



Designing for ethical innovation: A case study on ELSI co-design in emergency

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ARTICLE INFO

Article history:

Received 16 July 2015

Received in revised form

22 February 2016

Accepted 10 April 2016

Keywords:

ELSI

Disclosive ethics

Collaborative design

ICT

Crisis management

Methodology

ABSTRACT

The ever more pervasive ‘informationalization’ of crisis management and response brings both unprecedented opportunities and challenges. Recent years have seen the emergence of attention to ethical, legal and social issues (ELSI) in the field of Information and Communication Technology. However, disclosing (and addressing) ELSI issues in design is still a challenge because they are inherently *relational*, arising from interactions between people, the material and design of the artifact, and the context. In this article, we discuss approaches for addressing such ‘deeper’ and ‘wider’ political implications, values and ethical, legal and social implications that arise between practices, people and technology. Based on a case study from the BRIDGE project, which has provided the opportunity for deep engagement with these issues through the concrete exploration and experimentation with technologically augmented practices of emergency response, we present insights from our interdisciplinary work aiming to make design and innovation projects ELSI-aware. Crucially, we have seen in our study a need for a shift from privacy *by* design towards designing *for* privacy, collaboration, trust, accessibility, ownership, transparency etc., acknowledging that these are emergent practices that we cannot control *by design*, but rather that we can help to design *for*—calling for approaches that allow to make ELSI issues explicit and addressable in design-time.

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1. Introduction

Technology has always played an important role in emergency response. Physical technology such as breathing apparatuses for fire-fighters, gloves for medical personnel, guns and body armour for police have protected and augmented the capabilities of emergency responders for many decades. Collaboration tools, such as incident command systems, too, have shaped the nature of response (Buck et al., 2006; Moynihan, 2009). What or who can be rescued or protected changes with these technologies, as do the processes and practices involved, and therewith the ethics and politics of emergency response.

Information and Communication Technologies (ICT) are bringing new rounds of transformation. A process of ‘informationalising’ crisis response and management is currently underway,

following in the footsteps of similar developments in other industries and services (Bücher et al., 2014a, 2014b, 2014c, 2016a, 2016b). In emergency response, informationalisation can support enhanced risk assessment, preventative measures and learning from past events, as well as increased surge capacity, data sharing, communication and collaboration between emergency responders, closer engagement with people affected by disasters, and mobilization of ‘collective intelligence’.¹ But informationalising socio-economic processes can also engender far-reaching transformations of these processes. In the domain of crisis management, the use of digital radio in over 125 countries in the world² and the rise of social media (Palen et al., 2009; Letouzé et al., 2013) have fundamentally changed emergency communications practices, for example. Furthermore, when data can be shared more easily and to greater effect, exceptions from data protection regulations may foster surveillance and social sorting and erode values of freedom and democracy. The scandal over NSA surveillance starkly highlights the challenges to informational self-

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¹ See for instance the ISCRAM conference series for a discussion of related trends and approaches (<http://www.iscram.org/>).

² See <http://www.tetratoday.com/news/tetras-love-affair-with-the-asia-pacific>

determination and privacy arising in the context of ICT use in security policy and practice. The ways in which ICTs are designed and appropriated are deeply entangled with how societies conceive of risks, respond to crises, and facilitate freedom. The informationalisation of emergency response is a form of 'disruptive innovation', that is, innovation that transforms the social, economic, political, and organizational practices that shape this domain (Chesbrough, 2003).

The often un-intended consequences of technological innovation have long been a subject of study across a range of academic fields. Introna and Wood (2004) argue that especially in the design of ICT systems, ethical, legal and social issues (ELSI) are often silent and opaque, and they propose a "disclosive ethics" method of scrutinizing the ethics and politics of ICT. However, it is this opacity that makes it very challenging to address disclosive ethics during design time, especially since the un-intended consequences that technological artifacts engender are *relational* in the sense that they arise from interactions between people, the material and design of the artifact, and the context. Open ended design approaches like co-realization (Hartwood et al., 2008) address the emergent nature of human-technology relations and its politics (Beck, 2002), but often lack a focus on 'deeper' and 'wider' political implications, values and ethical, legal and social implications arising between practices, people and technology.

