Community Development Crowdmapped and Texted

by

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Glossary of Terms

Application / deployment / platform - An interactive, online mapping web page, which can be customized because of its programming interface. These allow for integration with other applications.

CDMA (Code Division Multiple Access) - CDMA is a telecommunications method by which a transmitter (e.g., a cellphone) can use multiple broadcast channels to send and receive transmissions. It is the prevalent telecommunications network standard for Canada.

Community Development – Community development is a process where community members collaborate by means of an organized intervention with the goal of empowering them vis-à-vis circumstances that affect their lives (i.e., to improve the community's physical, social and economic conditions).

Community Informatics – Community informatics is a discipline that aims to use technology to solve problems in communities by local people, rather than technology experts.

Crisis Mapping - A medium by which impacted individuals can easily contribute and share digital geographic information related to challenges and solutions to crises through online and offline methods. If offline, individuals tend to be on the site of the crisis. Contributions tend to occur as the crisis is occurring. Like VGI, crisis mapping projects often enable large numbers of people, including the public and crisis responders.

FOSS (Free and open-source software) - Software written generally by a community of users that is freely available and editable code.

Geoweb (Geospatial Web) - The geoweb is a combination of Internet technology (usually a mapping platform), geographic information and social networking, a part of the Web 2.0 movement.

GSM (Global System for Mobile communications) – The most used type of mobile technology network. Mobile phone service carriers can search a mobile phone tower with the GSM network in proximity to the phone's location.

ICT (Information and Communications Technology) – An ICT is a type of computing technology that focuses on communication technologies (e.g., Internet, wireless networks, mobile phones) and grants access to information through the use of telecommunications (see definition below).

ICT4D (Information and Communications Technology for Development) – ICT4D is a movement with goals to bridge the accessibility gap between computing technologies. It focuses on economic development by providing access to modern communications technologies.

IMEI (International Mobile Station Equipment Identity) – A unique number used to identify mobile phones used by a GSM network for the identification of valid devices.

LBS (Location Based Services) – LBS integrate numerous spatial and communication technology services that are concerned with the location of a user's mobile device.

Neogeography – Neogeography is termed the "new geography". It refers to non-credentialled users developing and using software tools/related to traditional Geographic Information Systems (GIS) and the Geoweb.

SIM (Subscriber Identity Module card) – A card that contains the phone number and storage for text messages (SMSs).

SMS (Short Message Service) – A text message sent from a mobile phone. It has a 160 character limitation.

Telecommunications – Telecommunications represents different means of technology-assisted communication. Traditional telecommunications technologies include the broadcast system (radio), telephone and television; new telecommunications technologies include the satellite phone, Internet and mobile phone. It also refers to the infrastructure that supports these technologies (e.g., mobile phone towers).

VGI (Volunteered Geographic Information) – VGI is geographic data created, assembled and/or disseminated voluntarily by individuals (e.g., the OpenStreetMap initiative). These individuals tend not to be formally coordinated. The information is communicated via the Geoweb.

Web 2.0 – Web 2.0 is a concept popularized by social entrepreneur and book publisher, Tim O'Reilly. It refers to a World Wide Web that bases its utility on user generated content, the users being primarily non-experts, who contribute content about their lived experiences. Conceptually, it distinguishes itself from Web 1.0, of expert-driven content that emphasized a one-way delivery of content. Web 2.0 includes blogs, wikis, social networks and cloud-based applications. It is supposedly a collaborative and more open environment, which contains mashable content and serves the "long tail" of users.

Abstract

The thesis investigates the use of mobile technology and an online crisis mapping platform for community development practices. Mobile technology has been widely used to facilitate communication and build social structures for communities. Online mapping platforms allow non-experts to create, organize, and visualize a dialogue about events like earthquakes, fires, or floods. In particular, crisis mapping has been used in the information and communications technology for development (ICT4D) movement as a method of connecting and empowering citizens during emergency events. Ushahidi is the best-known example of a mapping platform used for crises, which integrates mobile technologies by allowing for texting/SMS (a.k.a. Short Message Service) to collect citizen reports. Crowdmap, Ushahidi's cloud-based mapping platform is used to investigate whether citizens would text/SMS and send online messages such as email, web-based, tweets and smartphone application submissions for community development (e.g., local places, community assets, improvements). Moreover, the thesis interrogates the utility of crisis mapping platforms for acute (crisis) and chronic (persistent, long-term) issues in communities and examines developer issues and participant (i.e., community organization) use.

A crisis mapping platform is repurposed to deploy five applications for community development initiatives in four communities (case studies) in Canada: McGill University (one application) and Lachine (two applications) in Montreal; Acadia Park (one application) and Grandview-Woodland (one application) in Vancouver.

The methodology consisted of five steps. First, five applications on the crisis mapping platform were created. Second, telecommunications hardware were set up to receive SMSs submitted by participants. Third, telecommunications software were set up to map SMSs to the mapping applications. Fourth, meetings were scheduled with the communities. Here, storyboards were used to communicate and propose the applications to non-technical, multilingual audiences. In addition, attending local meetings, creating manuals, co-designing and distributing multilingual posters and flyers were critical for community outreach. Fifth, the applications were administered by geo-locating, uploading and parsing incoming messages. The data was collected by receiving, approving and crowdmapping messages.

There are four trends in the findings: (1) the technical challenges of the platform, (2) the use of information communication technologies (ICTs) by community organizations, (3) the use of ICTs by participants, and (4) the issues of temporality, technology ecosystems and small data. The four findings contributed to an inconsistent adoption and use of the applications, producing an uneven spread of the 254 total messages among the four communities.

The thesis concludes by discussing broader implications and prospects of mobile and web-enabled mapping for community development. ICT mapping platforms create innovative possibilities for community development practices and self-organization. Future work includes developing more participatory technologies according to existing community development frameworks. This will ensure community participation and long-term use before we spark meaningful and lasting community dialogues about local places.

Résumé

Dans ce mémoire, l'utilisation des technologies mobiles couplée avec une plateforme en ligne pour la cartographie de crise dans un contexte de développement communautaire est étudiée. La cartographie de crise a été utilisée dans le mouvement des technologies de l'information et de la communication (TICs) au service du développement comme méthode pour connecter et renforcer les capacités des citoyens dans des situations d'urgence. Cette étude a utilisé *Crowdmap*, la plateforme cartographique « dans un nuage »de Ushahidi est utilisée pour analyser si les citoyens allaient envoyer des textos et envoyer des messages en ligne comme les courriels, les *tweets* et les soumissions provenant des applications de téléphones intelligents pour le développement communautaire (ex. : les lieux locaux, les atouts de la communauté, les éléments à améliorer). De plus, l'étude interroge l'utilité des plateformes pour les crises dans des conditions de problèmes graves (de crise) et de problèmes chroniques (qui persistent, long terme) dans les communautés. Les problèmes du développeur et de l'utilisation du participant (ex. : l'organisation communautaire) dans le contexte de communautés locales ont été également abordé.

Le contexte de l'utilisation de la plateforme de cartographie de crise a été changé afin de développer cinq applications pour des initiatives de développement communautaire dans quatre communautés (études de cas) au Canada: l'Université McGill (une application) et Lachine (deux applications) à Montréal, ainsi que Acadia Park (une application) et Grandview-Woodland (une application) à Vancouver.

La méthodologie comprend cinq étapes. Premièrement, cinq applications sur une plateforme de cartographie de crise ont été créées. Deuxièmement, le matériel de télécommunications pour recevoir les messages textes envoyés par les participants a été mis sur pied. Troisièmement, un logiciel de télécommunications afin de cartographier les messages textes dans l'application cartographique a été installé. Quatrièmement, les communautés ont été visitées et des panneaux narratifs ont été utilisés pour communiquer et proposer les applications aux audiences dans un langage non technique et multilingue. Le chercheur a également participé aux diverses réunions locales, créé des manuels, ainsi que co-élaboré et distribué des affiches et pamphlets. Cinquièmement, les applications ont été administrées en géolocalisant, téléchargeant

et analysant les messages entrants .Les données ont été collectées en recevant les messages, en les approuvant et en utilisant la méthode de *crowdmapping*.

Les résultats se présentent sous forme de quatre tendances: (1) les défis techniques de la plateforme, (2) l'utilisation des technologies de l'information et de la communication (TICs) par les organisations communautaires, (3) l'utilisation des TICs par les participants, et (4) les problèmes de temporalité, d'écosystème technologique et de petites données (à l'opposé de données massives ou *Big data*). Les quatre résultats ont contribué à une utilisation et une adoption inconsistantes des applications, produisant une étendue inégale des 254 messages totaux reçus parmi les quatre communautés.

La conclusion discute des implications et des perspectives plus vastes pour la cartographie mobile et sur le web dans le cadre du développement communautaire. Les TICs de plateformes de cartographie créent des possibilités innovantes pour les pratiques de développement communautaire et d'auto-organisation. Les études subséquentes devraient inclurent le développement de technologies davantage participatives en fonction des cadres existants de développement communautaire. Ceci permettra d'assurer la participation communautaire et l'utilisation à long terme, afin de pouvoir alimenter un dialogue significatif et continu à propos des lieux importants dans les quartiers.

