Peripheral response: Microblogging during the 22/7/2011 Norway attacks

Sung-Yueh Perng
Monika Büscher
Lisa Wood
Lancaster University
{s.perng; m.buscher; l.a.wood}@lancaster.ac.uk

Ragnhild Halvorsrud
Michael Stiso
SINTEF
{ragnhild.halvorsrud; michael.stiso}@sintef.no

Leonardo Ramirez
Amro Al-Akkad
Fraunhofer FIT
{leonardo.ramirez; amro.al-akkad}@fit.fraunhofer.de

ABSTRACT

This paper presents a case study of a very recent man-made crisis in Norway on 22 July, 2011, during which a single person first detonated a bomb in downtown Oslo and then killed 69 young people on the island of Utøya. It proposes a novel way of conceptualizing the public contribution to mobilization of resources using microblogging, particularly tweeting. By examining aspects of public and professional response to this crisis, the notion of peripheral response is developed in relation to emergent forms of agile and dialogic emergency response. Through examining the distributed efforts of responding to the crisis, the paper also revisits situation awareness and reflects upon the dynamic and constantly changing environment that social media and crises inhabit together.

Keywords

Microblogging, peripheral response, situation awareness, Norway attacks, resource coordination,

INTRODUCTION

Recent years have seen microblogging and grassroots responses play powerful roles in many aspects of major crises, from understanding uneven development of events to supporting decision-making (Sutton, Palen, and Shklovski, 2008; Palen, Vieweg, and Anderson, 2011). New forms of identifying, documenting and addressing needs for particular resources in different locations emerge through self-organized 'voluntweeting' and distributed collaboration during crises (Starbird and Palen, 2011). 'Crisis mappers' like the Ushahidi Haiti Project (UHP) also provide novel ways of mapping information, occasionally supporting the task of distributing resources to people in need. Morrow, Mock, Papendieck and Kocmich (2011), for example, describe how the Department of State Analysts for the US government interagency task force and US marines used UHP information to enhance situation awareness and identify "centers of gravity" for deployment of field teams (ibid, p.4). Innovations like 'Tweak the Tweet' (TtT) can promote a shared 'grammar' to facilitate computational parsing of tweeted information through hashtagging needs, locations and contact details, and Starbird and Palen (2011) observe how 'voluntweeters' translated messages from different sources, such as text messages or tweets, using the TtT syntax in response to the Haiti crisis, and worked as 'remote operators' to facilitate assistance and collaboration from a distance.

In parallel to the official mobilization of staff and equipment initiated by calls to alarm centres, the public – those directly affected, as well as bystanders and volunteers – have always also participated in self-organized coordinations of resources *in situ* (Fischer, 2008; Stallings and Quarantelli, 1985). One recent example examined by Kendra, Wachtendorf and Quarantelli (2003) demonstrates how members of the public improvised waterborne evacuation of victims of 9/11 by mobilizing boats available near the shoreline of Lower Manhattan after the World Trade Centre towers collapsed. Social media extend the possibilities for self-organized mobilization of resources.

Understanding the potential and challenges of self-organized mobilization is interesting and important, especially in relation to more 'agile' and 'dialogic' forms of emergency response (Harrald, 2006; Artman, Brynielsson, Johansson, and Trnka, 2011). And integrating distributed, improvised public participation into professional emergency response and vice versa requires a deeper understanding of the processes and practices of public and

professional responses to crises. This paper provides an exploration of opportunities, and also argues for the need to consider challenges and complications of engaging the public through microblogging. We analyze aspects of how social media were used to encourage mobilization of resources during the attacks in Norway on 22 July 2011, providing further insight into phenomena observed by Starbird and Palen (2011) as well as highlighting other situated and emergent practices. 'Voluntweeters' may be acting from a spatially distant periphery, but they are connected to and can become implicated in physical actions taken *in situ*. In response to the attacks in Norway, for example some tweeters called for, and some people took, action in the emergency response area, addressing a very difficult situation, but also generating dilemmas, not least because microblogging is currently often peripheral to the professional emergency response. But 'peripheral' does not mean unimportant, and in our discussion we seek to explore ways of shaping more agile, dialogic engagement between formal and public response efforts through the concept of 'peripheral response'. Drawing on research on the importance of peripheral awareness in computer supported cooperative work (Heath and Luff, 1992; Bertelsen and Bødker, 2001; Heath, Svensson, Hindmarsh, Luff, and vom Lehn, 2002), and insights into emergent practices of micro-coordination in computer mediated communication (Ling and Yttri, 2002), we argue that these concepts can provide analytical and practical purchase on some of the delicately organized and 'stretched' social and material practices involved.

