Darkness and Disaster in the City

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Many people all over the world are regularly hit by floods, cyclones, or bushfires. Many people use smart phones and social media to stay connected, seek help, improvise, and cope with crises or challenging situations. This column discusses these practices after dark or during disasters in order to unveil challenges and opportunities for innovative designs that increase resilience and safety.

Recent severe weather events such as floods, bushfires, and cyclones have devastated the lives of many Australians. The Brisbane floods, for instance, cost Brisbane City Council AU$440 million.[1] This bill would likely have been much higher, if not for the substantial self-initiated and peer-to-peer volunteer support that quickly unfolded, much of which was swiftly orchestrated and facilitated in a networked fashion without central control through social media and mobile applications such as Facebook and Twitter. This technology plays a key role in both improvisation during and recovery after natural disasters.

It also helps users cope with everyday risks, such as traversing inner-city environments after dark. In 2010, the number of assaults in Melbourne rose for the seventh straight year.[2] Our research shows that some patrons of Melbourne's entertainment areas started to appropriate mobile social media in innovative ways to reduce these risks and increase their perceived sense of safety.[3]

This dualism of "darkness and disaster" is at the center of our research interests. The increase of certain types of natural disasters due to climate change is one reason to investigate technological solutions to users' need for greater security in the city, but designs must address this problem holistically. We shouldn't view personal safety and security through the lens of a specific incident or event but as part of a process through which the evolution of the user and the technology empowers individuals and communities to protect and help themselves and each other. To this end, new knowledge and insights are required about how we can design urban informatics to enhance the lives of people in urban environments.[4]

Our approach asks, "Who else faces the kinds of problems we have identified, how do they deal with it, and what design lessons can we learn from them?" Our case study "Welcome to the Jungle" describes how our early research into using mobile technology to help people cope with darkness was interrupted by a major natural disaster and highlighted the need to recontextualize everyday personal safety technology. We sum up this "Designed for Darkness — Relevant for Disaster" approach in our YouTube clip "Welcome to the Jungle: HCI for Darkness and Disasters " (see http://youtu.be/X2xnYnZsDFc).

HCI after Dark

As both technology and technological practice evolve in turn, human–computer interaction (HCI) has expanded its focus from the design and assessment of particular interaction styles to encompass the role that interactive systems play in connecting people with their world. Yet, we rarely see these interactions and activities as extending past midnight. By constructing the user in a 24/7 context, a spectacle of after-dark activity emerges that brings with it a unique set of novel user needs and significant design challenges for HCI. The open 24/7 model of urban living has reconstructed the nighttime dynamics of inner-city spaces. Many once void and abandoned central business districts have become hives of nocturnal activity such as entertainment and 24h commerce. Yet only a slim body of HCI research looks specifically at technology's role in mediating physical safety in the streets at night. "Night and Darkness: Interaction after Dark," proposes examining night and darkness as a starting point for designing ubiquitous computing.[5] Jan Blom and his colleagues recently addressed this challenge; in a study of 200 females, they identified a need

to alleviate the fear they experienced in an urban context and describe an investigation of a mobile communication system to help meet this need.[6]

Relevant research has also examined wearable computing technology to help older people overcome fear of crime,[7] as well as the potential for technologies that let parents monitor their teenagers.[8] In an albeit less conventional context, Emily Troshynski and her colleagues delve into using electronic monitoring to keep sex offenders out of defined public spaces.[9] Although coming from different perspectives, these last three papers show that although we want to be protected, we don't necessarily want to be watched. The authors raise significant concerns about how technologically mediated attempts to ensure personal safety are tightly coupled with surveillance and the erosion of privacy. This concept is exemplified in the critical perspectives provided by research into privacy.[10] Our own work in this area[3,11] has produced a critically informed theoretical lens for thinking about the potential technical, social, and cultural issues that arise when we harness metadata about people for surveillance-based purposes.

The significance of helping inner-city residents manage and reduce their fear in the city after dark was also highlighted via a study conducted by the Australian Government's Healthy Spaces & Places initiative (see www.healthyplaces.org.au/site/design.php), which identified design factors that enhance city residents' feelings of well-being. They found that perceptions of safety influence the nature and extent that people use spaces and places. Street and place designs that aim to reduce crime can enhance a community's physical, mental, and social well-being.

Furthermore, "crime statistics or even the actual crime rate is less damaging to the public psyche than 'the toxic psychological impact' of the perception that crime is getting worse and our communities are unsafe."[12] The fear in urban spaces escalates rapidly once night falls, which supports our research's significance.