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Chapter 1: Introduction

This thesis has three goals. First, it examines how crisis mapping applications/methods might be adapted for ongoing (non-crisis/chronic) community development. Second, it questions whether community development can be advanced with the usage of mobile technology, particularly its connection to mapping platforms. The use of crisis mapping and the mobile phones for development (community and otherwise) predominates in developing countries. There is a seeming research gap between developing and developed world literature on the potential for crisis mapping and mobile phones to promote communities so, third, this research seeks to fill this gap as well.

1.1 Context

The rise of Web 2.0 has inspired many technologies to be created for humanitarian response. Indeed, they have been proclaimed as liberation technologies (Diamond, 2010; Meier, 2011). Crisis mapping could be considered one such liberation technology. Crisis mapping methods have been developed to deal with acute natural or human-induced situations. They have been lauded for offering numerous benefits. Crisis platforms demonstrate connectivity between open source software, humanitarian crises, and crowdsourcing (Okolloh, 2009). They provide immediate collection of reports and have the ability to handle and collect unstructured data (e.g., emails, forms, tweets). They can geocode messages automatically (using smartphones and Twitter) and manually (using SMS content) (Gao, Barbier & Goolsby, 2011; Roche, Propeck-Zimmermann, & Mericskay, 2011; Zook, Graham, Shelton, & Gorman, 2010). Indeed, crisis platforms are useful tools for collecting information and visualizing data (Gao et al., 2011; Morrow, Mock, Papendieck, & Kocmich, 2011). They have the ability to fill information gaps (Morrow et al., 2011), and in the instance of Haiti, have provided aid for earthquake victims (Forrest, 2011; Neis, Singler, & Zipfet, 2010). Crisis mapping activities are supposed to respond to sudden catastrophes (i.e., floods, earthquakes) but we are interested in the potential to be applied to more chronic situations. More long term conditions like famine and disease (Marcus,

2011; Ziemke, 2012) have been addressed with crisis mapping technologies. This thesis asks whether and how it could be applied to community development?

The thesis research combines mobile phone texting with online and mobile mapping. We are interested in this integration where mobile phones, in particular texting, are seen as a fast and well-understood method to contribute content about natural or human disasters. In addition, it supports the idea that individuals who live in a locale, non-experts, are best equipped to sense changes in their immediate surroundings (Goodchild, 2007). This is in contrast to experts, who may not understand the context of an area nor be able to respond with sufficient speed and attention.

The Ushahidi platform is considered to be the first Web 2.0 mapping platform developed specifically for crisis mapping. Platforms like Ushahidi explicitly link mapping and texting, which differentiate them from the rest of online platforms that solely rely on the Internet for user contribution (Zook et al., 2010). Ushahidi was originally created to allow for easy and fast reporting of post-election violence in Kenya (http://legacy.ushahidi.com/). Since then it has been used in numerous applications, yet the best known example is the Haiti Earthquake (Forrest, 2010; Roche et al., 2013), where individuals could report damaged buildings, missing persons and violence. Online mapping has broadened from acute events like natural disasters to acute community problems. For example, the Ushahidi platform has been used to build HarassMap in 2005, which allows people to report incidents of sexual harassment (http://harassmap.org).

There is strong support in the literature for use of mobile phones in community development. Many studies on mobile phones for community development have been conducted in the developing world but few in the developed world. This is intriguing because the platforms and work that have been created and applied in the developing countries tend not to be applied to developed countries. Therefore mobile phones as well as Ushahidi, which has been developed in Kenya, could represent a knowledge transfer opposite to the usual direction of transfer. Instead of the endless transfer of knowledge from developed to developing (read: well educated to less), we may see a movement of knowledge about community development move from developing to developed. The developing world may be able to teach us something about cutting-edge technology.

How popular are text messages? By the end of 2013, 40 percent of the world will be online, although 4.4 billion people will remain unconnected (Figure 1-1) (ITU, 2013). Still,

mobile phones are reaching more people than ever before. Mobile broadband is now more affordable than fixed broadband (i.e., Internet access) (International Telecommunications Union [ITU], 2013). "We send over 8 billion text messages per day" (Fisher, 2013). In particular, Canadians send more than 270 million text messages daily (Canadian Wireless Telecommunications Association [CWTA], 2013). The initial focus was on the use of so-called "dumb" cellphones, to use more inclusive and diverse ways of communication. Even though smartphone (i.e., a software application-enabled phone) use is prevalent in the developed world, a large number of the population does not own smartphones.

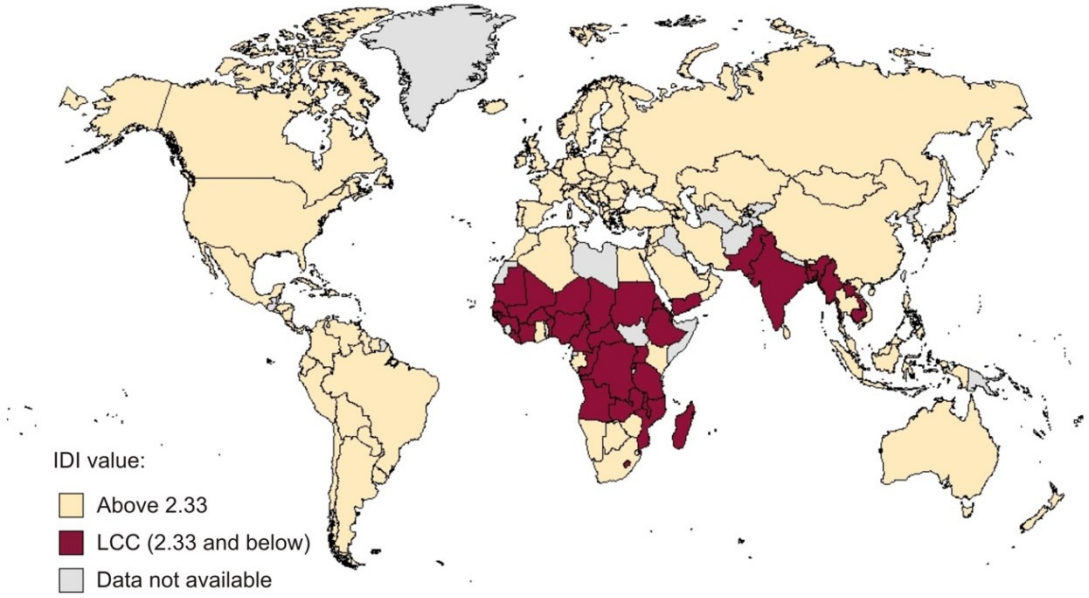


Figure 1-1: Map depicting global Internet connection. The least connected countries (LCCs) are in red. (Source: International Telecommunication Union [ITU], 2013)

Mobile technology has been widely used to facilitate communication, promote networking, and build social structures for communities (Donner, 2008; Hardey, 2007; Horst & Miller, 2006; Katz, 2011; Yzer & Southwell, 2008). Many examples derive from the developing world, proving that mobile phones are valuable tools for communities, where mobile technology is accessible and widely used (Abraham, 2007; Bailard, 2009; de Souza e Silva, Sutko, Salis & de

Souza e Silva, 2011; Wong, 2008). Africa and Asia are the biggest mobile markets in the world (Adewunmi, 2011). Mobile technology research has focused on rural settings in the developing world but this thesis explores the potential for phone usage in urban settings.

There is an enormous literature on mobile technology, in particular mobile phones. Integrating mobile technology in society has led to progressive outcomes, particularly in epidemiology, agriculture, and fishing industries (Abraham, 2007; Aker & Mbiti, 2010; Patnaik, Brunskill & Thies, 2009; Wong, 2008). The value of mobile technology is tied to successful community integration. In rural settings of the developing world, locals save time, energy and money by receiving current and accurate information (Abraham, 2007; Alamenciak, 2012; Patnaik et al., 2009). The impact of mobile technology has inclined research to suggest further use in urban settings (Baron, Goutard, Nguon, & Tarantola, 2013). However, even under positive representations of Information and Communications Technologies (ICTs), the risk is of a top-down model that fails to include the diversity of communications and cultures within communities (Shanmugavelan, 2000). This thesis examines the research engaging communities in a bottom up process of co-designing ICTs that support multiple forms of mobile phone-related communication.

Finally, what is community development? The community development process is an organized initiative that empowers local citizens by giving them more control over their lives (Lyndon, Moorthy, Er, & Selvadurai, 2011). It is largely based on physical projects, which consist of local events and public meetings, where often the physical presence is more important than the use of technology. Here, empowerment refers to human actions that build links, mutual confidence with local communities and partners, where they learn to work together (Beland, 2014a). Communities are not unanimous. They have many voices which at times disagree. There are haves and have nots in a single community. Here, technology can advantage some people while disadvantaging others. The challenge is to bridge the physical and the virtual of crisis mapping and phones, represent multiple voices, and broaden engagement.

