	Organization Sciences	Section	Faculty of Social Sciences
Envisaged role in the project	Daily supervisor / coordinator PhD project		

Co-applicant			
Name, first name, title(s)	**Prof.dr. Peter Groenewegen**		male
University	VU University Amsterdam		
Department	Organization Sciences	Section	Faculty of Social Sciences
Envisaged role in the project	Promotor		

Co-applicant			
Name, first name, title(s)	**Prof.dr. Arjen Boin**		male
University	Utrecht University		
Department	Utrecht University School of Governance (USG)	Section	Faculty of Law, Economics and Governance
Envisaged role in the project	Promotor		

Co-applicant			
Name, first name, title(s)	**Dr. Bartel van de Walle**		male
University	Tilburg University		
Department	Department of Information Management	Section	Tilburg School of Economics and Management
Envisaged role in the project	Daily supervisor / coordinator PhD project		

3. Details of the external partner(s)

External partner			
Organisation	**Instituut Fysieke Veiligheid (IFV), Project Netcentrisch Werken**		
Contact person		Position	Programmamanager Netcentrisch Werken
Envisaged benefit of the research	Contribution: IFV will contribute its knowledge of crisis management and citizen response to this project. The IFV project 'Netcentrisch Werken' is responsible for the implementation of a net-centric governance approach in the 25 Dutch Safety Regions. By participating in this research project they will be able to further validate their operations in the Netherlands. IFV's contribution to this project will be providing access to data, and expert views on the Dutch net-centric governance approach.		

External partner			
Organisation	**Veiligheidsregio (Safety Region) Groningen (VRG)**		
Contact person		Position	Directeur
Envisaged benefit of the research	Contribution: For the Veiligheidsregio Groningen it is important to participate in this project because the outcomes of the project will help VRG further develop and validate social media in use, to integrate citizen information in crisis management. The results will contribute to developing disaster and crisis management practice. VRG will contribute to this project with its knowledge on crisis management and provide access to data, for example data from the emergency response room (112).		

External partner			
Organisation	**Veiligheidsregio (Safety Region) Noord-Holland-Noord (VRNHN)**		
Contact person		Position	Directeur
Envisaged benefit of the research	Contribution: For the Veiligheidsregio Noord-Holland-Noord it is important to participate in this project, because it will allow VRNHN to further develop and validate its insights on how netcentric operations can enable a smooth exchange of information between first response organizations during mid-size crisis situations. VRNHN's contribution will be to provide access to data and to share its expertise in the contextual analysis of crisis situations.		

External partner			
Organisation	**Veiligheidsregio (Safety Region) Rotterdam Rijnmond (VRRR)**		
Contact person		Position	Director Risk and Crisis Management
Envisaged benefit of the research	Contribution: This project will provide the Veiligheidsregio Rotterdam-Rijnmond new insights on how net-centric operations can enable a smooth exchange of information between first response organizations during crises. VRRR's contribution relates to providing access to data, in order to specifically generate understanding of how crisis management depends on multiple and layered information streams from different stakeholders, including professional response organizations, self-organizing communities, and citizens.		

External partner			
Organisation	**Veiligheidsregio (Safety Region) Utrecht (VRU)**		
Contact person		Position	General Manager
Envisaged benefit of the research	Contribution: For the Veiligheidsregio Utrecht it is important to participate in this project, investigating: 1) the international comparison between the various national capacities in crisis and humanitarian response; 2) the various forms and layeredness of control (in what we call 'higher and lower governance'); and 3) information streams and adaptive responses at times of crisis. VRU will provide access to data and support the project with its knowledge of crisis management and citizen response.		

External partner			
Organisation	**Cordaid**		
Contact person		Position	Director, Unit Disaster Risk Reduction & Disaster Response
Envisaged benefit of the research	Contribution: For Cordaid it is important to participate in this project on coordination and information management during emergency response operations. It will improve Cordaid's understanding of citizen participation in bottom-up and top-down processes of information management. Cordaid is specifically interested in investigating the use of innovative network approaches and ICT tools for data collection and information management in relief operations. Providing access to data and support of researchers during field work is part of the contribution.		

External partner			
Organisation	**Oxfam Novib**		
Contact person		Position	Humanitarian Director
Envisaged benefit of the research	Contribution: For Oxfam Novib it is important to participate in this project, investigating coordination and information management during humanitarian crises. Oxfam Novib expects that this research project will provide new insights about how networked operations will enable a smart(er) and thus more legitimate and reliable disaster response. In this project Oxfam Novib will share its expertise in collaboration practices with other NGOs, and in the use of social media by citizens, and how this information can be used in humanitarian response. Providing access to data and support of researchers during fieldwork is part of the contribution.		

External partner			
Organisation	**Dienst Landelijk Operationeel Centrum (DLOC) Politie**		
Contact person		Position	Hoofd Dienst
Envisaged benefit of the research	Contribution: For DLOC it is important to participate in this project, because it will contribute to developing the understanding of the various, heterogeneous flows of information including social media data (i.e. citizen involvement) that employees of the operational center have to deal with during crisis situations and emergencies. DLOC will provide access to data at its center, which is one of the main nodes in the Dutch national emergency response network. The involvement of dr. Jan Kees Schakel, one of its employees, will guarantee the dissemination of the project results at DLOC.		

The broad and committed consortium guarantees us access to relevant data, and provides us with expert views on the outcomes of the project, as well as supporting utilization and dissemination of generated knowledge to key beneficiaries.

