Principles of Radical Research in the area of Information Systems for Crisis Response

Jonas Landgren
Department of Applied Information Technology
University of Gothenburg, Sweden
jonas.landgren@gu.se

ABSTRACT

The paper outlines a set of principles for radical research in the field of information systems for crisis response and management. After every major disaster, there is a never-ending call for new solutions that could improve emergency and crisis response work. This paper presents confessional accounts from one research group on how design oriented research could adopt a design perspective and organize research that have substantial potential in improving emergency and response work through innovative design of information technology use.

Keywords

Method, design, principles, radical research

INTRODUCTION

Since well before the infamous 9/11 events in the United States of America, societies around the world has called for improved information technology to prevent and mitigate disasters. In the after-math of major disaster events such as earthquakes, hurricanes, wildfires, civil conflicts, outbreak of infectious diseases and antagonistic attacks, new solutions for prevention and mitigation are requested. Researchers and professionals involved in the study of information systems for crisis response and management, form a growing community that has good capabilities in significantly improving emergency and crisis response on a local-, national- and global-levels. A key requirement for releasing these capabilities is the adoption of a design perspective.

For the research domain of emergency and crisis response, a design perspective has a few practical implications. First of all it means that the researcher becomes a designer and will approach ill-structured problems, using a problem-solving mode that is solution-oriented, and a mode of thinking that is constructive (Cross, 1982). There are many good examples of how a design perspective have been applied in the study of emergencies and disasters and contributed to the general body of knowledge with rich insights on both organizational practices and innovative use of artifacts. Kristensen, Kyng & Palen (2006) presents in a study the challenges in designing for a future emergency response work practice and outlines key requirements of specific digital artifacts that such future work practice should include. Sutton, Palen & Shklovski (2008) present insights on how social media applications could be used to improve communication between citizens and professional response organizations. Bergstrand & Landgren (2009) present brief insights about using consumer-based mobile video technology to improve the work of professional responders.

Adopting a design perspective means that the researcher becomes a designer, and as such also explicitly intervene in the everyday world of the organizations and people. Such design interventions are neither simple nor unproblematic. Simply speaking, it must be done carefully and respectfully. Work practice focused design projects have a long tradition in applying Participatory Design methods (Namioka, 1993). In order to execute design projects carefully and respectfully, PD has developed both moral as well pragmatic propositions:

"the people whose activity and experiences will ultimately be affected most directly by a design outcome ought to have a substantive say in what that outcome is" - the moral proposition (Caroll & Rosson, 2007, p243)

" the people who will need to adopt, and perhaps to adapt to an artefact or other outcome of design, should be included in the design process […]" - the pragmatic proposition (Caroll & Rosson, 2007, p.243)

In order to conduct design-oriented research in the domain of information systems for crisis response and management, this is not enough. Involving the users are of great importance for successful design interventions. However, what is missing here is the temporal aspect. Too often, the research community approaches crisis response organizations or local communities when a large-scale emergency or disaster already has happen. In a

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sense, it is good that focus is on real events, but it is less suitable in respect to the possibility to plan for systematic research.

In order to avoid a reactive research approach, this paper outlines a set of principles for design-oriented research in the field of information systems for crisis response and management. These principles form the basis for what could be viewed as radical research.

RESEARCH APPROACH

The principles outlined in this paper have been derived from the research group's (the author is a member of this group) experiences of conducting research on information technology use in emergency and crisis response. These research projects have covered; police work, fire & rescue services, paramedics work, regional crisis response at the country administrative board, municipality crisis preparedness, national 112 dispatch, and the national civil contingencies agency. The principles should here be viewed as confessional accounts (Van Maanen 1988, Schultze 2000). The intention is not to present the research in detail but rather to describe general aspects and insights of the work. These aspects and insights has been structured as key principles. This self-reflective analysis of previous research studies is subjective.