1.2 Research Questions and Objectives

The following questions are addressed in the thesis:

1. What are the benefits and challenges of integrating texting/SMS practices with online mapping applications?

Mobile phones are a potential intermediary to connect local citizens and share information through Short Message Services (SMSs), or via the web. The question seeks to determine whether using this technology identifies community assets and community improvements that strengthen community ties and reveal community values. However, given the novelty of SMS practice for community development, potential challenges are identified: hardware and software availability, the nature of mobile network providers and the process of geo-locating messages. This is discussed at great length in Chapter 4.

2. How can geo-tagged texting/SMS be implemented in community development processes?

The question investigates the potential of texting/SMS in communities to initiate a dialogue, to determine the preferred communication medium, and understand the spatial distribution of messages contributed. The content, spatial distribution and sheer number of messages is investigated. Chapters 4 and 5 provide answers to this question.

3. In what ways can a crisis mapping platform be adapted for the purposes of community development?

The question explores how techniques developed for crisis mapping work can be adapted for the continuous work of community development. Such a platform is repurposed for community development. Its adoption and sustained usage is defined as a process of three steps: (1) adoption of the platform by the community, (2) community use of the platform with the researcher's assistance and co-administration, and (3) independent community use and administration of the platform after the co-administrative phase. Chapters 3, 4 and 5 provide answers to this question.

1.3 Study Sites

The thesis examines empirical research collaboration with four communities in Canada and built and evaluated five integrated SMS-mapping applications. The first application, University Spaces, was created for the McGill University student, faculty and staff community, which included university students living in temporary residences. The McGill community is comprised of 38,779 students (Fall 2012 statistics), 1,674 faculty members and 3,457 administrative and support staff (Fall 2013 statistics). University Spaces was intended as a pre-test of the ability to integrate the two technologies, texting and mapping, and to evaluate the spatial distribution of contributions. The applications *Espaces Lachine* (Lachine Spaces) and *Saine Alimentation* (Healthy Eating) were created for Lachine, Quebec. Lachine is a disadvantaged community in Montreal, consisting of 7,340 low-income residents (18% of the population in Lachine) (Statistics Canada, 2006); these residents are also physically separated from other areas by heavy industry (Centraide, 2012). We worked with the *Table de concertation jeunesse de Lachine* (Table for Youth Dialogue in Lachine [Table]) from *Concert'action Lachine*. The Table is an umbrella non-profit organization of numerous community based organizations that coordinate/organize activities and events for Lachine youth, professionals and adults. Here, the interest is in understanding how technology can be adopted by a community-based organization. In particular, the initial interest was in its adoption by youth in a disadvantaged area; disadvantaged in terms of technological capacity as well as income and class. The fourth and fifth applications were in more affluent urban settings. The fourth application, Acadia Park Spaces was created for Acadia Park, a community of Vancouver, British Columbia consisting of young, middle class families living in subsidized student housing, with a total population of 1,700 (Mahal, 2013), with more than half (58%) reporting an annual income of less than $30,000 (Bigam, 2013). We worked with the Acadia Families for Sustainable Communities collective, formed of current and former student families that are concerned about the risk of the community's land-use changes. This community is considered both affluent and is located in a university setting. Interest in the platform application derived from the potential to voice concerns about a specific community development issue: rezoning. A fifth application, Let The People Speak, was created but never launched for the Grandview-Woodland community of Vancouver. The community comprises of a mixed low and middle income population with multiple ethnicities that are largely renters (66%) (City of Vancouver, 2012). The interest in this

community resulted from a more adversarial community, which also exhibits an expansive organizational and technological capacity.

1.4 Methodology

The methodology is carried out in five steps. First, research was conducted on mapping platforms to determine the benefits and limitations specific to the application(s) that would be created for the thesis. Second, the technology was tested by building the first Crowdmap application, University Spaces, for McGill University students, faculty and staff with a specific focus on mobile phone message submissions. Third, qualitative visual methods were researched and determined that storyboards are one such effective method to disseminate information. Given this, storyboards in comic book form were created to present the project proposal to communities. Fourth, community organizers and activists were contacted through on-the-ground networking and emails. Meetings were prepared with community organization members with storyboards used to explain the process of mapping and contributing content to be mapped. We met and presented the project and, to give them insight into the potential, showed previous applications. I, as well as others associated with the research (i.e., research assistants, committee members) attended community meetings. I developed each application after consultations with the communities. There were numerous iterations of application development, following discussions with community members. The applications were launched once we came to a consensus. Multi-lingual flyers were designed by community based representatives. Manuals were written so that the organization could navigate the applications. Guidelines were created for what constituted an appropriate message. Fifth, applications were launched. These were part of a co-development process of community representative involvement in the look and feel of the application. The applications consisted of three parts: a mapping software platform, telecommunications hardware, and a telecommunications software platform. Crowdmap, a free and open source cloud-based mapping platform was used to develop the applications. FrontlineSMS, which integrates with Crowdmap (and Ushahidi), was used as the telecommunications software. The hardware and software required by FrontlineSMS is under the Global System for Mobile Communications (GSM) network, not the Code Division Multiple Access (CDMA) that is prevalent in Canada.

1.5 Structure of the Thesis

The thesis is divided into six chapters. The next chapter, Chapter 2, is a literature review that examines the issues and debates surrounding the use and implications of technology in society and in particular, for community development.

Chapter 3 investigates the "hype" behind crisis mapping and its use for real world applications in community development. Crisis mapping (the platform/ideology on which Crowdmap is based) was repurposed and tested as a community development application. What is the role of a crisis mapping platform for undertaking the process of community development? In doing so, I revealed some assumptions in crisis mapping with findings: on-the-ground matters; the zero cost argument does not hold; the communication medium is important when soliciting contributions; crisis mapping involves both disintermediation and the introduction of new roles.

Chapter 4 provides an in-depth look at the challenges of integrating mapping and texting in community development practices. That is, what is the utility of these crisis mapping platforms towards persistent community based conditions? What is the preferred mean of communication? What are the limitations of the platform for the community members? Findings related to the preferred mean of communication, which varies between communities and creates differences in message contribution, with further limitations of platform/to participation found in the methods of communication; the applications frequently demanded skills that resembled technical system administration; telecommunications resources availability in Canada complicated application development and diffusion; telecommunications hardware use accessibility in Canada was low; geolocation parsing was far more complicated than advertised; and rapid technological change meant challenges with system structure, management and outcomes.

Chapter 5 examines the temporal and small data limitations of using a crisis mapping platform for community development. Findings relate to the acuteness of the event, the singularity of purpose, the motivations of contributing to non-acute events, the connection of contribution to action, and the issues related to the concept of small data. There is an embedded temporality to a technology developed for crises that can or cannot be translated to more long-term, non-event-driven, conditions.

Chapters 3-5 are manuscript-based. Their connection is illustrated in Figure 1-2. Chapter 6 concludes the thesis and suggests future work for mapping technologies in communities.

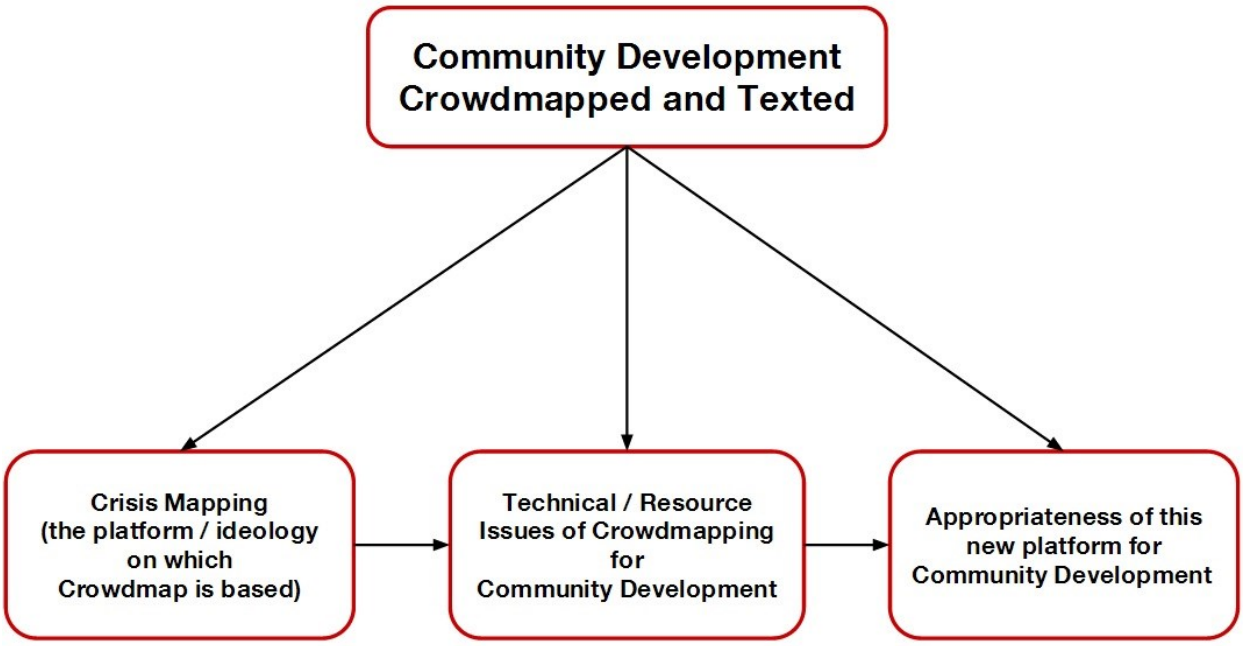


Figure 1-2: The manuscript-based chapters are based on three themes: crisis mapping, technical/resource issues, and crisis mapping platform appropriateness for community development. (Source: Brandusescu)

Chapter 2: Literature Review

2.1 Introduction

This research ties together several fields; whereas every attempt was made to cover the relevant literature for the thesis, an exhaustive review is impossible. A crisis mapping platform is reappropriated that integrates SMS for individuals to map places for community development practices. The focus is on both crisis situations and everyday co-management of local affairs by individuals and civil society. Due to the interdisciplinary nature of this thesis, the fields investigated range from community development to community informatics (Figure 2-1). Several are founded on community based principles (e.g., community mapping, public participatory Geographic Information Science) and principles heavily influenced by technology and communications (e.g., telecommunications, location based services, ICTs/mobile technology). In addition, fields covered combine technology and geographic data (e.g., volunteered geographic information, crisis mapping). The newness of some of the fields examined is shown by grey literature.