UNDERSTANDING CRISES BY MICROBLOGGING

During crisis situations, emergency responders face an 'uncertainty dilemma' where high uncertainty and the potential for wide-ranging, cascading consequences affect the space for deliberation and action. The more complex and ill-understood a crisis situation is, the more time responders need to collect and process intelligence to produce adequate 'situation awareness', that is, a dynamic understanding of the situation based on both detailed information and overview, including anticipation of likely future developments (Endsley, 1995). At the same time, the more complex and ill-understood a problem is, the more likely it is to escalate along unforeseen dimensions, and the less time there is to gather and synthesize information. Furthermore, crises can develop in different locations and places, and require coordination among various agencies distributed across potentially large areas. These conditions pose significant challenges to practices of sense-making, developing, sharing and maintaining situation awareness.

Microblogging is emerging as a grassroots practice alongside official emergency response and mainstream media coverage, opening up new opportunities and challenges. Microblogging engages bystanders and volunteers in providing continuous updates about different affected locations and developments of crises at particular points of time. Researchers are referring to this as 'crisis informatics', highlighting fast, constant and distributed updates through these "backchannel" communications as real and helpful contributions (Palen, Vieweg, Liu, and Hughes, 2009). Better alignment between official and public information practices could improve situation awareness regarding the coordination of resources and emergency responders (Vieweg, Hughes, Starbird, and Palen, 2010; Verma, Vieweg, Corvey, Palen, Martin, Palmer, Schram, and Anderson, 2011).

The use of microblogging as citizen crisis informatics requires much dedication and effort. There are rumors and misinformation (Mendoza, Poblete and Castillo 2010) and voluntweeters must confirm existing and search for missing information. Starbird and Palen (2011) show how highly motivated individuals leverage and establish connections for finding, proofing and routing information across a variety of sources, acting as remote 'emergency operators'. In other studies, researchers show that this work may also involve the engagement of 'public editors', such as environmental journalists and activists, to amend exaggerated media reports and calm the public (Sutton, 2010). This is highly valuable work, but it often takes place on the periphery of professional response. Despite the successes Morrow et al (2011) note for the UHP, their general conclusion is that there are significant barriers to the use of microblogging by official responder agencies; they quote one of their most experienced emergency responder interviewees as describing UHP as "a shadow operation that was not part of the emergency response plan". And Starbird and Palen (2011) describe how voluntweeters felt frustrated and 'obstructed when the "formal" response moved into place' (see also Landgren, 2011; Kavanaugh, Yang, and Li, 2011; c.f. Latonero and Shklovski, 2010).

Supporting more use of citizen crisis informatics in the context of more agile professional response requires better understanding of processes, practices and patterns of activity, indigenous information verification procedures and the formation of often ephemeral response communities. To contribute to such efforts in crisis informatics research (Palen et al., 2009), it is useful to explore how information, people and resources are mobilized in both virtual and physical spaces. We draw on theoretical resources from sociology to render analysis sensitive to the increasingly 'osmotic' relationship between physical and digital spaces and multiple intersecting, and sometimes conflicting flows, as well as efforts to suppress, fix, hold still, immobilize people, information, effects or resources (Sheller and

Urry, 2006; Chouliaraki, 2008; Jenkins, 2010). We are particularly interested in how information, understanding, awareness and action propagate, how they are stretched, fragmented and brought into tension. Clearly, these are big questions and we cannot provide full answers. But what needs to be explored in particular is that, when requests for actions or resources are circulated through microblogging, actions might be taken *in situ*, including inside the official crisis response zone, thereby creating new uncertainties and risks. Therefore, deeper understanding of how formal and improvised, professional and public emergency response efforts could support each other is needed, including understanding of how to facilitate 'emergent interoperability' (Mendonça, Jefferson, and Harrald, 2007) and how to ensure the safety of affected people, volunteers, bystanders and emergency response personnel.