For the project components covering emergency coordination in the Netherlands, we will work together with four *Safety Regions* that support our project, and one additional region that endorses it. Together, they cover the main (risk) characteristics in the Netherlands: rural/urban (Groningen, Brabant Zuidoost), coastal (Noord-Holland-Noord), urban/industrial (Rotterdam-Rijnmond, Utrecht). Our partner *Netcentrisch Werken* is a project organization of the *Netherlands Institute for Safety* (IFV), whose activities cover the total of 25 Netherlands safety regions. *DLOC* is a new and innovative national police coordination center that coordinates large-scale national level police activities and whose work complements the safety regions.

For the project components covering humanitarian relief, our partners *Cordaid* and *Oxfam Novib* are leading NGOs that are active around the world, and who are also both involved in the Collaborating Aid Agencies (SHO; with Cordaid currently acting as coordinator). They will provide access to their data and networks, and will also support and join us during fieldwork activities. For example, prior to this proposal deadline, members of our research team already joined Cordaid during first relief efforts to the Philippines typhoon Haiyan, to gather initial research data on-site. This part of the project is also endorsed by *Ushahidi* and *CrisisMappers*, both highly innovative and worldwide-renowned networks enabling crowdsourced crisis information sharing. These networks guarantee us access to their (Web 2.0) data, and will provide access to their own expertise, and where necessary their on-site partners' expertise, on humanitarian relief. Finally, the endorsement by *VNG International* guarantees dissemination of results to national and international governmental bodies in over 100 countries, and to the United Cities and Local Governments (UCLG) 'Local Government Disaster Management' unit.

Letters of endorsement:

- Veiligheidsregio Brabant Zuidoost: Jac Rooijmans, directeur;
- CrisisMappers: dr. Patrick Meier, co-founder and director;
- Ushahidi: dr. Chris Albon, director of data projects;
- Crisisplan BV, Consultancy, Training, Simulaties: Werner Overdijk, director;
- Vereniging Nederlandse Gemeenten (VNG) internationaal: Jaap Breugem.

Scientific Advisory Board:

- **Professor dr. Louise Comfort**, Director of the Center for Disaster Management, University of Pittsburg, Pennsylvania, USA;
- **Professor dr. Scott Poole,** Director of the Institute for Computing in the Humanities, Arts, and Social Sciences (I-CHASS), Department of Communication, University of Illinois at Urbana-Champaign, USA;
- **Dr. Patrick Meier**, Co-founder of Digital Humanitarian Network, Geneva, Switzerland; Director of Social Innovation at the Qatar Computing Research Institute; Director of CrisisMappers, USA;
- **Dr. Anouck Adrot**, Associate Professor Disaster Management, Institut Mines-Télécom, Université Paris-Dauphine, Paris, France;
- **Dr. David Allen**, Senior Lecturer, Leeds University Business School; Director of the AIMTech Research Group (Adaptation Information Management and Technology), UK;
- **Dr. Menno van Duin**, Lector Crisisbeheersing, Instituut Fysieke Veiligheid (IFV), the Netherlands.

The members of this multi-disciplinary scientific board will validate our data collection and analysis on an annual basis (e.g. in a Skype meeting). The board will provide a mid-term evaluation of the project (after the second year) to provide advice and expertise, and evaluate the project outcomes, utilization and dissemination throughout the project.

4. Main field of research

44.10.00 Public administration

Other fields:

37.20.00 Textual and content analysis

51.90.00 Development studies

5. Title of the proposal

Enhancing smart disaster governance: Assessing the potential of the net-centric approach.

6. Summary of the proposed research *(maximum 250 words).* Word count: 248.

This project will identify disaster response practices and conditions that can lead to net-centric governance. We define netcentric governance as the organization of a response to disasters by making use of self-directed networks of heterogeneous stakeholders, in an environment enabled by shared technological and organizational infrastructure. We will study whether net-centric governance offers an alternative for formal top-down command and control practices, by drawing on the potential of community networks.

Netcentric governance is studied in two different social contexts. Humanitarian work represents weak governmental response structures, but ample experience with social media. The Dutch context represents an over-regulated governmental response structure, but less experience with the use of social media in disaster response. Net-centric governance in these cases can support heterogeneous response networks, building on interconnected goals and ensuring better cooperation.

We will combine ethnographic studies with network analysis and semantic analysis, to understand response practices and to chart patterns in information streams among and between heterogeneous networks. The Safety Regions' project 'Netcentisch Werken' for crisis response in the Netherlands, and Ushahidi and CrisisMappers, citizen-based social media platforms in humanitarian relief as used by NGOs, provide the cases.

By analyzing the consequences of interconnecting response organizations with community networks, we will identify the possibilities of a more adaptive disaster governance. This project aims at developing principles of net-centric governance, to be implemented in both humanitarian and national disaster response. The project will contribute to a more legitimate and reliable, that is 'smart' disaster response to foster societal resilience.

7. Keywords

Disaster and crisis management, humanitarian response, information networks, net-centric governance, resilience, social media.