The first section of the literature review links community development to community informatics by introducing activism, community building and integration of ICTs in communities. The second section discusses geospatial ICTs for community development; it includes public participatory Geographic Information Science, volunteered geographic information, crisis mapping and participation motivations. The third section addresses different perspective on technology, including its contenders. The fourth section examines the role of mobile technology in communities. The fifth section concludes the literature review.

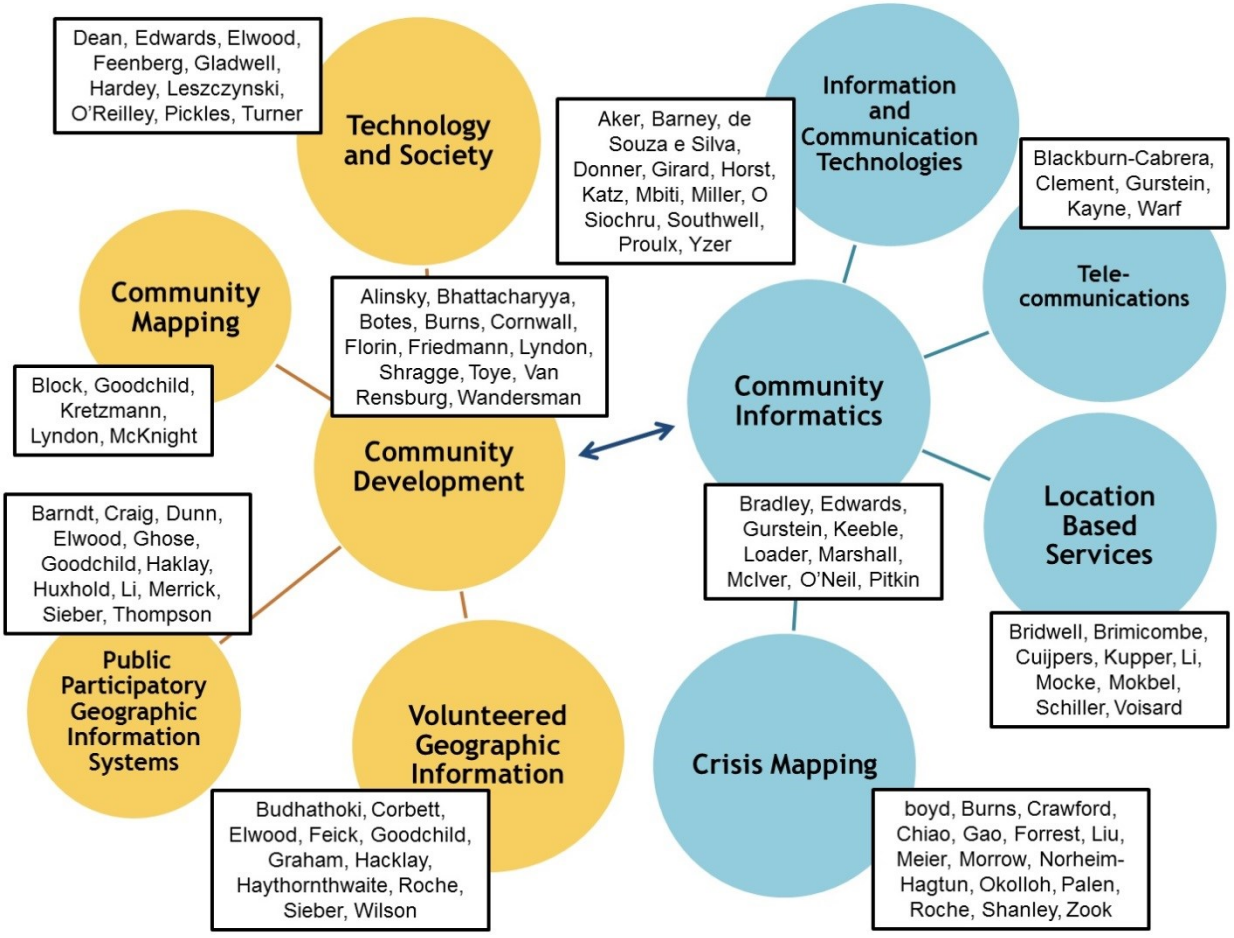


Figure 2-1: Overview of Disciplines and Main Authors in Literature Review (Source: Brandusescu)

2.2 Community Development and Community Informatics

The use of digital tools and technology for community development practices is not new. Community development is a traditional discipline with practices rooted in physical interactions and activities based on local events. Authors define the main scope of community development to be the improvement of a community's physical, social and economic conditions (Cox, Erlich, Rothman, & Tropman, 1970; Florin & Wandersman, 1990). The type of activities (e.g., local events, community groups, weekly activities), which are found in community organizations are, by definition, geographically based, ideally volunteer-driven and locally initiated (Florin & Wandersman, 1990). (Community development is distinguished from communities of practice,

which are organized around the sharing of common interests, irrespective of geography.) Community development efforts have had demonstrable positive impacts on communities (e.g., neighbourhood cleanups, home repairs, building projects) (Berkowitz, 1984; Boyte, 1980; Cassidy, 1980; Florin & Wandersman, 1990; Williams, 1985). "Unlike citizen participation, community development has not constructed well articulated models or theories; it remains more of a social movement (Blakely, 1980) rather than an applied behavioral or social science" (Florin & Wandersman, 1990, p. 46). The worry is that community development is more hype than theory.

One of its big challenges is exactly what comprises a community in community development. Communities are not homogenous. Also known as the third sector, a community is a complex environment defined by multiple and diverse goals, structures and motivations (Haugh & Kitson, 2007). However, it is important to address macro factors which exist in micro environments, because community development practice is complex with problems that span beyond the local scale (Bhattacharyya, 2004). Here we can find many voices that are sometimes arguing. Haves and have nots can inhabit a single community. Technology can advantage some people while disadvantaging others. Moreover, the difficulty of defining a community differentiates from communities speaking with more than one voice. The former speaks as much to jurisdictional bounding, as it does to the notion that communities can coalesce around common goals and identities.

It is important to gain insight on past research and fieldwork (Jones & Silva, 1991; Kretzmann & McKnight, 1993). The community building literature focuses on local assets and mapping, which challenge community development obstacles by focusing on inclusive processes (Jones & Silva, 1991; Kretzmann & McKnight, 1993). It emphasizes the use of community assets to encourage interest and participation in local projects, where residents participate in mapping local assets (Kretzmann & McKnight, 1993; McKnight & Block, 2010). Through these mapping initiatives, there is considerable awareness drawn to local institutions, citizen associations and individual skills. Their meaning systems are significant because they enable them to define themselves rather than have others define them (Bhattacharyya, 2004).

Much of community development practice centres around the idea that communities should be able to help themselves (Burns et al., 2004). Often, community members are considered to be the experts of their community. "Civil society generates knowledge, including

certain kinds of knowledge that cannot be produced by other sectors or institutions" (Edwards, 2011b, p. 1). Authors believe that traditional community development represents processes that encourage organizations and empower marginalized groups and communities (Alinsky, 1971; Friedmann, 1992). They argue that, by participating in community development, community members can marshal this local knowledge to influence policy, ameliorate local problems and effect social change (Alinsky, 1971; Friedmann, 1992). As implied above, knowledge accumulation may not be uniform within a community, however defined. Empowerment, itself is a difficult concept to define (Hennink, Kiiti, Pillinger, & Jayakaran, 2012; Spreitzer, 1997). Empowerment may not accrue uniformly to community members either.

The scale of community development projects may be detrimental to its ultimate impact. Community development projects are often too small and may have few impacts for lasting results (Friedmann, 1992). More broadly, authors argue that the government's inaction and increased privatization may only aggravate existing problems in communities and further neoliberal ideas and agendas (Friedmann, 1992; Shragge & Toye, 2006). As a concept, neoliberalism is both a mechanism that emphasizes efficiency in government and also delegation of key government service provisions and government functions to the non-profit sector (Cornwall, 2008; Haugh & Kitson, 2007). Delegating authority over communities to community development organizations appears progressive and empowering, but can further this disempowerment because community development organizations lack access to the same power held by government (Haugh & Kitson, 2007). In this context, ICTs are enabling the corporatization of community based organizations (CBOs), exacerbating uneven power relations between underprivileged community members and said organizations. In addition, ICTs and the data that is needed for those technologies ties the community to government, which have the ability to shape communities in the government's image (Shragge & Toye, 2006).