CASE STUDY OVERVIEW

On 22 July 2011, two successive attacks, which are described as 'the worst peacetime massacre in the country's modern history', took place in Norway. The first attack was a bomb explosion at 15:25, detonated at the executive government quarter in Oslo, causing extensive damage to government buildings including the Prime Minister's Office. It killed 8 people and wounded 30. Less than two hours later, another attack took place on the island of Utøya, about 40 km northwest of Oslo, where the Norwegian Labour Party was holding its yearly youth summer camp. A person disguised as a police officer started shooting, killing 69 people and leaving 60 more wounded.[1] The two attacks resulted in 77 fatalities, with another 90 people injured. The right-wing extremist Anders Behring Breivik (ABB) confessed to the twin attacks.

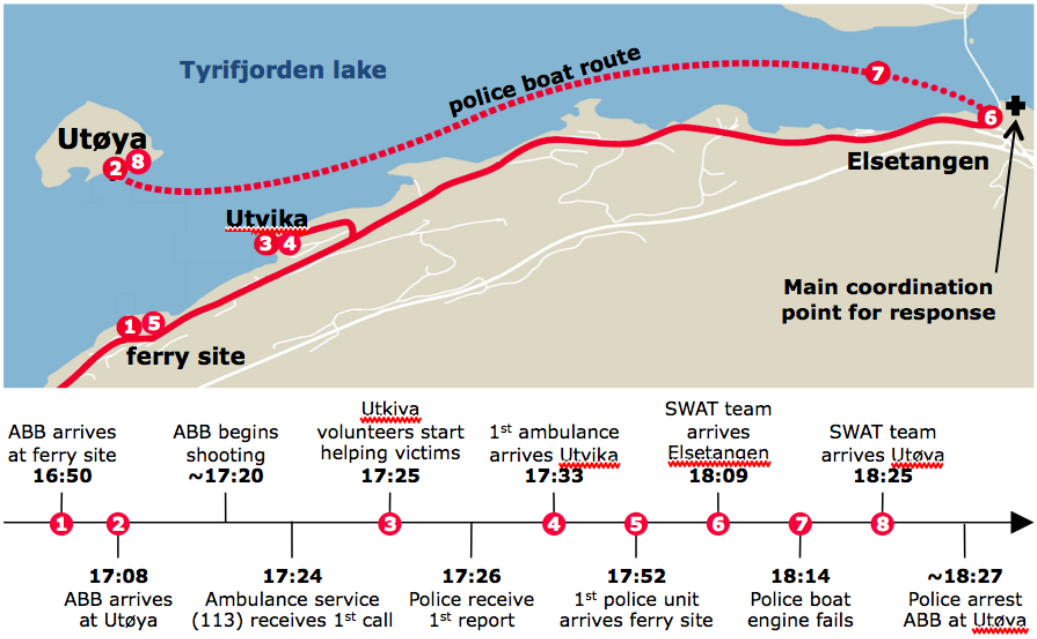

Figure 1. Coordination of rescue personnel around Utøya. The time stamps are only indicative, as presented through the media, awaiting a formal confirmation by the authorities. (Redrawn from the newspaper Aftenposten, August 12, 2011.)

Figure 1 shows an overview of important events during the emergency response around Utøya. ABB, dressed as a police officer, entered the island using the ferry (1&2), gathered the youths, and then started to shoot. The emergency agencies were alerted. At the same time, many participants of the youth camp made contact with their family and friends using their mobile phones (calls, SMS, Twitter, Facebook). These fast and widespread updates of horrifying situations on the island alarmed parents and raised questions about the emergency response efforts. Shooting was first reported from the island at 17:20. The first police patrol arrived at 17:52 at the ferry site (5)

[1] Information from http://www.bbc.co.uk/news/world-europe-14260297 [15/10/11] and http://www.aftenposten.no/nyheter/iriks/Fakta-om-terrorangrepene-22-juli-6692670.html [04/10/11]

searching for boats to carry the SWAT team across the lake (dotted line in Figure 1). The heavily loaded police boat soon suffered an engine failure (7), and private boats transported the police to the island.