8. Planning of the proposed research

Envisaged start date: 1 October 2014
Envisaged end date: 1 October 2018

PAST PERFORMANCE AND PUBLICATIONS

9. Past performance of the applicants *(maximum 1200 words).* Word count: 1162.

Kees (F.K.) Boersma is *Associate Professor* in the Department of Organization Sciences of the *VU University Amsterdam*. He completed his PhD thesis at the Eindhoven University of Technology. His current research is about organization networks and strategies in the context of safety, crisis management and security. Subsidies and international networks (selection):

- From 2009 – 2013 he was Management Committee member and working group leader of the EU COST Action ISO807 Living in Surveillance Societies. Chair: prof. Webster;
- Visiting scholar in 2012 at the University of Illinois at Urbana/Champaign, USA, in the Department of Communication and the Institute for Computing in Humanities, Arts, and Social Sciences and fellow at the Illinois Fire Safety Institute (IFSI), Champaign Illinois;
- 2013: NWO Smart Governance Partnership Development. Co-applicants: dr. Ferguson, dr. Van de Walle, prof.dr. Groenewegen, prof.dr. Scott Poole: €20.000;
- 2011: Cultural change in crisis response organizations by the Platform Network-centric Operations (Crisisplein): €53.000;
- 2011: PhD project (funded by Thales): The influence of culture on multi-agency collaboration within the Dutch emergency management domain: €200.000;
- 2010: Project on Public Values in Mega Project by the consortium Next Generation Infrastructures. PI with prof.dr. Van Marrewijk: €260.000.

Dr. Boersma is group leader of AREA: Amsterdam Research on Emergency Administration (http://www.area-vu.nl), senior member of the Netherlands Institute of Governance (NIG) and senior editor of the *Journal of Contingencies and Crisis Management* (guest editor), *Organization Management Journal*, and the *International Journal of Emergency Services*. He is an active member of the international Information Systems for Crisis Response and Management (ISCRAM) Community; at the 2014 conference on *Empowering Citizens and Communities through Information Systems for Crisis Response and Management* he will join a panel on crisis, citizens and sensemaking. Website: www.keesboersma.com. Dr. Boersma is an expert in research on crisis management and networks; he also has previous experience in leading and managing projects such as at the (former) Department of Culture, Organization and Management at the VU, and as manager and group leader of a large-scale multiparty EU project.

Julie (J.E.) Ferguson is *Assistant Professor* of Organization Sciences, *VU University*. She has a PhD in Business Administration, and has extensive international experience through previous work at development organizations *Hivos* and the International Institute for Communication and Development (*IICD*). Her main research interests are ICT-enabled collaboration in heterogeneous, dispersed knowledge networks, particularly in development cooperation and emergency relief. She is a Research Associate of *Royal Holloway University of London ICT4D Collective* and member of *IFIP Working Group* on Social Implications of Computers in Developing Countries. One of her current research projects (completion phase) includes a longitudinal study on the aftermath of the Haiti earthquake, focusing in particular on collaboration between NGOs and local citizens. Dr. Ferguson is well-qualified to participate in this project because she specialized in semantic and social network analysis, in systematic, qualitative research methods in the context of humanitarian response, and through her strong project management skills.

Peter (P.) Groenewegen is *Full Professor* of Organization Sciences, *VU University*, and a founding member of the *Network Institute*. Peter has conducted many studies of social networks in and around organizations. Current subjects of network study include social networks in online communities; health care and emergency management organizations; and the networked character of organizing in different institutional domains. He is interested in the manner in which formal and informal organization can be combined. In his academic career he has studied policy questions in

environmental and technical fields. More recently, jointly with American colleagues, he has studied collaboration and organizational issues of emergency response, further extending his interest in information and technology use in such situations. He combines network and qualitative data analysis, as published in *Information Systems Journal, Organizational Research Methods, Research Policy,* and *Journal of Homeland Security and Emergency Management*. He has been involved in projects in cooperation with computer and information science for the past ten years. He has (co-) supervised 14 (3 NWO) completed dissertations in which extensive data collection was employed. Prof. Groenewegen is also qualified for a senior role in this project as he has co-led three NWO multiparty projects and three EU projects that have been satisfactorily concluded.

Arjen (R.A.) Boin is *Full Professor* of public governance and crisis management at the *Utrecht University School of Governance* (USBO), and *Adjunct Professor at the Public Administration Institute, Louisiana State University*. He is also *Director* of Crisisplan, an international crisis management consultancy based in Leiden. He has published widely on topics of crisis and disaster management, leadership, institutional design and correctional administration. His most recent books include *The Politics of Crisis Management* (Cambridge University Press, winner of APSA's Herbert A. Simon book award); *Governing after Crisis* (Cambridge UP, 2008); *Crisis Management: A Three Volume Set of Essential Readings* (Sage, 2008); *Designing Resilience* (Pittsburgh UP, 2010); *MegaCrises* (Charles C. Thomas, 2012); and *The EU as Crisis Manager: Patterns and Prospects* (Cambridge UP, 2013). Professor Boin is the Editor for *Public Administration*, a premier journal in the field. He is a founding member of the European Societal Research Group. His work has been funded by NWO, the Swedish Civil Contingencies Agency, and the European Union. Professor Boin is qualified to participate with a senior role in this project because of he is a well-recognized scholar in disaster and crisis management and governance.