For ICTs and community development to work, the practitioners must have skills to satisfy both fields, which are often a challenge (Stoecker, 2005). Marshall et al. (2004) disagree with larger societal critiques and emphasize the current inadequate dispersion and disparity of ICTs in marginalized communities to be the main downfall of failed community initiatives. The research presented in the thesis does not consider neoliberalism in any depth but it does cover notions of power. Community organizations have been around for decades, enabling them to have considerable influence in their communities. Longevity, consistency and persistence are

significant factors for effective outcomes and improvements that are to accrue power (Burns et al., 2004).

The concept of community self-help plays an important role in understanding the importance of interventions from individuals outside the community who wish to assist in community development (Burns et al., 2004). The concern is that the involvement of different gatekeepers can sway community development processes based on their interests. It is argued that, should outsiders wish to participate in community activities by means of constructive interventions, they should understand community needs, their relation to them and their role as outsiders (Burns, Williams, & Windebank, 2004; Lyndon et al., 2011). In community development and community organizing literature, a strong element of activism is present. Alinsky (1971, p. 81) argues that "people only understand things in terms of their experience, which means that you must get within their experience". Therefore, grasping local community dynamics is vital. Community development is perceived as a participatory process to development that differs from the top-down approach, where it is significant to build solidarity and agency through self-help, felt needs and participation (Bhattacharyya, 2004). The community development framework addresses empowerment by connecting literatures from a wide range of multidisciplinary fields, perspectives and findings. These findings have been determined to easily translate into community action programs (Florin & Wandersman, 1990).

Community Informatics: The literature on community informatics aligns community development with the use of ICTs for communities. Community informatics is an interdisciplinary field that integrates technology with traditional community development practices (Gurstein, 2007; Keeble & Loader, 2001; O'Neil, 2002). The focus of community informatics is on community development in contrast to ICT4D, which focuses on international development. In particular, the field is concerned with the societal use of technology to solve problems in communities by local people, rather than technology experts (McIver, 2003). It is argued that ICTs purposed for community development must be developed, deployed and managed in such a way to be inclusive, linking technology to economic and social development at the scale of the local community (Bradley, 2006; Gurstein, 2001; McIver, 2003). Community informatics theory aims to understand how one can establish an even distribution of control of the decision making process in various aspects of the community with economic, cultural, and environmental ICT-based projects (McIver, 2003).

Challenges to implementation for community informatics exist. They are rooted in the theoretical structure and nascency of the field (Pitkin, 2001); a field that could be considered ever "beta" because the technology constantly changes. Community informatics poses the risk of appropriating purely technical solutions to societal problems, being critiqued of favouring the techno-optimist perspective (Pitkin, 2001; Stoecker, 2005). It is important to note that societal problems must have an inherent social process before the introduction of technology is even considered (McIver, 2003). Moreover, being able to make choices between various ICTs does not equate to "real and lasting outcomes that these choices have on empowerment and social relations" (Edwards, 2011a, p. 4). Indeed, ICT initiatives require a process involving community development goals (e.g., self-help) and proper training to facilitate adequate participation and democratic discourse within communities (Steyaert, 2000). Here, the development of trust is significant to encourage citizen adoption of online applications (Warkentin, Gefen, Pavlou & Rose, 2002). A bottom-up process can solve the problem by those closest to it, because of an already existing system administered by locals. However, the inclusion of community members cannot promise support from current community development projects because the projects themselves are not always participatory (Barney, 2004; Girard & O Siochru, 2006). In fact, the insertion of ICTs into the process can exacerbate tensions. One of these is the digital divide, perceived as "the difference between those for whom ICTs are an instrument of power and autonomy, and those for whom digital technologies mark a continuing lack of same" (Barney, 2004, p. 161). As a result, the inclusion of ICTs into community development often does not result in better representation of poor and vulnerable groups. Promoters of ICTs may deem including the poor and vulnerable exclusively social processes, which are outside the domain of the technology. The introduction of new technology may affect a disruption of traditional practices, reinforcing the argument that the adoption of new technology can be risky for communities (Pickles, 1995). ICT adoption can become a distraction, an illusion to the context of the issue at hand. Given this, creating local dialogues by meeting information requirements, supporting financial opportunities and enabling access to technology for citizens are goals that can facilitate ICT efforts in communities (Rideout & Reddick, 2005). Problems persist in the practice of community informatics. Pigg (2001) argues that beyond community directories and basic information, sustainable resources for more sophisticated ICT use have not yet been produced.

Web 2.0 usage in communities is at early stages of implementation. Techno-optimists will offer quick fixes and not give communities a stable platform to effect that change, when many of the challenges are long-standing (Pitkin, 2001). Therefore, community organizations often make the argument of investing money in affordable housing rather than new technologies. The struggle of technologies in communities is perpetuated by the neglect of the bottom-up process (Scholz, 2008). Gladwell (2010) argues that the tools activists use are the purpose for action and not the causes of the events. Tools like social media generate weak ties among community members, which largely manifest in the virtual world where new information and ideas are communicated (Gladwell, 2010; Granovetter, 1973). Once we peel away the veneer of social media, the physical context may be what actually matters (Gladwell, 2010).

2.3 Geospatial ICTs for Community Development

The previous section focused on traditional community participatory literature. The discussion now turns to discuss the role of participatory technologies in communities. The section covers public participatory Geographic Information Systems, volunteered geographic information, crisis mapping and participation motivations.

2.3.1 Public Participatory Geographic Information Systems

Combining community mapping with community informatics gives rise to public participatory Geographic Information Systems (PPGIS), a discipline centered on citizen participation for low-income, disadvantaged communities and marginalized groups (Dunn, 2007; Sieber, 2006). PPGIS considers the contribution of geographic information by locals for local mapping purposes. It is hoped that contributions are bottom-up processes that serve goals of community empowerment, especially in resource poor settings (Elwood & Ghose, 2004). In some cases, they have created more inclusive GIS practices (Craig, Harris, & Weiner, 2002; Sieber, 2004). PPGIS practices have reframed public policy debates and, in certain instances, gained control over planning processes, providing more sophisticated analyses and visualizations than the experts and officials in those processes (Dunn, 2007; Goodchild & Li, 2012; Haklay, 2010; Sieber, 2006). Given their successes, geospatial technologies in community development have garnered

increasing popularity (Elwood, 2006b). Due to their popularity, a shift has occurred in citizen participation, where the combination of community tools and insights and local government resources can be used to account for community needs (Thompson, 2012). Although these new technologies hold considerable promise for communities and non-experts, local community organizations and groups often have lacked the technical skills and resources to fully benefit from these applications (Barndt, 1998; Haklay, Singleton & Parker, 2008). For example, participation on online mapping platforms "requires at least a cursory understanding of the importance of spatial concepts, spatial implications, and spatial data" (Merrick, 2003, p.35). As a result, it is important to remain critical of assumptions made by these processes in terms of their requirements and outcomes.

2.3.2 Volunteered Geographic Information

PPGIS has moved from stand-alone desktop versions that focus on spatial analysis to cloud-based visualization platforms. Much of the focus in community use of geospatial technologies also has shifted to information contribution. Called volunteered geographic information (VGI), it is geographic data created, assembled and/or disseminated voluntarily by informal groups of individuals (e.g., the OpenStreetMap initiative). The information is communicated via the Geoweb. VGI concerns the contributions of and contributors to geographic information to Web 2.0 based platforms, many of which are mapping based. In contrast to PPGIS, the focus and use of VGI can shift from a local to a global context. PPGIS has openly accepted VGI but one primary difference is that PPGIS is facilitated, where VGI not need be (Seeger, 2008). VGI was first defined as a way to aggregate online user-generated geographic content of thousands of individuals (Goodchild, 2007). It is a process that has mobilized communities and non-experts to create, perceive and use geographic data (Goodchild, 2009). It allows researchers to examine the spontaneous nature of contributions that appear on the map. Similar to PPGIS practices, VGI promotes contribution of geographic information, with a possibility of change in scale to global communities. VGI is conducted on an individual basis, and does not necessarily manifest in groups. However, VGI has been used "to better understand and reconnect groups with their land-related knowledge" (Corbett, 2013, p. 223). Simultaneously, this group happened to be a dispersed community that used VGI as a medium for communication to counter the physical

distance between the members (Corbett, 2013). In addition, VGI ties crowdsourced "local knowledge", which changes the process of geographic information creation.