However, in fields such as emergency response, where values such as humanity, solidarity, equality, trust, and dignity can play a literally vital role and exceptions to normal legal and political process may apply, there is a need for ethically sensitive innovation. This requires designers to attend to broader processes of social, societal, organizational and policy innovation. Hence, design approaches need to *explicitly* appreciate the emergent and contextual nature of values, ethically sensitive and lawful practices and enable stakeholders to notice and address emergent opportunities and challenges, and to manage conflicting perspectives. This poses the challenge of constructing design settings which as closely as possible resemble real world settings, or even better, to bring design into those real world work settings, as well as co-ordinating across multiple domains of expertise, and bridging cultural and political contexts. Organizing and facilitating such an ethically sensitive design process we found difficult to implement in our own work (Büscher et al., 2013, 2014a, 2014b, 2014c).

In this paper, we extend debates on disclosive ethics by investigating ways of addressing potential ELSI of informationalisation at design time. Apart from the literature, our paper is based on experiences of doing ELSI-aware collaborative design in BRIDGE and SecInCoRe, European research projects aimed at developing IT systems for large scale crisis response and management (Liegl et al., 2015).³ The BRIDGE project has been one of the first projects to systematically and explicitly address ELSI in the context of ICT innovation for crisis management and response and offered an ideal setting for exploring such issues and experimenting with design (and other) solutions, bringing analytic, designerly and regulatory perspectives on ELSI together at design time. SecInCore builds upon these efforts and seeks to develop 'live, lived, living' ELSI guidelines as an evolving, co-created resource for innovation in risk governance (Büscher et al., 2016a, 2016b). Reporting our experiences of developing an ELSI aware co-design approach, we highlight challenges and opportunities that we hope will help other researchers operating in similarly sensitive domains, and contribute to the development of co-design methodologies that include ethical issues in more explicit and comprehensive ways.

The remainder of this article is structured as follows: In Section 2, we present the background for our research by providing an

overview of the domain of ICT in emergency response with a focus on the ELSI-related challenges and issues that can arise when ICTs are developed and used in this domain. This discussion sets the stage for Section 3, where we investigate existing design- and regulatory approaches, particularly in participatory design and science and technology studies, and discuss them with regard to their approach to ELSI issues. Section 4 then presents findings from the BRIDGE project as a case study that illustrates our experiences with approaches for making ELSI noticeable and addressable in the practice of designing ICT for supporting emergency response. In Section 5, we draw the different parts together by discussing of our experiences against the background of related work that has been presented in the previous sections. Section 6 closes the paper with a discussion on the methodological implications for the state of the art of ELSI in emergency response, as well as with concluding remarks about future research directions and potential other application domains.

2. Background and domain

In this section, we provide a review on the current state of the art in developing support systems for emergency response and discuss both the ELSI challenges characteristic for this domain and more specifically the challenges related to the use of collaboration technologies. As an example for such a complex support system we introduce the BRIDGE Project which will serve as a case study for our discussion of approaches for ethical innovation in the following sections.

2.1. Technology support for emergency response—enabling interoperability with systems of systems

Emergencies call for the swift and accurate mobilization of information about the incident (what happened, to whom, what needs to be done to help?) and the mobilisation of resources to address the emergency. Unsurprisingly, information and communication systems have become an integral part of emergency management. While praising the efforts of communities and emergency responders, many post-disaster reviews find that there are serious shortcomings in the ability of the diverse actors involved to collaborate and coordinate their efforts (ENISA, 2012). Examples range from not enough boats being available for rescue missions during Katrina (Committee on Homeland Security and Governmental Affairs, 2006), to the impossibility for responders to communicate between underground and above ground teams after the London bombing (Barnes et al., 2006).

A Europe-wide review of multi-agency emergency response reveals that a lack of interoperability is a critical flaw in emergency response (ENISA, 2012). This is a serious problem in a century that has been labeled the century of disasters (eScience, 2012), where an increase in frequency and severity of disasters is to be expected, a growing, ageing and increasingly urbanized population is becoming increasingly vulnerable, and financial resources to maintain public emergency services are shrinking. Emergencies are characterized by their un-ness—they are unexpected, unknowable in their complexity and at least temporarily uncontrollable (Crichton 2003, cited in McMaster and Baber (2008, p. 6)). Emergency responders need to flexibly form adhocracies of response organizations appropriate for the tasks at hand, the need systems that support emergent interoperability (Mendonça et al., 2007).

To share information, responders need support for flexible assembly and orchestration of a 'system of systems' appropriate for the specific emergency at hand (NATO, 2006; Zimmerman, 2013). The utilization and synthesis of information requires collaboration and information sharing between actors e.g. through *emergency*

³ See <http://www.bridgeproject.eu/en> and <http://www.secincore.eu>.

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