Bartel (B.A.) van de Walle is *Associate Professor* of Information Management, School of Economics and Management, *Tilburg University*; and *Visiting Professor* at the *Harbin Engineering University* (China). He served as staff advisor on science policy to the Flemish minister of science and innovation in 2010-2011. His research interests are: decision support for individuals and groups, at the intersection of ICTs and (humanitarian) crisis management. He has served as reviewer, advisor and consultant for the American, Dutch and Flemish National Science Foundations, the European Commission, and the United Nations (ISDR, OCHA and WHO). He is co-founder of the international Information Systems for Crisis Response and Management (*ISCRAM*) Community, and elected founding chair of the Board of the ISCRAM Association. Dr. Van de Walle is qualified to participate in this project because he is an international expert in IT solutions in disaster management and humanitarian response.

Jeroen (J.J.) Wolbers is the envisioned PostDoc researcher. He completed his research master at USBO Utrecht, and is currently working on his PhD thesis within the VU *Amsterdam Research on Emergency Administration* (AREA) research group (defense expected: Fall 2014). His PhD thesis is titled 'Drawing the Line: Practicing cross-boundary coordination in emergency response'. Based upon an interpretive analysis he describes how cross-boundary coordination is practiced between heterogeneous response organizations, and explains how coordination can lead to both integration and fragmentation of response operations. Part of his work is published in leading crisis management journals and he is an active member of the *ISCRAM* association. In 2012 Jeroen Wolbers and Kees Boersma successfully completed a project with one of our partners, *Project Netcentrisch Werken* (IFV) and TNO, on the exact topic of this proposal. This resulted in a number of co-authored publications.

10. List of key publications *maximum 25,* count: #23.

Boersma, F.K., **P. Groenewegen** and P. Wagenaar (2010). The information management of co-located Emergency Response Rooms in the Netherlands. In: Rahman, H. (Ed.) *Cases on Adoption, Diffusion and Evaluation of Global E-Governance Systems*, Hershey USA: IGI: 107-116.

Boersma, F.K., P. Wagenaar and **J.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): Article 6.

Boersma, F.K., L.K. Comfort, J. Groenendaal and **J.J. Wolbers** (2014, forthcoming). Incident Command Systems: A dynamic tension among goals, rules, and practice. *Journal of Contingencies and Crisis Management,* 22(1).

Boin, R.A., P. 't Hart, E. Stern and B. Sundelius (2005). *The Politics of Crisis Management: Public Leadership Under Pressure*. Cambridge: Cambridge University Press.

Boin, R.A. (Ed.) (2008). *Crisis Management: An Anthology*. London: Sage (three volumes).

Boin, R.A., P. 't Hart and A. McConnell (2009). Crisis Exploitation: Political and Policy Impacts of Framing Contests, *Journal of European Public Policy*, 16(1): 81-106.

Boin, R.A. and M. Van Eeten (2013). The Resilient Organization: A Critical Appraisal. *Public Management Review*, 15 (3): 429-445.

Bosse, T., K. Majdanik, **F.K. Boersma** and K. Ingibergsdóttir (2013). Studying Shared Situation Awareness by Agent-Based Simulation. Proceedings of the 2013 *IEEE/WIC/ACM International Conference on Intelligent Agent Technology*, Atlanta, USA, Volume 2: 201-208.

Comfort, L.K., **R.A. Boin** and C. Demchak (Eds.) (2010). *Designing Resilience: Preparing for Extreme Events*. Pittsburgh University Press.

Ferguson, J.E., M.H. Huysman and M. Soekijad (2010). Knowledge Management in Practice: Pitfalls and Potentials for Development. *World Development*, 38(12): 1797–1810.

Ferguson, J.E. and J. Hilaricus (forthcoming). Coping with crisis: A knowledge-based perspective on emergency response to the Haiti earthquake disaster. In: F. Célimène, S. Jacob, S. Ravitch, and K. Logossah (Eds.). *What Type of "Public Help" for What Type of "Development".* Harvard University Press.

Ferguson, J.E., M. Soekijad, M.H. Huysman and E. Vaast (2013). Blogging for ICT4D: Reflecting and Engaging with Peers to Build Development Discourse. *Information Systems Journal*, 23(4): 307-328.

Groenewegen, P. and P. Wagenaar (2006). Infighting or Emergence? Towards Understanding how Information Systems Come into Being. *Information Polity*, 11: 1-14.

Groenewegen, P. and C. Moser (2014). Online communities: challenges and opportunities for social network research, In: D.J. Brass, G. Labianca, A. Mehra, D.S. Halgin, and S.P. Borgatti (Eds.) *Contemporary Perspectives on Organizational Social Networks. Research in the Sociology of Organizations,* 40: 459-473. Bingley: Emerald.

Rutkowski, A.F., **B.A. van de Walle**, W.J.H. van Groenendaal and J. Pol (2005). When Stakeholders Perceive Threats and Risks Differently: the Use of Group Support Systems to Develop a Common Understanding and a Shared Response. *Journal of Homeland Security and Emergency Management*, 2(1): 1-17.

Soeparman, S., H. van Duivenboden, F.P. Wagenaar and **P. Groenewegen** (2008). ICTs and the Limits of Integration: Converging Professional Routines and ICT Support in Colocated Emergency Response Control Rooms. *Information Polity*, 13: 95-211.

Van de Walle, B.A. 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.

Van Den Eede, G., W. Muhren and **B.A. van de Walle** (2009). Organizational Learning for the Incident Management Process: Lessons from High Reliability Organizations. *Journal of Information System Security*, 4(3): 3-23.

Van de Walle, B.A. and M. Turoff (2008). Decision Support for Emergency Situations, *International Journal of Information Systems and e-Business Management,* 6(3): 295-316.