The first tweets about the bomb in Oslo appeared around 15:45. Images, videos and eyewitness stories quickly propagated via microblogging. The first uncertain reports about the Utøya shooting, emerged at 17:41 (12 minutes before the first newspaper[2]):

> *Anyone heard about shooting at Utøya?*
>
> *Shooting incident at Utøya. What is right and what is rumours?*

Twitter activity initially focused on fact finding and information sharing. At some point, however, some tweeters began to explore opportunities for action, as we will discuss below. For example, a number of tweets encouraged Norwegian residents to go to hospitals for blood donations, and people who were affected by the attacks were encouraged to go to the Red Cross for information. Telephone numbers for information were also widely circulated on Twitter for those who were desperate to know whether their children or friends had survived the attacks.

METHODOLOGY

The research presented here is part of an interdisciplinary four year project concerned with ethnographically informed participatory design of IT support for large scale multi-agency emergency response[3]. The project began in April 2011 and a mixed methods empirical research and design program is underway, combining analysis of observations, video and communication transcripts from exercises (including BOILEX and SKAGEX 2011), mobile video ethnography, three 2-4 hour 'Critical Decision Method' interviews (Mendonca, 2007) with emergency response professionals and several shorter interviews, focus groups, co-design workshops, 'End User Advisory Board' meetings, and 'rapid response' virtual ethnography, where we collect as much data from online social media interaction as possible as and when crises arise. Studies with members of the public are planned. This is interdisciplinary team-based domain analysis and our aim is to understand and design for emergent future practices of multi-agency emergency response. This clearly should involve the publics and communities that form in crises.

This paper draws on this research, but focuses on the material we have been able to gather and analyse through our 'rapid response' fieldwork in Norway. Practices, opportunities and challenges of 'peripheral response' are particularly interesting in this material. When first reports were overheard on the radio, collection of tweets was initiated, using a variety of methods, including a Lancaster University stream listener, search.twitter.com, Twapper Keeper, Topsy, Snap Bird and news outlets that monitor related Twitter activity using paid services such as CoverItLive[4]. Topsy provided an opportunity of indexing 'important' tweets[5] and was used to supplement the search conducted using Twapper Keeper. Because Topsy does not provide time stamps, Twapper Keeper and Snap Bird were used to capture related tweets. Starting at 4pm on 22nd July, tweets about Oslo bombing and Utøya shooting were collected (also going back in time) by setting up queries in Twapper Keeper with the hashtags #Oslo, #oslobomb, #osloexpl, #Utoya, and #Utøya. #Oslo and #osloexpl were used by the public from very early on during the attacks and both #Utoya and #Utøya were used to enable collection of English and Norwegian tweets. There were other hashtags, such as #whys and #norwayterror, but they often appeared in conjunction with the hashtags that were used for capturing the tweets. A search performed on a set of 1000 tweets between 15:00 and 20:00 CMT on 22 July 2011 using Topsy supported observations of resource mobilization made with the tweets collected from Twapper Keeper. More than 220,000 tweets (including retweets) were collected in total using these methods.

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[2] http://www.nrk.no/vitenskap-og-teknologi/1.7756593 [04/12/11]

[3] Bridge Project: http://www.bridgeproject.eu/en

[4] twapperkeeper.com; topsy.com; and see http://www.radiosmaalenene.no/nyheter/vi-er-tilstedet-i-oslo/ for an example of the use of CoverItLive [15/08/11].

[5] Topsy adopts algorithms that rank the influence of social media contents when returning results, see http://topsylabs.com/company/about/ [15/08/11]

At this stage, our analysis is exploratory, combining 'quick and dirty' empirical study (Hughes, King, Rodden, and Andersen, 1994) with conceptual and theoretical investigation, focused on generating insights for participatory socio-technical innovation. We noticed efforts by members of the public to mobilize and coordinate resources alongside other types of tweets that provided information, showed emotional support, confirmed facts or clarified rumours. We coded tweets to identify examples of resource coordination in the first 1000 non-retweeted tweets in our sample. The tweets were categorized in terms of the types of resources involved (blood donation, Wi-Fi, boats), paying special attention to tweets in which warnings, help, tips or resources were offered or requested. Identifying tweets confirming the receipt of resources was attempted, but difficult, possibly due to the urgency of the crisis[6]. Google translation and our Norwegian colleagues were consulted for categorizing tweets in Norwegian. After coding, the analysis traced the propagation of requests for resources to determine who tweeted these early or first. We then explored these users' tweeting activities in their contextual stream on 22nd July. We screen-captured seven different users' conversations but searched many more to understand the context of resource requests and this also allowed us to reconstruct some flows of tweets exchanged between users (see Figure 2 for an example).