OpenStreetMap (OSM) is known to be one of the most successful VGI projects (Budhathoki & Haythornthwaite, 2013; Goodchild, 2007; Haklay, 2010). OSM is volunteer based, where a global community of practice drives data contributions, rather than a local, physical community. For example, an individual can edit OSM, an online, open source, collaborative and interactive mapping platform, without the need to collaborate with an on-the-ground community. A further point of interest, a community landmark, can be used in local contexts to navigate places. The value of VGI derives from aggregated independent data the user creates and the repurposing of this data, for example, as governments have used it as their digital road data (Feick & Roche, 2013). Data from sites like OSM has been applied for environmental monitoring (Gouveia & Fonseca, 2008). OSM also has been deployed for crisis mapping and humanitarian relief, where experience of the person is a major factor for both quality and speed (Beland, 2014b).

Governments and others finding value in VGI has led to data quality being a main focus in VGI research. Problems with the quality of VGI are observed by the use of descriptions and location information for discovering the data. "It was clearly shown that large data contributions have been made in selected areas by members that maybe never collected data locally in person and lack the "local expertise" (Goodchild, 2009) that are making VGI projects unique" (Neis, Zielstra & Zipfet, 2013, p. 297). Urban areas have large clusters of OSM data, which derive from high quantity of data imports or skewed differences in contributors (Neis et al., 2013). Data validation and timely information have been seen as assets of VGI, yet unstructured and unstable influxes of data remain its challenges (Feick & Roche, 2013; Goodchild & Li, 2012; Ostermann & Spinsanti, 2011).

In community driven initiatives, such as PPGIS and VGI in the geoweb, the motivation for participation is key to understand the benefits and limitations of new technologies. The drive for collaboration and contribution is polarizing; it can attest to its success or entirely reject it. Due to this, project sustainability often relies on motivations. At a closer glance, the motivational arena demarcates the context of participation. Participation is driven by personal, social or technological means, grouped into intrinsic and extrinsic motivations, which vary amongst users (Budhathoki, 2010, p. 31). Positive motivations such social reward, an outlet for creative and

independent self-expression, and pride of place, influence participation to contribute VGI (Coleman et al., 2009), along with civic activism and collective action (Jaureguiberry & Proulx, 2003; Van Zomeren & Iyer, 2009). Participation can be increased, for instance, by appealing visualizations (Budhathoki & Haythornthwaite, 2013). In turn, new sources of credibility accrue to communities from their efforts to contribute information. This factor can facilitate participant motivations as they have the incentive to "contribute data to support others within a community of users" from an altruistic perspective of "generalized reciprocity" (Flanagin & Metzger, 2008, p. 145). In some instances, participation via online interactive mapping can lead to improvement of services in on-the-ground/physical communities (Kingston, 2007).

Participation via geospatial ICTs is recognized as a complex process (Tulloch & Shapiro, 2003). A person who edits OSM or Wikipedia does not require interaction or conversation with others. He/she may very well be anonymous so we do not know where he/she lives or his/her connection to a community. The challenge remains in linking an online mapping community to a physical community (Budhathoki & Haythornthwaite, 2013; Haythornthwaite, 2007; Wellman, 1999). Will the importance of maintaining a local context in an online community be feasible when using an online mapping platform? As factors that encourage message contribution alter, participation consistency may diminish. Therefore, we should question geospatial ICTs and their ability to influence change.

2.3.3 Crisis Mapping

This thesis is about the potential to repurpose crisis mapping for community development. Crisis mapping is a new participatory mapping ICT that is both very popular and possesses a contested and complicated history. It is considered to be derived from the ICT for Development (ICT4D) movement (Harvard Humanitarian Initiative, 2011; Meier & Leaning, 2009). ICT4D formed in the early 1980s, when the Independent Commission created by the International Telecommunications Union (ITU) examined global telecommunications development (Milward-Oliver, 2005 & Souter, 2005 in Unwin, 2009). In 1984, the first official ICT4D event, The Maitland Report, emphasized the global inequality in the distribution of telecommunications and the importance for governments to take action. The report encouraged developing country governments to expand their communications strategies and share information with development

assistance stakeholders (Unwin, 2009). Actual delivery and progressive change of these proposed strategies did not occur within the ITU until the mid-1990s when other ICT developments joined from Europe and North America (Unwin, 2009). At this point, addressing the digital divide problem was a shared objective among key groups: donor and recipient countries, the private sector, academics and civil society organizations. Over time, multilateral organizations (e.g., United Nations, World Bank) became involved in the ICT4D process.

Organizations such as the United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA) collaborated with online volunteer groups to deploy mapping applications for humanitarian response (Meier, 2012). This initiative can be seen as an extension of ICT4D to the geoweb/Web 2.0 initiatives. The rise of Web 2.0 has inspired the creation of many technologies for humanitarian response and crisis mapping (Diamond, 2010; Meier, 2011). Crisis mapping is an activity by which individuals can easily contribute and share digital geographic information related to challenges and solutions to crises through online and offline methods. If offline, individuals tend to be on the site of the crisis. Contributions tend to occur as the crisis is occurring and are considered to provide real-time humanitarian response (Meier, 2012a, p. 100). Like VGI, crisis mapping projects often enable large numbers of people, including the public and crisis responders. The crisis mapping community can be simultaneously global and local, digitizing disasters online and contributing geographic information while conducting on-the-ground humanitarian relief efforts. In addition, online mapping has extended from acute events like natural disasters to acute community problems. For example, the Ushahidi platform has been used to build HarassMap in 2005, which allows people to report incidents of sexual harassment (http://harassmap.org).

There are several crisis mapping organizations: The International Network of Crisis Mappers, Standby Task Force, Crisis Commons, Humanitarian OpenStreetMap Team (HOT), Sahana, Crisis Cleanup and Humanity Road. These organizations can be grouped into four main categories:

1. On-the-ground volunteers/relief work: Red Cross, UN OCHA, HOT, Standby Task Force
2. ICT4D/humanitarian relief, technical teams/start-ups (bottom up, engineer type, FOSS) in developing countries: HOT (VGI volunteers), Crisis Mappers, Ushahidi, Sahana, Standby Task Force, Humanity Road, Crisis Cleanup
3. Digital volunteers, digitizing base maps: HOT, Standby Task Force

4. Technical teams in the US and other developed countries digitizing base maps: HOT

As noted above, some of these organizations fit into more than one category. For example, HOT works both online and offline, in developing and developed countries, which relies on OSM base map for data collection (before and after a crisis); their first deployment was activated in Gaza, in 2009 (Chapman, 2013). Other organizations are building applications so victims can report on-the-ground or monitor social media for disaster response (e.g., Ushahidi, Sahana, Humanity Road, Crisis Cleanup). There are on-the-ground disaster relief efforts community (e.g., Red Cross, UN OCHA, HOT, Standby Task Force). Crisis Mappers and Crisis Commons are larger networks that collaborate to bridge different communities and advance the crisis mapping field and its application via technology.

Ushahidi is considered to be the first geoweb mapping platform developed specifically for crisis mapping. Unlike traditional crisis maps deployed by government agencies, Ushahidi offers the public the opportunity to report, ask for help and/or offer assistance (Goolsby, 2010) via a geographic text message or mapping interface. Ushahidi was originally created to allow for easy and fast reporting of post-election violence in Kenya (http://legacy.ushahidi.com/) (Goolsby, 2009; Meier, 2012). Since then, "some twenty thousand Ushahidi maps have been deployed in over 130 countries since the original Kenya crisis map in 2008" (Meier, 2012a, p. 92). Ushahidi has been used in numerous applications, yet the best known example is the Haiti Earthquake (Forrest, 2010; Roche et al., 2013), where individuals could report damaged buildings, missing individuals and violence.

In addition to Ushahidi's participatory message submission, the base map used is equally important. Originally, Ushahidi used Google Maps as their base map but switched to OSM due to its detailed and accurate coverage. In the case of Haiti, the OSM/HOT community consisting of 600 global volunteers, "populated" Port-au-Prince on OSM to build the most comprehensive map of the city's downtown area (Meier, 2012a; Soden & Palen, 2014). From Haiti onwards, HOT have mapped every natural disaster, noting the importance of local knowledge and local context (Arney et al., 2014).

Applications based on platforms like Ushahidi explicitly link mapping and telecommunications, which differentiate them from the rest of online platforms that solely rely on the Internet for user contribution (Zook et al., 2010). Rather than solely online methods, the Ushahidi application collects reports via SMS, smartphone messages, emails, Tweets and online

message submission. Geocoding messages occurs automatically (i.e., using Twitter and smartphones) and manually (i.e., using SMS content) (Gao et al., 2011; Roche et al., 2011; Zook et al., 2010).

The crisis mapping literature suggests many benefits to using mapping technologies for disaster response. According to numerous authors crisis maps provide real-time information and cheap or even free communication, create situational awareness, produce additional data unmatched by previous mapping processes, better direct resource distribution, and increase connection between online and offline networks (Gao et al., 2011; Meier, 2012a; Ziemke, 2012; Zook et al., 2010). Most of the discourse on crisis mapping exists in grey literature (e.g., blog posts), where enthusiasm of these technologies prevails (Bittner & Turk, 2012). However, crisis mapping also has its critics. This section focuses on five main critiques: the definition of crisis mapping, technology training efforts, content production, the physical/digital connection of messages/reports (data accuracy), and their security risks (collection and management) and ethical concerns. A final critique, knowledge politics, undergirds all the others.