Van der Weijden, I., D. de Gilder, **P. Groenewegen** and E. Klasen (2008). Implications of Managerial Control on Performance of Dutch Academic (Bio)medical and Health Research Groups. *Research Policy*, 37: 1616-1629.

Wolbers, J.J., **F.K. Boersma** and J. De Heer (2012). *Netcentrisch Werk in Ontwikkeling*. Den Haag: TNO/NIFV.

Wolbers, J.J. and **F.K. Boersma** (2013). The Common Operational Picture As Collective Sensemaking. *Journal of Contingencies and Crisis Management*, 21(4): 186-199.

Wolbers, J.J., **P. Groenewegen**, J. Mollee and J. Bim (2013). Incorporating Time Dynamics in the Analysis of Social Networks in Emergency Management. *Journal of Homeland Security and Emergency Management*, 10(2): 555-585.

RESEARCH PROPOSAL

11. Description of the proposed research *Maximum 4000 words.* Word count: 3995.

Research questions and objectives

Disasters disturb social order and have a huge impact on citizens and their communities. Governing disaster responses is both complex and difficult, since professional response organizations are heterogeneous, often overly focused on their own actions, while at the same time having to coordinate their actions and collaborate with affected citizens (Comfort, 2007; Moynihan, 2009; Boin and 't Hart, 2010). Hurricane Katrina and the Haiti earthquake became classic examples of failing governance: coordination between the responders, relief workers and citizens occurred haphazardly if at all (Majchrzak et al., 2007; Curtis, 2008; Zanotti, 2010; Van de Walle and Dugdale, 2012). Mid-sized crises in the Netherlands might have a smaller impact, but to govern response is still a major challenge for professional organizations (Van Duin et al., 2013).

In highly prepared western countries attention seems to be directed to use formal governance structures to plan coordination; in humanitarian contexts formal governmental structures are often lacking, or seriously compromised (Van Wassenhove, 2005; Smirl, 2008; Hilhorst, 2013). Yet, the different contexts show a striking parallel: citizens help themselves and inform each other through social media platforms, generating a bottom-up information network (Roberts, 2011). This provides important additional resources, but at the same time it creates a complex information ecology of layered information streams. Governance needs to guide such actions, and weave together response initiatives. Increasingly, improved disaster response is found in interconnecting networks of local citizens, NGO and governmental bodies. However, *how* this interconnection actually occurs is still an open research issue (Majchrzak and More, 2010).

The international disaster management literature has questioned the reliability and legitimation of formalized response organizations (Comfort, 2007; Norris et al., 2008). 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). The unpredictability of crises has proven this top-down, bureaucratic control model to be unrealistic (Dynes, 1994; Quarantelli, 1997; Neal and Phillips, 1995). To impose an authoritarian structure on a disaster is impossible, because it fails to integrate the overall community response. While the 3-C model remains a powerful instrument for accomplishing tasks characterized by repetition and uniformity, it insufficiently accounts for the response capacity of communities. Nonetheless, the traditional 3-C governance model still dominates the governmental disaster management agenda, partly because it is difficult to yield control (Tierney et al., 2006), and partly because the consequences of citizen participation and social media are still highly unknown (Roberts, 2011).

Including local communities in the response network and facilitating their efforts is nonetheless a critical aspect of disaster governance. Local involvement potentially enables professional disaster managers to harness the capacities of existing societal structures, leaving local communities to deal with tasks that managers are overburdened with, and allowing managers to focus on other relevant activities. This idea is reflected in an alternative 'C3' model, which turns the disaster response infrastructure around. It recognizes the 'Continuation' of societal and institutional structures after a disaster occurs, despite the pressures these structures are under (societal resilience). Further, to deal with disaster effects, it suggests that responses must be 'Coordinated' by heterogeneous stakeholders, in 'Cooperation' with citizens (Dynes, 1994; Helsloot and Ruitenberg, 2004). Communities thus become part of disaster managers' resources, since they know how to solve local problems much better than outsiders. Overall, this C3 model presupposes interconnected networks of response organizations and local communities, and is better equipped for a more legitimate and reliable 'smart' governance.

Net-centric governance promises smart possibilities that the C3 model envisions. Netcentric governance is defined as connecting 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). It recognizes that citizen participation increasingly occurs in a number of networks, including social media and Web 2.0 platforms, which can help generate more legitimate and relevant responses.

Safety Regions in the Netherlands recently started with 'Netcentisch Werken' (Boersma, et al., 2012), a project enabling coordination between heterogeneous response organizations but still with hardly any inclusion of local communities and social media data. Humanitarian response, in contrast, has far more experience with net-centric (Web 2.0) data: for instance, the use of platforms such as Ushahidi in Haiti and CrisisMappers in Philippines have been important support mechanisms for the work of NGOs like Oxfam Novib and Cordaid (Meier, 2010/2013). An unresolved issue in both contexts, is how disaster managers can develop *adaptive capacity* (Staber and Sydow, 2002) to govern heterogeneous networks. Since local 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).

Our proposed research project aims to develop knowledge about the consequences of *net-centric governance*. We will study its conditions and consequences (intended and unintended) in close collaboration with our partners. The project is guided by the following research question:

> *What is the potential for net-centric governance to disaster management in facilitating a more adaptive response, and what are the consequences for the connections between networks of response organizations and local communities?*

This question will be answered by:

(1) identifying disaster response practices and conditions that can lead to net-centric governance;
(2) discovering how and where community networks engage in Web 2.0 platforms;
(3) analyzing the consequences of interconnected response organizations and community networks in becoming more adaptive;
(4) developing principles of net-centric governance to be implemented in both humanitarian and national emergency response organizations.