The virtual ethnography of public response efforts is supplemented by analysis of interviews with a fire chief who coordinated response efforts at the Oslo bomb site and an emergency doctor who was involved in the whole process of responding to the Norway attacks, starting out in Oslo, and then participating in the emergency medical response at Utøya. These critical decision method interviews are part of our larger research program and sought to investigate sense-making processes during non-routine decision making in professional multi-agency emergency response (Mendonca, 2007). They were not focused on social media use. However, the interview with the doctor is highly pertinent to the issues discussed here. He described the mobilization of medical response for the rescue operations at the bombing and the shooting sites, highlighting some interesting tensions with the public response.

INSIGHTS INTO COORDINATION OF RESOURCES THROUGH MICROBLOGGING

In this section, we explore some aspects of mobilizing and coordinating resources through microblogging in detail with reference to two examples: establishing communication channels and recruiting rescue boats. As mentioned earlier, other resources were also requested and offered via microblogging, but these two examples stretch public response beyond the periphery, converging physical and digital spaces, revealing particularly significant complexities. Our investigation seeks to explore potential benefits and tension that arise.

Communication channels

When crises happen, many people seek information, often flooding emergency organizations with telephone calls (Quarantelli, 1988). There is often a lack of clarity over where specific information can be found. In the Oslo attacks, microbloggers responded to this difficulty by disseminating various telephone numbers to guide people:

> @rslind[7] Anyone with relatives missing in #Oslo: the numbers to ring are Ulleval Hospital at 276532201 or 98765432 (pls RT for people)

But when more people than normally try to find and exchange information, their actions contribute to one of the most frequent cascading consequences of crises: telecommunications service failures (Hale, 2005). Such failures may have occurred shortly after the bomb blast in Oslo, judging by microbloggers rephrasing and retweeting the following, especially after it was picked up by @crowdsourcing, *Wired* editor Jeff Howe's twitter account:

> @bigodac: If in #oslo please unlock your WIFI to allow comms for trapped/injured/missing people. Phones jamming. via @crowdsourcing

The short message explained why Wi-Fi was needed, who could benefit from the action and how to provide help. Microblogging thus provided an avenue for members of the public to become engaged in relief actions, augmenting

[6] Interestingly, in a 'rapid response' study of the London Riots we find tweets that confirm receipt of resources, which seem to have been instrumental in micro-coordinating mobilization of volunteer 'cleanup' operations.

[7] Twitter names have been changed and tweet texts have been changed to protect people's anonymity. Several have been translated from Norwegian.

official public and commercial infrastructures by unlocking their private resources for this exceptional situation. We do not know how many people opened their Wi-Fi in response to these calls or whether this was indeed used to support communication between people affected by the attacks. Demands on our broader research program have limited our capacity for interviewing members of the public so far. However, such follow up investigations would clearly be useful in future research.

Different aspects of information seeking practices are revealed by our examination of contextual streams. Shortly after the shooting on Utøya began, 'NilsPetter' received the following tweet from one of the people on the island:

> **cpltee** @NilsPetter We are sitting by the lake. A man dressed in police uniform is shooting. Help us regarding when the police will arrive. 5:58 PM July 22nd, 2011 from Twitter for iphone

The police, who led the overall formal response effort experienced challenges in mobilizing resources given the two locations of the attacks, separated by more than 35 kilometers. Interviews with first responders indicated concern over a potential second blast in Oslo, a second car bomb at the ferry port at Utøya, and more than one shooter. When ABB's car was found at the ferry port, the police evacuated the ambulances that had arrived there earlier to the more distant Elsetangen (Figure 1, 6). At the point this tweet was sent, the police had arrived at the ferry site.

Following NilsPetter's stream after this request, we find updates that appear to draw on further first person reports from the island. Reading Figure 2 from the bottom up, we learn details about the shooting. Updates like these supported some insight into the events for twitter followers and their social networks, but they also caused great concern, especially amongst friends and parents whose children were attending the summer camp, whose first reaction was often to try to find out about more the whereabouts and safety of their friends or children.