One critique is definitional, in both determining a crisis and defining crisis mapping (Petersen, 2013; Ziemke, 2012). What is the raison d'etre of crisis mapping? Burns (2014, p. 51) places the emphasis on digital humanitarianism, which he defines as "a set of social and institutional networks, technologies, and practices that enable large numbers of remote and on-the-ground individuals to collaborate on humanitarian projects," enabled by the geoweb. Others focus on remote construction of a base map or on-the-ground humanitarian relief guided by mapping efforts (Chapman, 2013; Meier, 2012a; Ziemke, 2012). Palen & Liu (2007) argue that crisis mapping research can be too narrow, mostly focusing on post impact response, which is just a fraction of the life span of crisis events. Petersen (2013) questions the very definition of a crisis, which then affects what events are considered important and how individuals then interact with them via digital mapping platforms. In crisis mapping, a crisis can be reduced to an acute event. The reasons earthquakes, as addressed in the famous application of Ushahidi to Haiti, may cause so much damage may be due more to poor building practices than to the natural acute event itself. Ziemke (2012, p. 105) also questions the meaning of crises because they extend beyond acute events, where "our definition of, and view about, 'what crisis mapping is' expands as new iterations emerge." Most research on crisis mapping focuses on post impact response, which is just a fraction of the life span of crisis events (Palen & Liu, 2007). Continuously

evolving, the organizational structures of these messages are still forming and have yet to be considered formal emergency response systems. There is no consensus on definition for a crisis (Petersen, 2013), which places additional strain on an ever complex organizational structure and process.

A second critique is based on the training efforts of the technical teams that create and deploy crisis mapping platforms. This refers to teams trained in the mapping platforms from either developing or developed countries. These teams are critiqued for not knowing/being trained in humanitarian relief and not knowing the situation on-the-ground (Morrow et al., 2011). As a result, well-meaning mapping teams may interfere with or misinterpret activities on the ground (Arney et al., 2014). Crisis platforms such as Ushahidi cannot replace an on-the-ground emergency teams trained in relief efforts; the increase of situational awareness that supposedly results from on-the-ground reporting does not necessarily increase the situational appreciation of remote teams or technical mapping teams. This is supported by instances where crisis mapping teams had issues with handling sensitive information (Arney et al, 2014, Goolsby, 2010). If a victim of a crisis sends a text message to Ushahidi, for any action to occur, it then has to be forwarded to a local, on-the-ground response team. This disconnection can contribute to a "confusion of noise" (Goolsby, 2010, p. 5). There may be no clear, organized cohesive network that handles all of the incoming messages, a collaborative and coordinating network that effectively shares information, and a connection of virtual contribution to physical responses (Arney et al., 2014; Gao et al., 2011; Goolsby, 2010). Crisis mapping activities may be good at broadcasting site-specific problems; there is no automatic trackback of how or whether they were handled. Goolsby (2010, p. 5) reports that in the use of Ushahidi for the Haiti earthquake, "people generally did not send messages to say their request has been fulfilled". Indeed, it was rare to find an update made on Ushahidi Haiti, which should temper exhortations about crisis mapping as a useful communication medium for humanitarian response.

A third related critique concerns the lack of security and confidentiality about the submitted data. Gao et al. (2011) argue that, structurally, the security features on crisis mapping applications to be inadequate; for example, public reporting almost always equates to public viewing. According to Burns, 2014:

> in the Standby Task Force's Libya deployment, security flaws challenged participants' need to have their knowledges protected by being strategically invisible. The decision to

> make the public map had been made by those who had not produced the knowledges. The protections were extended to the public map because one member had protested the terms on which the knowledges were being made visible. (p. 58)

Other applications have generated critiques. A similar critique to Libya is found with Mission 4636 (Ushahidi Haiti), where information that had questionable consent was uploaded by contributors (Petersen, 2013). Ushahidi imported all private data and made it public. In the original data, some contributors had made hasty or personal statements that disclosed more information than they retrospectively wished to; in the importation and subsequent mapping, this data was then made available to the public without the participants' permission (Petersen, 2013). For example, names and phone numbers of girls as young as fourteen in earthquake damaged, unstable housing were made public by crisis mappers even though they were asked not to display this information (Arney et al., 2014). An example of the direct consequences is the Mexico murders, wherein drug cartels were able to identify victims based on the information found online (Petersen, 2013). As a result of the Mission 4636 reports made public, the Standby Task Force no longer deploys in conflict zones (Arney et al., 2014). This is a clear consequence of failing to consider the critical geography concerns, perhaps due to crisis mappers emphasizing the technical aspects of deployment; people affected by the crisis can be put in harm's way.

Unsurprisingly, critiques can rile the strong supporters of crisis mapping. Meier (2013a) does not recall these conversations and considers critiques of past projects such as Ushahidi Haiti not constructive. Indeed, crisis mapping approaches a kind of evangelism of non-experts motivated to do good via mapping. There are those who believe that open source crisis mapping has the potential to save lives (in Arney et al., 2014). Researchers, Arney et al. (2014) report that in a remote village in Haiti, "[t]here were three women who were severely injured...had it not been for us using open source information that was available, we wouldn't have been out there and I don't think they would've survived."

Crisis mappers are considered to be a type of what is called neogeographers. Neogeography refers to the practice of amateur cartographers. Admittedly there have been amateur cartographers since the beginnings of mapping; these are "neo" because digital earths have made it far easier to make maps online. Turner (2006) considers neogeography to be do it yourself mapping from the ground up, without the need of credentials or expertise. But often in neogeography practices, actors do not take responsibility for the effects of the mapping

technologies they produce or the maps they make (Leszczynski, 2014). Ziemke (2012) argues the crisis mapping field will learn from past and present deployments for future progress. However, as crisis mapping gains momentum within neogeography practice and in humanitarian relief, it is important to not get lost in the hype of crisis mapping and remain skeptical of the claims being made.

A fourth critique is found in the connection between the digital message and the physical disaster. This contributes to 'noise' that impedes effective humanitarian aid for the disaster. Many individuals may be involved a specific crisis mapping activity. They possess different technical capabilities found "over time and/or in different spatial zones, [with] different access by different populations, [which] appeal to different and unknown audiences" (Palen & Liu, 2007, p. 735). For example, offers of housing to displaced victims of Hurricane Katrina via a website required the affected population to have computer and Internet access to make use of those offers. Here, Palen and Liu (2007) question the appropriateness and effectiveness of digital over paper media. In the Hurricane Katrina example, a paper flyer would have been more effective to reach those displaced. Therefore, it is significant to address the differences in functionality each medium provides to avoid the loss of context in message transformation due to a change in medium.

A fifth and final critique is the way in which knowledge politics structures the way actors frame acceptable discourse of crisis mapping (Burns, 2014). Burns (2014) states that different actors in crisis mapping view the crisis quite differently; this can make for impossible conversations and inadvertent exposures of data, where a certain direction is prioritized over another, deeming a state of "closure". He speaks of four "moments" of dissonance: what data is included and therefore considered valid, what is an acceptable category, how one considers data accuracy and how one handles privacy of contributions. First, inclusion, speaks to the way HOT projects consider geographic areas without taking into account on-the-ground local knowledge (e.g., participant collective memories of hazard zones), because it is not directly visible on a map. Second, categorization, shows how the Ushahidi Haiti Project forced contribution into specific categorizations such as "Emergency". Here, messages were selected and categorized by administrators to match what they, themselves had decided to be urgent from the submitted reports. Third, accuracy in crisis mapping platforms often side-lines non-Cartesian knowledge practices (e.g., indigenous mapping), because they do not match the standard mapping practices

currently used. And fourth, privacy challenges arise when these projects encounter technical issues. For example, during the Libya Crisis Map deployment, Ushahidi encountered a major security bug that took a significant amount of time (⅕ project duration) to fix.

The general reliance on technology used to understand and treat on-the-ground events is problematic because of its complicated user interface that obscures contextual points. Here, an epistemic closure exists, where choices are made based on what is allowable and what is not even considered in the conversation. The conclusion of Burns's (2014) thesis is that technology has social implications deemed as knowledge politics, which contest legitimacy and representation within digital humanitarianism and the geoweb. Indeed, the significance of knowledge claims new mapping techniques provide can be dangerous, in terms of asserting legitimacy, authority and credibility (Elwood & Lesczynzki, 2013).

It is clear that the initial discourse of crisis mapping (circa 2009) has changed. In the beginning, the main contenders behind the hype remained somewhat critical of these technologies (Meier & Leaning, 2009), identifying challenges of unequal access between technologies and security implications (e.g., field staff personnel, local communities, and data). Both the technology and the discourse have changed, but the challenges are as significant and relevant as ever. The right information needed on-the-ground is not always conveyed and message geo-locations are often inaccurate (Gao et al., 2011). In the Ushahidi Haiti example, quantity can trump quality in crisis crowdsourced data because of the sheer number of emails received (i.e., hundreds of thousands). Meier (in Arney et al., 2014) notes that "it was impossible to catch up and [we] were always behind which in many ways felt like a failure...how many thousands of emails did we not go through that could have contained really important information." This suggests an overload of information and inability to anticipate, prepare for and manage a large influx of messages and demand. In addition, citizen mapping remains insufficient for disaster mapping (Arney et al., 2014). In fact, remote verification of messages supports a top-down approach for decision making in a local context. This further stifles the ability to build between agencies and the people sending messages/reporting on-the-ground, given the time allocation involved. Further, handling data with different formats is especially difficult when infrastructure needs to be built on trust between community members and community mappers.