This project is innovative in two domains: 1) we combine theories in two, often unconnected, domains of international humanitarian relief and national disaster response, thereby contrasting governance in an unstructured environment with a regulated and structured environment; and 2) we generate a dynamic perspective on the information ecology in which crises occur, focusing on the intersections between formal and informal response networks.

Scientific approach and methods

We position net-centric governance in the broader context of interconnected heterogeneous networks. This perspective builds on the acknowledgement that social systems comprise more than one relevant network (Castells, 1996). Further, it is an adaptive way of dealing with a polycentric, interconnected world, based on an understanding and leveraging of the (concentrated or distributed) governance mechanisms of *each* of the relevant networks, but in concert with one another. As such, net-centric governance is the next generation of network governance (Klijn and Koppenjan, 2000; Provan and Kenis, 2008). Net-centric implies that on the one hand each of these networks is 'programmed' and on the other hand is connected to other networks by '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.). The interconnection between separate networks generates a form of power, which separates and flows between different networks, and is manifested in joint action. Both programming and switching are key components of net-centric governance.

To discover the potential of net-centric governance to make disasters response more legitimate and reliable, this project aims to search for efforts to 'program' different kinds of networks and 'switching' between them. An important starting point is the vast array of evidence on disasters highlighting emergent and unforeseen collaborations. These collaborations appear 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, Web 2.0 information sharing and communication platforms will provide useful insights (Finin et al., 2007; O'Reilly, 2011). The self-contained, highly decentralized components of various Web 2.0 applications encourage individuals to collect information posted on websites, and to contribute to them in ways that can leverage information (Majchrzak and More, 2010). 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 (O'Mahoney and Bechky, 2008; Majchrzak and More, 2010).

Second, the interconnection of different networks will enable response organizations and communities to interact, and will allow us to study the information ecology and switching dynamics. Indeed, in the era of technological innovations, there is an urgent need for governance forms that better fit and support the dialogue in many-to-many, multi-layered information streams. Coordination centers and emergency response rooms are important nodes where switching takes place and therefore crucial research sites of this project.

We will study net-centric governance through a case-based study comprising *mixed methods* (Creswell and Clark, 2007). The underlying research approach is inductive, in line with the need for theory building (Eisenhardt, 1989) about net-centric governance. Data provided by and collected in collaboration with our partners allows us to conduct in-depth analyses of the information ecology that emerges among heterogeneous stakeholders. We will conduct retrospective analyses of disaster response information networks, and ethnographic observations on location, to identify how switching occurs, which challenges are encountered, and what opportunities for resolution emerge. The ethnographic approach (Hammersley and Atkinson, 1995) will help understand the nature and content of information flows deriving from communicative practices, providing insight into programming and switching dynamics. We will also conduct social network analyses, to chart patterns in information streams among and between different networks (Parker et al., 2002). We will use semantic analytical methods to conduct analyses of large-scale virtual communications to identify interaction patterns, which will then be analyzed in more depth, qualitatively.

The initial case selection took place during a workshop we organized in 2013 in the context of our approved proposal 'NWO smart governance call for partnership development', in close collaboration with our partners. We selected two humanitarian large-scale responses to Haiti and the Philippines, and already have access to network data from web 2.0 platforms, including Ushahidi and CrisisMappers. We will conduct interviews with representatives at the research sites (e.g. response managers) to gather expert views on disaster management. Observations of mid-sized crises in the Netherlands will take place in emergency response rooms of our partnering Safety Regions, combined with an analysis of Web 2.0 Twitter messages, and an already initiated social media initiative, *Compronet* in Groningen, to analyze social dynamics during net-centric operations.

By developing principles of net-centric governance in different contexts we can enhance smart governance mechanisms in disaster management. The analysis will provide us insight into the differences between overregulated versus compromised governmental structures, and whether and how these differences affect adaptive disaster response capacity. We aim to theorize the organizing principles of network governance, by strengthening the conceptual net-centric governance framework.

The methods are further detailed below, for each of the three sub-projects. Four Work Packages list exactly how the individual researchers will collaborate with the applicants and external partners and what output we envision. Section 16 presents the rationale behind the team composition.

Individual projects

PhD I - <u>How can heterogeneous information networks be mapped, interpreted and governed to make the Dutch net-centric response more adaptive?</u>

The proposed first PhD project will identify programming and switching of information streams during mid-sized crisis in the Dutch context. The PhD candidate will conduct ethnographic studies in the emergency response rooms and decision-making teams of our partnering regions, combined with a multi-layered network analysis (including social media) to chart patterns in information

streams among and between different networks involved in (and outside) the response operation.

This will provide insight into local work practices in response rooms combined with community responses through the use of social media. Results will be interpreted through a social scientific perspective to understand the significance of information patterns to response organizations. These analyses will help construct concrete responses of coping with heterogeneous information networks of emergent community and formal response structures.

PhD II - How can heterogeneous information networks be mapped, interpreted and governed to make humanitarian response operations more adaptive?