NilsPetter's responses then reveal that it was also crucial to *stop* people from contacting those who were trapped on the island (Figure 2). With some urgency (Figure 2), he tweets 'DO NOT CALL acquaintances on Utøya', explaining that 'It can put them in danger' in a second tweet:

Figure 2. Tweets by NilsPetter, providing situational updates and warning about the danger of calling people at Utøya

The sound of mobile phones ringing could expose the locations of young people on the island and put them in danger, a fact that may seem obvious with hindsight but that was probably easy to miss in the heat of the moment.

The brief, exploratory, descriptive analysis of these examples facilitates some insight into potential benefits and tensions arising between public and formal response efforts. While factual updates inform publics and support the channeling of enquiries to official helplines, they also expose the formal response to greater and more immediate scrutiny than possible before the advent of social media. In a context where formal emergency responders are not participating in the 'twitterverse', the publics in question do not have much access (outside conventional media) to professional reasoning about the unfolding complexities, or the professionals' rationale for caution. We will return to this issue below, but would like to highlight a phenomenon that is of particular interest. NilsPetter's work of collecting and relaying information from various sources resembles the work of the 'remote operators' in the response to the Haiti crisis that Starbird and Palen (2011) analyze. His contribution is sensitive to and hopefully having a positive impact in the unfolding crisis. Being in touch with reports from people on the island, he provides a

'service' of 'configuring awareness' (Heath et al., 2002), sensitizing others to critical aspects of reality on the ground. Heath and his colleagues develop the concept of configuring awareness through analysis of collaborative work practices in 'centres of coordination', including police operation rooms and traffic control centres, with a view to informing the design of computational support for more distributed collaboration. They show that awareness is not just a 'state' of shared understanding of a particular situation, but an ongoingly accomplished dynamic process that relies on people being able to – often very subtly – highlight different aspects of a situation. The sensitivities, practices and skills involved can be impoverished and undermined by new technologies. But, as this example shows, people also appropriate new technologies in ways that support new practices and skills of configuring awareness.

Sourcing boats

As revealed in news reports[8], people in the surrounding area heard gunfire and saw people waving and calling for help to nearby boats. Some of them then used their boats to pick up people from Utøya and the surrounding water. In parallel, numerous tweets and retweets encouraged residents and tourists near Utøya to use their private boats to rescue people:

> Boats on Utøya are recommended to pick up people from the water .. The temperature is low .. High risk of drownings .. Rescue boat is on the way. [Via Twitter])
>
> RT @elisefang: do you have a boat close to #Utøya? Pick up swimming children around Utøya! #osloexpl #norwayterror # bombeoslo [via Twitter]

People also received text messages asking for help with boats. One of the local summer house owners described how he received calls and texts:

> 'You have to get in the boat of a friend of ours and rescue people from Utøya, because something terrible is happening there.'

It is difficult to establish whether members of the public helped the young people in the lake specifically *because of* the requests made via tweets and further research is required. However, the fact that such requests were made in significant numbers and through different channels suggests that emergent practices of 'micro-coordination' (Ling and Yttri, 2002) in public emergency response are taking shape. Ling and Yttri analyse everyday practices of flexibly coordinating shopping, appointments and meetings on the move using mobile technologies. They describe this as micro-coordination, because new, dynamic and delicate coordination of people, places, times and objects becomes possible. Translating such social innovation from everyday to crisis situations has the potential of supporting efforts of mobilizing needed resources (such as supplementary communications infrastructures or boats) locally and swiftly. However, undertaking such efforts 'in the wild' also creates tensions and potential problems. There is growing research and innovation-focused engagement with the possibilities and difficulties of integrating crisis informatics into formal response efforts (Latonero and Shklovski, 2010; Palen, Anderson, Mark, Martin, Sicker, Palmer, and Grunwald, 2010; Kavanaugh et al., 2011; Landgren, 2011), and juxtaposing the analysis of activities of members of the public with a glimpse into the experience from the perspective of a participant in the formal response effort will inform our discussion.