KEY PRINCIPLES

The radical research approach embeds the idea of already being highly connected to a range of response organizations before a major event happens. Such connectedness opens up for significant design interventions. Key principles of radical research includes: Cover the network of actors, Continuous field work, Bottom-up perspective, Study real events, Networked design process, Prototype as real as possible, Real world use and evaluation, and Become part of innovation initiatives.

Cover the network of actors

As a research team, we do not just focus on one organization or a specific type of response actor. Instead we have embraced a strategy to cover a network of actors in order to also cover the dynamics between different response organizations and consequences on information infrastructures (Monteiro & Hanseth, 1995). Actor-network theory (Latour, 2005) has been an important analytical lens in these efforts. Over time and after a lot of work, we have been able to involve and connect to a range of organizations on a national, regional and local level. In one of our ongoing projects we have involved the following organizations: the regional administrative board, one large and one small fire and rescue service, one large and one small municipality, the regional police, the regional security services, and a regional disaster medicine unit. Having said this, we should also underline that our daily research is not done at all these organizations at the same time or with the same level of attention. A large network coverage is important to gain deep insights in the relationships and interactions across this network of organizations. In addition to the professional organizations, we also strive to cover the initiatives by the national security systems industry. This group of actors is important in terms of understanding the commercial forces that influence the market in general and specifically the impact on the public response organizations. For the commercial network, we have only informal contacts and, in contrast to the collaboration with the response actors, a weak network coverage.

Continuous fieldwork

Several of the organizations covered in the above mentioned network, have over the years been approached by a range of academic researchers. Typically, the researchers make a short visit and never come back. In some of the less appealing cases, the academic researchers never even sent the final report or gave a presentation of the findings. To avoid such situations, we conduct what could be called continuous fieldwork. This means that we do not apply a strict sequential research process of reviewing the litterateur, formulate a research question, design the study, conduct the fieldwork, go home and analyze and in the end report the findings in a paper. Instead, we have a set of high-level research questions that to some extent fades into the background when we field work. Based on what is covered in the field material, we focus on specific aspects that could be mapped to the high-level questions. In practice, this means that we conduct shorter periods of fieldwork each month. This form of fragmented fieldwork allows us to continuously cover several organizations and identify interdependencies between the organizations. This approach fits well to the ethnographical approach suggested by Fetterman (1995) allowing the researcher to also pull-back and make sense of important aspects covered by the field work.

Bottom-up perspective

A bottom-up perspective means that we believe that many of the really good insights and important aspects of crisis response work will be found on grass-root levels in the organizations. By focusing our studies on the people that on a daily basis work with these issues, rich descriptions and relevant insights will be covered. This work-practice (Greenbaum & Kyng, 1991) focus does not mean that we never would meet the management levels in an organization, quite the contrary. By having a firm focus on the grass-root levels, we are able to uncover weaknesses in the management processes that never would be found if our focus was on the management levels. By picking up small fragments from operative levels, we are able to say something about the higher management processes. Have in mind that the large-scale disasters often are based in tiny breakdowns on operative levels with cascading effects (Weick, 1990) on an organizational and inter-organizational level. From a practical point of view, a bottom-up perspective means that we study field personnel, command centre personnel in order to gain deep insights on the everyday aspects of response work.

Study real events

Over the years, we have done numerous studies of field-based exercises and table-top exercises that has to some extent been useful for us in our studies. But we have also realized that what people do in an exercise could radically deviate from what the very same person would have done in a real emergency under the pressure of incomplete, missing and conflicting information. We have therefore decided that in order to really be able to say something about crisis response work, we must study real and ongoing events. But large disasters and emergencies do not happen on an everyday basis. However, even small and routine-like incidents are dynamic and colored by many complex issues that the response organization needs to address. Even in small-scale incidents, break-downs will occur and will become valuable observations for the study. In cases where we are unable to conduct direct observation during the actual response work, we make a strong effort in doing after-incident interviews with key response personnel as soon after the incident as possible. As a contrast, we also try to keep track of events that there is a planning horizon for, such as severe weather conditions, planned public protests, EU-meetings or high-risk football-games. These events are known on beforehand which means that one could actually plan when there might be a good opportunity to study response work.