The proposed second PhD project will focus on structural integration of bottom-up, citizen-empowered information sources with humanitarian and local response networks. The PhD candidate will analyze programming and switching of information streams in the context of humanitarian disaster relief. This comprises a historical case analysis (Haiti earthquake and Philippines typhoon), combining quantitative semantic and social network analysis of crowd-empowered platforms (in particular CrisisMappers and Ushahidi), as well as qualitative ethnographic studies, i.e. semi-structured interviews and if possible on-site observations during actual disaster response operations. These analyses will help visualize network patterns, both in terms of content and actors, revealing which governance mechanisms enable or inhibit adaptive network collaboration.

PostDoc – How can adaptive capacity be enabled through smart governance to strengthen community resilience to disasters?

The question addressed in this overarching, integrative sub-project is how adaptive capacity and societal resilience can become reciprocal. This part of the project requires in-depth knowledge of the disaster management field, for which we need an experienced researcher. For this component of the program, a PostDoc researcher will build on, extend and integrate the empirical studies described under PhD projects I and II. The PostDoc will identify whether and how adaptive responses take place, and which governance mechanisms support adaptive capacity. This part of the project focuses on local communities and authorities in both Western and humanitarian contexts. Moreover, it will seek to conceptually and empirically strengthen the link between adaptive capacity and societal resilience.

Organization and finances

The project will run from 1 October 2014 to 1 October 2018 and is divided into four Work Packages (WPs) in which the two PhD candidates, the PostDoc, our external partners, and the senior research staff will work together. The two PhD candidates will be hired from the start; the PostDoc will start three months later.

The work packages allow us to integrate the individual projects over the course of the whole project, drawing on a consistent scientific approach and research agenda. Over the course of the project the members of our scientific board will reflect upon the research outcomes and process (including a mid-term evaluation). Our external partners will be involved in the selection of specific cases throughout the project. Our partners co-fund the total sum of €200.000 (including €50.000 in-kind), listed in detail in the tables of section 3 and split out in the requested funding table 15.

WP1: Review and Pilot

October 1, 2014 - June 30, 2015 (9 months).

The objectives of WP1 are: a review of (net-centric) governance models in disaster management and humanitarian response, and the identification of (types of) networks and their interactions. This phase of the project will provide us state-of-the-art information about information networks, including social media relevant to disaster management and humanitarian response. The focus will be on identifying dynamics and properties of the (digital) information environment in different societal contexts that affect response organizations.

The two PhD candidates will conduct a systematic review of scientific articles and evaluation reports to calibrate the scientific approach and methodology. These reviews will be submitted as working papers, for external evaluation, following FSW/VU University practice for dissertation projects. The PostDoc will conduct, together with seniors and PhDs, two three-month pilot studies: one into Compronet, a Dutch social media platform in-use during emergency situations, and one into the historical case of the Haiti earthquake, through data from Web 2.0 interactions on Ushahidi and CrisisMappers. The studies will offer empirical outcomes and insights into combining our methods. In addition to working papers, the WP will thus result in a protocol to ensure comparability of data collection.

WP1 will start with a kick-off meeting with our partners. It will result in two submitted systematic review papers (one per PhD project), and an integrative review paper by the PostDoc. The pilot studies will result in two white papers by the PostDoc on information ecologies in humanitarian response and crisis situations. WP1 will lead to a research plan for WP2 and 3, to be presented at the end of WP1 in a workshop with our partners.

WP2: Information Ecology and Network Interactions

July 1, 2015 - September 30, 2016 (15 months).

The objectives of WP2 are data gathering and analysis of information streams, programming, switching points, and network structures (i.e.: analyzing the information ecology). Interviews with representatives of the key stakeholders, analysis of network interactions will be conducted, supplemented with ethnographic studies of actual practices and interpretive processes.

Together with our Dutch *Safety Regions* partners and the IFV project *Netcentrisch Werken* we will select up-to-date empirical cases of mid-sized crisis (e.g. similar to the Moerdijk Fire, the Amsterdam Train Collision, the flooding in Groningen, and the Alphen Mall shooting) that occur around that time. They will be researched by the first PhD candidate. The analysis of social media platforms such as Twitter will be included. Dr. Schakel, our DLOC partner, will take an active role the analysis of network data. The second PhD candidate will conduct an in-depth analysis of the 2013 Philippine disaster in collaboration with our partners *Cordaid* and *Oxfam Novib* who have granted access to their networks. The PostDoc will participate in the data gathering of the two PhDs, while at the same time start to integrate their initial findings to develop insight into the different information ecologies and network interactions, which will be the main outcome of this WP. The PostDoc will also initiate and guide the knowledge dissemination process to our partners.

WP2 will generate three submitted journal article papers (one per PhD project and one by the PostDoc), a special issue on net-centric governance practices and conditions (with the PostDoc as main editor). Since the data collection and analyses in different contexts will be conducted in parallel, the first integration of the results can take place in this time slot. Around month 18 of the project, we will convene an international conference with our partners, practitioners and invited experts. Part of the conference will be dedicated to discussing forms of net-centric governance, as input for WP3.

WP3: Net-centric Governance: Contexts, Conditions and Consequences

October 1, 2016 - December 31, 2017 (15 months).

The objectives of WP3 are to deepen case-based knowledge on the characteristics of net-centric governance generated in WP1 and WP2).