Formal response

While grassroots rescue efforts were highly valuable, they also endangered those involved, and increased the uncertainty dilemma for emergency response professionals. When asked how the medical response to the Utøya attacks was organised, the doctor we interviewed described a scene of complex tensions, criticism, and emotions:

> *When we were standing up at Sollihøgda [some 20 km from the ferry port, waiting for instruction on where to set up a reception area for injured from Utøya], a lot of persons came with private cars and the press came,*

[8] http://www.cnn.com/2011/WORLD/europe/07/22/norway.rescue.worker/index.html, http://www.bbc.co.uk/news/world-europe-14266456, and http://news1.capitalbay.com/headlines/275166-german-tourist-hailed-as-hero-for-rescuing-30-more-than-hour-before-police-arrived.html [04/09/11]

> *and they wanted to interview us and they wanted to know what we knew and lots of the publikum, persons coming there they had children on Utøya and they had contact with them on their phones and got sms's. Like, I'm shot and I'm dying and I am sad we been quarreling so much, stuff like that. … And, and also people coming from Utøya that had been evacuated and were driving back to Oslo. … they stopped and asked us 'why aren't you going to the island? It's okay now and ..', but it was never said from the police that it was secure, because the police I think, they didn't, as I or anybody else, they didn't think that this was a one man show. So if you caught one, where is the rest? I don't think anybody imagined that one man did all this. So it [the island] was never [declared] secure.'*

The police hesitated to declare the island or surrounding areas safe, because they feared secondary explosions and additional shooters. As mentioned above, this prompted them to evacuate an ambulance that had reached the lakeshore. However, this was not an entirely orderly retreat:

> *when they said that - we should leave this place, some of our colleagues … decided that we should go out … to see what's going on … And - the police said it [the island] is not secured, it is not safe, but they didn't actually say you can't come, so they took … a private boat … got to the shore and saw some very damaged injured persons and … they [the doctors] were – [taken] up to the house [by the police] … but they couldn't really do anything … because … there were lot of people shot but none of them were alive… I think they found a computer with names and list of all the … people attending to the meeting - so they handed that over to the police, so they at least had some … first register of how who is there and how many.*

An emergency medical reception area was set up in Elsetangen (see Figure 1):

> *And a little before seven I think then the big mass of heavy casualties arrived with small boats on this spot and it was the police that brought them, the delta police brought them over here. So it was - some people were evacuated by themselves, lot of people tried to swim over and – and - civilians from the camping here with small boats collected them and brought them over.'*

Voluntary participation in collecting the young people from the island and the water to safety was brave, but it was also hazardous for the volunteers and their cargo. The public rescue effort and public opinion, possibly influenced by microblogging activities, also increased the complexity for the professionals and added to the pressure to act. For example, it added uncertainty with regard to what happened to those injured victims who were not brought to the reception area; it was unclear where they had gone, what treatments they got, what they still needed, and exposed staff to critical questions such as the '*why aren't you going to the island? It's okay now and ..'*. above.

In this research it is important to realize that microblogging and volunteer actions can contribute to ethical dilemmas for the police and other professional responders: how to deal with the increased pressure to act, perform under increased public scrutiny, utilize pertinent intelligence, respond to public attempts to mobilize resources. Interviews with officers involved would be highly valuable in future research, as would be studies of how professionals are developing (or might develop) approaches to social media citizen crisis informatics that go beyond monitoring on-line activity (Palen et al., 2010). In this event the professionals did not openly engage by either posting on social media platforms themselves or by attempting to curb the physical volunteer operations. But if something had happened and it became known that they had known, would they be held accountable for not stopping or protecting members of the public? It is no longer unusual for professional agencies to try to monitor the microblogging sphere, but it remains unclear how to respond to or integrate public response efforts. And for the professional agencies to openly acknowledge and engage with the public response may conflict with their duty to protect the public. There are significant practical, moral, ethical and legal dilemmas that need to be explored.