Networked design process

Over time, our research has become increasingly characterized by a strong adoption of a design perspective. The research questions that are addressed are viewed as design problems. A fundamental consequence when applying a design perspective is that we move from a descriptive to a constructive focus. The design work we do is a in a sense a collaborative effort among a network of actors. In contrast to participatory design where users and stakeholders are strongly involved, we employ a much weaker design approach, which could be viewed as a networked design process. In the networked design process, we typically conduct design workshops, prototyping and early evaluations as well as focused field work to cover newly identified aspects that is understood to be important. In practice, this means that we do not organize large-scale design meetings where all actors are involved. Instead, we enact a structure where we, over time, link in various actors in order to make sure that all actors of the network meet their commitments in order to push the design work ahead. This means that all actors are not always aware of all other actors' ´activities or even their goals. This weakly connected design process provides flexibility for design initiatives on a small budget. Therefore, our approach does not strictly conform to neither the democratic values of participatory design as suggested by Mumford (2001) or the strict formalism of canonical action research (Davison, Martinsons & Kock, 2004), where well-defined agreements with the potential users or clients are fundamental.

Prototype as real as possible

In our research projects, we often try to produce mock-ups and prototypes that address issues that we have identified during the fieldwork and that we would like to further explore in a materialized design. The underlying idea of designing prototypes and bring them back to the professionals is only partially about bringing a solution to a practical problem: The more important role of the materialized design concepts is to use them as research instruments to further explore the role of IS/IT in this domain. This means that we use prototypes as triggering artifacts (Mogensen, 1992). However, a key aspect in designing prototypes is to keep them small in terms of functionality but very rich in terms of usability. We are therefore always striving to design as real prototypes as possible. This means that the prototypes should manifest properties that make them trustworthy in terms of practical relevance and practical rigor. Such properties become important when the professionals also use the prototypes as part of real incident response work.

Real world use and evaluation

Over time, we have moved from scenario-based evaluation of mockups to evaluation of prototypes evaluated in exercises in realistic work contexts. But since a few years, we have also had the opportunity to deploy functionally solid prototypes to be used and evaluated as part of real emergency response. This type of situated evaluation (Twidale, Randall & Bentley1994) opens up the evaluation process to move away from the artifact itself and to also cover a broader range of contextual implications. In practice, this means that we have been working with deployability issues, learning curves, acceptability, work practice fit, and usability. But the key differences in this approach are the opportunities to study the impact of the prototype system in a work practice. With this approach, important aspects such as adoption of technology as well as connectivity and embeddedness in respect to existing infrastructure could be covered.

Become part of innovation initiatives

Maintaining a strong and close relationship with the public response organizations means not only the possibility to study real response work. In addition, it also means that we often become involved in small and larger innovation initiatives on local and national levels. We are sometimes asked to have a look at specific aspects when the organizations plan some form of technology-driven organizational development project. Our role in these projects is to provide feedback and bring important insights from the academic research community that could have positive influence on the project. Having the opportunity to follow an innovation project from the inside is a good way to get access to underlying assumptions and real-world challenges, organizational issues, installed base, financial aspects, in designing and deploying IT-use for response work. Our efforts in these settings have been inspired by the discourse on open-innovation (Chesbrough, 2003).

Conclusions

This paper has outlined a set of principles for conducting design-oriented research in the area of information systems for crisis response and management. The research community involved in this area has great capabilities to improve crisis response work. The principles outlined in this paper form a tentative basis to conduct radical research with the distinct goal of improving emergency and crisis response work. The radical aspect of the approach outlined in this paper is targeting the researchers active role in making constructive contributions to the conditions for efficient response work. Future work should focus on enriching these principles and as well as learning about their effectiveness by comparing them with similar as well as contrasting approaches. Hopefully, this brief presentation will serve as a trigger for further explorations on the approaches adopted and applied in the ISCRAM community.

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