The PhD candidates will extend their empirical work, based on mapping the information ecology in WP2, toward more extensive focus on the context, conditions and consequences of net-centric governance. It is difficult if not impossible to predict disasters and crises, so the selection of additional cases is planned toward the start of this WP. Our partners guarantee expert knowledge and access, enabling joint case selection at the time. The PostDoc will carry out a context analysis based on ethnographic and network data, to understand actual programming and switching practices. The main dimensions of the WP3 analysis are: a) the context: the quality of governmental organizations, the characteristics and scale of crises and disasters, (potential)

conflicts of interests and forms of resilience; b) conditions for network governance to be successful; and c) consequences (intended and unintended) of network governance.
At the start of WP3 we will convey the second international workshop, in which results of WP2 will be presented. We will conduct a mid-term evaluation with our external partners and with the scientific advisory board. Months 26-36 will be dedicated to data gathering and analysis. WP3 will result in 3 journal articles (at least one by each PhD candidate), two white papers by the PostDoc on net-centric governance, and an edited volume comparing net-centric governance in different contexts.

WP4: Development and Analysis of Net-centric Governance Principles

January 1, 2018 - October 1, 2018 (9 months).

The objectives of WP4 are to develop strategies toward dissemination and utilization of results, and completion of the two PhD projects. WP4 starts with an international conference, coordinated by the PostDoc (whose contract will end directly after the conference). The conference will be open for external academics. One day will be dedicated to the presentation of the project results for which practitioners are invited. The conference's main theme will be 'adaptive capacity of net-centric governance for disasters' (i.e. how practitioners can integrate the outcomes of WP1-3 in their organizations). A central component will be the discussion of smart governance principles for net-centric disaster management and humanitarian response.

The remainder of WP4 will be dedicated to the completion of the two PhD sub-projects. The PhDs will complete their (article-based) dissertations. Their anticipated results will provide both academic researchers as well as (informed) practitioners the tools to implement and validate net-centric governance. WP4 will result in three journal articles, and in two PhD theses.

Knowledge utilisation

This project will disseminate state-of-the-art knowledge about how to increase adaptive capacity in disaster response organizations, and to better include community responses. We aim at publishing the results in national and international journals. At the start of the project, we will launch a website, to promote the project and the collaborative network, and to act as a resource for project materials, both academic and practitioner-oriented.

Among our consortium partners organizations, we see initial movements emerging towards net-centric disaster governance, but these organizations still struggle with the question how to accomplish and develop adaptive capacity. This project will help them to answer questions that were posed during our 'NWO call for partnership' workshop. The project will develop various tools for knowledge utilization:

1) The project will generate policy input for governance agencies and their officials, to deal with programming and switching of information networks at times of crises and disasters. The smart governance principles will result in stronger adaptive capacity of governance agencies. In particular, our Dutch partners the *Safety Regions* will be able to use the project results to organize a smoother exchange of information between their first response organizations and local residents. Our humanitarian response partners *Cordaid* and *Oxfam Novib* will implement results in their relief and recovery operations. Since they are also leading organizations in the Collaborating Aid Agencies (SHO), our knowledge can benefit the broader (inter)national humanitarian sector. In addition *VNG International* guarantees dissemination of results to national and international governmental bodies through their involvement in the United Cities and Local Governments (UCLG) 'Local Government Disaster Management' unit.

2) We will guide our partners through this valorization process by allocating time for PhDs and the PostDoc spent in our partner organizations, and by inviting our partners to engage in an interactive learning process during to several practitioner workshops. Further, the senior researchers (applicants) will organize workshops during which representatives of our partners (i.e. disaster managers, professionals) will be able to further develop their skills in net-centric governance. In collaboration with our partner *Netcentrisch Werken* we will develop a module on net-centric governance to be implemented in the IFV curriculum.

3) The outcomes of the project will be available to the public. Our researchers will actively blog via our AREA research group website, allowing emergency organizations to follow the research process more closely. In parallel, we will compile valorization reports for our partners, such as executive outreach, progress reports and practice-oriented white papers. Through the use of social media we extend to a wider audience, e.g. inhabitants of the safety regions and the international humanitarian communities. Further, our consortium partner Patrick Meier has a top-1% of most-viewed Twitter profiles, as well as a highly influential blog *iRevolutions* with over 1.2 million hits. These channels, in combination with the Ushahidi and CrisisMappers platforms, will help us reach those directly or indirectly affected by disasters.

Time plan

<table>
<tr><th></th><th colspan="2">**WP1**
1 October 2014 – 30 June 2015</th><th>**WP2**
1 July 2015 - 30 September 2016</th><th>**Mid-term**

September 2016</th><th>**WP3**
1 October 2016 – 31 December 2017</th><th>**WP4**
1 January 2018- 1 October 2018</th></tr>
<tr><td>**PhD1**
PhD2</td><td colspan="2">Research Design
Literature Review</td><td rowspan="2">Data Collection, Analysis, Writing</td><td rowspan="3">Workshop with Scientific Panel</td><td rowspan="2">Data Collection, Analysis, Writing</td><td>Writing theses</td></tr>
<tr><td>**PostDoc**</td><td>PostDoc starts 1 January 2015. Pilot Study of Compronet/Ushahidi</td><td>PostDoc contract ends January 2018</td></tr>
<tr><td>Scientific Output *(articles)*</td><td colspan="2">PhDs: Review article (2x)
PostDoc: article and white paper (2x)</td><td>PhD: article (2x)
PostDoc: special issue and article</td><td>PhDs: article (2x)
Post Doc: white paper (2x), article, edited volume</td><td>PhDs: article (2x)
PostDoc: article</td></tr>
</table>

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