Social Dimensions of Climate Change Adaptation

The scientific community now considers many climate change effects, such as severe weather events, to be unavoidable, requiring adaptation over the coming decades, even if efforts to control emissions avoid more serious effects in the later part of the century. Private and public sectors are moving with increasing momentum to identify risks and implement adaptation strategies. Internationally, this is a major funding priority for the UN Framework Convention on Climate Change. In Australia, the Federal Department of Climate Change has been funding local government risk assessments for more than two years.

However, many individuals aren't prepared to cope with adverse situations that require improvisation and adaptation. Domestic households and private individuals lag behind in their understanding and preparedness, despite being among the most exposed to the effects of climate change impacts and regulation. The negative consequences are well-established: Hurricane Katrina in the US in 2005, severe flooding in the UK in 2009, Victorian bushfires in 2009 and floods in early 2011, and the Queensland floods and cyclone Yasi in early 2011 have all caused major social and economic disruptions that are expected to increase in magnitude and severity with climate change. Nonweather related events such as recent earthquakes in New Zealand and Japan also cause a similar magnitude of distress and disturbance. The process of climate change adaptation and resilience requires information and preparedness.

Based on this premise, the HCI and IEEE communities must identify additional opportunities that can enhance and accelerate personal adaptation by using tools, interfaces, methods, and practices of mobile social media that have already proven effective in other areas — such as personal health and wellness,[13,14] and persuasive technologies.[15]

New Design Opportunities

We can address the different challenges that both darkness and disasters pose through new designs in mobile technologies and applications. Research in these areas must be informed by critical theoretical concerns — such as the need to balance surveillance with that for privacy — and driven by visionary design goals, such as facilitating a greater culture of awareness for others' well-being. Technology must act as a conduit to foster a culture in which groups of people look out for each other while respecting users' privacy. To achieve this, novel design outcomes should be underpinned with various questions: What might

new designs look like if freed from the constraints of the form factor of the laptop or even the mobile phone? What embodiments of a design might appeal to different user archetypes in a range of contexts? For example, Mark Blyth and his colleagues suggest using wearable technology as a way to enhance the safety of the elderly.[7] At a time when the average smart phone staggers under the weight of multiple apps that do everything from acting as a carpenter's level to testing for pregnancy, this type of critical thinking about how to embody user needs will lead to innovative design solutions.

Welcome to the Jungle: A Case Study

The initial context of our research was personal safety after dark. This entailed an ethnographic study that zeroed in on areas of concentrated nocturnal activity. We weren't after the experiences of the lone jogger going for a midnight run in the park; rather, we wanted to position our research at the hub of after-dark activity. Our focus was on areas such as Chapel Street, Prahran, in Melbourne, where the late-night restaurants, bars, gyms, tanning salons, Internet cafés, and 24-hour clubs brought together hundreds of people from all over town.

Our study of this activity revealed that mobile devices are already a major factor in providing different user archetypes with a sense of security. For the "risk-minimizing female urban warrior," the faux phone call gave the perception of security; for the "technically savvy sex worker," it was the real-time protection via connectivity to a closely collocated human resource manager (pimp). Yet, we could also see that the lack of a specifically designated safety functionality meant that the "lone male" archetype dismissed his mobile phone's security properties as a type of preemptive digital Man Mace. This user problem required a design solution that not only incorporated a specific functionality that would facilitate personal safety but did so in a way that constructed the user not as a victim but as a protector. From a technical perspective, the possibilities for implementing this are almost endless; yet, as other research reminds us,[10] the ability to capture nuances in cultural implications will shape a design's success. So, to inform our particularly macho design brief, we embarked on a study that examined lone mining engineers using dedicated personal safety devices in remote and dangerous areas of outback Australia.

It the midst of this research, we determined the need for personal safety technology that we could recontextualize for use during natural disasters. In late 2010, Australia was hit by one of the worst natural disasters in the nation's history. Raging torrents flooded parts of Brisbane's central business district and surrounding suburbs. The BBC reported sharks swimming in the streets and crocodiles being swept out of rivers and into urban areas. Yet, at a time when inner-city residents were in great need of support from mobile networks, massive infrastructure failure revealed the city to be a thin veneer over the urban jungle.

One of the nation's three major mobile telecommunications providers lost mobile services to almost the entire state beginning around 6 p.m. on the night of the flood, while attempts by the country's main telecommunications provider, Telstra, to restore connectivity were hampered by factors such as poisonous snakes escaping the floods by wrapping themselves around telecommunications cables (see Figure 1). Thus, although our initial research focused on technology for personal safety after dark, the importance of leveraging these designs with mechanisms that made them robust enough to be useful in times of natural disaster cemented our research direction, "Designed for Darkness — Relevant for Disaster.

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