DISCUSSION

Building on existing research on the efforts of 'remote operators' (Starbird and Palen 2011) and crisis mapping (Morrow et al 2011), the examples of micro-blogging attempts at resource coordination discussed in this paper suggest that the boundaries between physical and virtual spaces are being blurred, and the sites and processes of coordination are changing. The incident site and spaces of public response are becoming articulated and connected in ways that impact on the unfolding events. They open up the possibility to rethink crisis responses through the notion of 'peripheral response'. Using eyesight as a metaphor, the periphery is not the central focus of attention but it is crucial for making sense of what humans see, feel, and sense and how they respond to unfolding situations. Furthermore, not only do we use a variety of sense-making mechanisms to articulate the situations around us, but we

also draw upon the understanding, insights, observations and judgments from others who can be in quite different situations to apprehend these situations and act upon them. 'Peripheral awareness' also plays a significant role in professional collaboration (Heath and Luff, 1992; Heath et al., 2002). Building on the metaphor, the notion of 'peripheral response' highlights processes through which an incident is noticed, read and responded to through practices of 'bridging' between areas and people that are endangered in an incident and the experiences, expertise, knowledge, resources and actions that are socially and physically distant.

Proposing the concept of 'peripheral response' draws attention to the actions and effects that microblogging can facilitate. Peripheral in this sense does not mean 'spatially distant', it means 'out of focus' but critical for orientation in a complex field. As discussed earlier, research in the field of crisis informatics demonstrates highly sophisticated patterns of information work, emergent roles and services in an ever growing number of crises. The case study in this paper suggests both promising potentials and unintended ethical dilemmas that microblogging the coordination of critical resources may engender. Further research into the links between microblogging and *in-situ* resource mobilization is needed. But our analysis also highlights how publicly mobilized information and action must be contextualized and understood in terms of their unintended consequences. By discussing some key aspects, this paper underlines the importance of considering how actions and resources may be mobilized in part through distributed collaboration with operators who are socially or physically distant from disasters.

To understand microblogging in this way suggests that the concept of 'situation awareness', commonly adopted to frame analyses of the use of social media during crises should be respecified. Firstly, situation awareness can develop in a distributed and collaborative manner, that is, by both centralized and distributed sense making and improvisation (Mendonça et al., 2007). While conventional accounts of situation awareness also recognize that decision- and sense-making do not necessarily derive from only one person (Endsley, 1995; Endsley, Bolte, and Jones, 2003), the emphasis is often placed on cognition and does not address in sufficient detail *how* awareness is developed and updated through distributed collaboration by those who are situated in very different socio-technological circumstances, and *how* this is a matter of 'configuring awareness'. However, as the case study demonstrates, this is important because some of the interpretation of situations and even resource mobilizations may benefit from grassroots collaboration, but also create dilemmas that should be anticipated and addressed in a more informed manner. In the example of coordinating communication channels, important support for communication, and important knowledge about how (and how *not*) to communicate were made possible through engaging the situated expertise and knowledge of socially and physically distant volunteers. This leads to a second point. Many crisis situations become knowable to others through the sociality of information exchange. Established social contacts, for example, can play a crucial role. Instructing people not to call was a result of information gathering built on existing social networks, as well as acute emotional and situational understanding. Furthermore, 'network capital' (Wellman and Frank, 2001) that tweet 'elites', such as @crowdsourcing, have, was crucial to make the request for Wi-Fi access widely noticed. Thus, collective awareness-configuring activities facilitate the production of situation awareness and awareness of wider personal, situational and social concerns.

Finally, peripheral response also draws attention to processes of turning information into action. The situation awareness paradigm posits an idealized, step-wise process to transform information to awareness and decision-making and action. In this model the reliability of information is often identified as a potential problem. However, reliability of information is not the only issue that affects the comprehension of situations and responses to them. A critical challenge for responders is the uncertainty dilemma – the need to balance urgent deployment of resources with the need for thorough evaluation of a situation. Public responses may sidestep this dilemma, mobilizing resources without informed assessment of risks. This can add to the informational complexity of crisis situations and emergency response plans, potentially adding unexpected dangers. Considering communicative and practical public response efforts in relation to formal response efforts is an important challenge for attempts to integrate social media use during crises into emergency response efforts in a more agile and dialogic manner.

CONCLUSION

This paper presents a case study from the 22/7 Norway attacks to discuss how peripheral response emerges, and how information made available in social media forums may be translated into action, mobilizing infrastructural and physical resources. Actions are micro-coordinated and awareness is configured in a manner that has the potential to be integrated into a more agile professional emergency response. However, peripheral responses may also exacerbate the existing uncertainty dilemma for professional responders and create significant new moral, ethical,

legal and practical pressures and difficulties. How peripheral response is to be integrated needs to be explored not only in relation to the informational practices involved, but also in relation to the physical actions taken.

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