2.4 Mobile Technology and Communities

This research initially consisted of uncovering challenges to integrating mobile technologies with crisis mapping. Therefore, investigating telecommunications literature is key. Much of the literature is highly technical and not directly linked to community development; however, mobile technology has become the key ICT in ICT4D.

Telecommunications represents different means of technologically-enabled communication via traditional (e.g., broadcast system (radio), telephone, television) and new telecommunications technologies (e.g., satellite phone, Internet, mobile phone). Protocols established in the 1980s established the stepping stones for current mobile technology communication (Schiller & Voisard, 2004). Over time, technological advancements and increased popularity of mobile technology has lowered the costs, which shifted the focus from sound transmission to the development of better security, the delivery of heterogeneous data types, and the improvement of user experiences.

The rapid changes in telecommunications and mobile technology have allowed for the creation of geospatially aware devices, that is devices that can deliver content to you which is site specific and allow you to contribute geotagged content. Termed, Location Based Services (LBS), LBS integrate mobile wireless cellular engineering and GIS to provide technological services via the Internet and wireless networks to the public based on the location of a person's mobile device (Kupper, 2005; Mocke, 2005; Brimicombe & Li, 2009; Sui, 2009). One advancement in telecommunications is the internalization of GPS, as well as location triangulation from cell phone towers. These allow for locating the phone's position. A phone and the telecommunications infrastructure that supports it can sense an individual's location and send, for example, coupons for a nearby store or directions starting from the phone's current location and to a specified point of interest.

Substantial research has been conducted on mobile technology integration with communities in the developing world, with the majority representing the global south (Aker & Mbiti, 2010; Bailard, 2009; de Souza e Silva et al., 2011; Tortora & Rheault, 2011; Wong, 2008). Authors found that mobile technology use in communities has led to effective results in banking, epidemiology, agriculture and fishing (Abraham, 2007; Aker & Mbiti, 2010; Patnaik et al., 2009; Wong, 2008). Researchers have found that locals can save time, energy and money via mobile banking; ask and receive accurate personal health information; and learn about market

conditions for goods they are selling (Aker & Mbiti, 2010; Alamenciak, 2012; Donner & Tellez, 2008). The results demonstrate the successful ways that mobile technology links and integrates with communities. I argue that the developed world has much to learn from the developing world in terms of methods and tools for resource-poor, disadvantaged communities and their management of heterogeneous handsets.

In contrast to the integration of mobile technology in the developing world, research on mobile technology research in the developed world is sparse and fragmented. The same can be said for mobile applications for community development in the "first" world. The use of mobile phones in urban settings tends to be limited to health reporting and urban planning (Foth, 2009; Freifeld, Chunara, Mekaru, Chan, Kass-Hout, Iacucci & Brownstein, 2010; Marshall, Taylor & Yu, 2004). Smith, Bellaby & Lindsay (2010) investigated the roles of social networks and scale for community empowerment and social inclusion in ICT projects. The authors discovered that the smaller the scale (e.g., a particular community rather than an entire city), the better chances of ICT adoption. Small scale ICT projects have better chances of success if the new technology appropriation interweaves with daily social practices. In addition, technology adoption has higher success rates if it sparks the opportunity of social change (Proulx, 2005). The use of existing mobile phones could surpass financial dynamics of other community project partnerships involving ICTs (e.g., community databases, community videos) that are often subsidized and short lived (Schilderman, 2002). It is possible that integrating mobile technology for community development initiatives may encourage participation by community members. "People who were not initially interested in the community stories were interested in the technology and that became a pathway for increased awareness. [The site] can be viewed and shared in absence of the investigators and project facilitators" (Boone, 2012, p. 181). Locals could voice their opinions directly and join the community conversation by sending messages via mobile phones. Local people, not outsiders, could be in charge of describing a place familiar to them. Similar to Boone (2012) project outcomes, Freifeld et al. (2010) find that crowdsourcing methods in communities were complementary and did not replace traditional community development methods or already existing technologies. Although positive initial findings exist, the impact mobile phones have on community development, for example on reducing the digital divide, remains unclear (Albert, Flournoy, & LeBrasseur, 2008).

2.5 Conclusion

The intended use of community development is to empower local communities, whereas PPGIS at its best is perceived as a bridge between community and technology. Yet, in technology driven disciplines, the empowering goal for community and individuals of that particular community is harder to identify; despite the intentions of a discipline such as community informatics to place society before technology, skeptics remain, wary of hidden agendas. However, in contrast to traditional community development, community informatics is a young discipline. It will take time to refine its purpose and goals to benefit communities effectively. Feenberg (1999) succinctly argues for a constructive collaboration between technology and society:

> Human beings still represent the unrealized potential of their technologies. Their tactical resistances to established designs can impose new values on technical institutions and create a new type of modern society. Instead of a technocracy in which technology everywhere trumps human communication, we may yet build a democratic society in which technical advance serves communicative advance. (p. 128)

Even if a consensus is yet to be reached, we should recognize that efforts of using ICTs to discover the way "people and communities communicate, obtain information and transact at present" can add value and knowledge to local dynamics (Graham, 2002, p. 52). There is much potential for ICTs and mobile phones to promote community well-being.

The literature reviewed in this chapter attempts to synthesize the fields needed for the research objectives: to build mobile and online applications for community development practices. Some authors argue that the use of ICTs supports neoliberal agendas and deviates from a democratic process, hence the existing and ongoing digital divide. Given these hindrances, new online mapping technologies have been developed and democratized at an unprecedented rate. Communities have used ICTs for successful community endeavours in the developing world but little is known about their use for this specific cause in the developed world. However, it is evident that there is a lack of mobile technology and community based research in the developed world, particularly in urban areas.

The goal of this research is to apply one such ICT, a modifiable online crisis mapping platform, and repurpose it for community development initiatives in both crisis situations and everyday co-management of local affairs by individuals and civil society. Many examples purport to show that the geoweb has been used for good. Our specific instance of integrated

mapping-texting, based on a repurposing of crisis mapping for community development, tests that assumption.

In the next chapter, the first of the manuscript chapters, the implications of the crisis mapping phenomenon in the context of community development cases are addressed.

Chapter 3: Hype meets Real World: The Use of Crisis Mapping for Community Development

Preface

Chapter 3 was co-authored by Brandusescu, Dr. Sieber and Dr. Jochems. It was submitted to Convergence, *The International Journal of Research into New Media Technologies*, for an upcoming issue (currently under review). Each author contributed the following: Brandusescu and Dr. Sieber framed the research in the chapter. Brandusescu wrote the chapter. Dr. Sieber added and edited content to the chapter. Dr. Jochems made introductions and attended initial meetings in Lachine. The *Table de concertation jeunesse de Lachine* provided funding for research in Lachine. Brandusescu conducted the research in Lachine, Acadia Park and Grandview-Woodland. The objective of the chapter is to examine the hype behind digital crisis mapping practices and uncover the challenges within crisis mapping and community development practices.

Abstract

Crisis mapping has carved a niche in the information and communications technology for development (ICT4D) movement as a method of connecting and empowering citizens during emergency events. This paper explores the hype behind crisis mapping as it extends into more long-term or 'chronic' community development practices. We aimed for a critical examination of developer issues, participant (i.e., community organization) use, amidst the context of local communities. We repurposed the predominant crisis mapping platform Crowdmap for three cases of community development in Anglophone and Francophone Canada. Our case studies show mixed results about the actual cost of deployment, the roles of disintermediation and context, and the importance of the telecommunications medium integrated with the mapping application. Lastly, we discuss the implications of temporality in terms of the crisis and chronic event dichotomy.

3.1 Introduction

We have witnessed a surge in the use of Web 2.0 mapping for crises, whether natural or human-induced. Crisis mapping is promoted as a medium by which impacted individuals can easily contribute and share information related to challenges and solutions; agencies can improve service delivery, where benefits extend to potentially counter the power dynamics of the state (Meier, 2011). Crisis maps gain additional salience because the hope is that by visually aggregating individual contributions, the applications build a comprehensive vision of the event that draws on the collective wisdom of the community. Mapping is useful for crises because of the specificity of the geography, as events are rooted to locations and spatial activities. The most popular of the Web 2.0 mapping platforms is Ushahidi, although new mapping platforms are emerging (e.g., www.nextdoor.com). Ushahidi is an integrated user contribution-mapping platform that is designed to match the swiftness and rapid changes that occur in acute events. Its most publicized usage was during the Haiti earthquake, where it required only 17 hours to build the application (Norheim-Hagtun & Meier, 2010). According to Meier (2012), this activity created the most complete map of Haiti to date; thus it can potentially fill information gaps in overall conditions and response (Morrow et al., 2011). Because it follows open protocols, Ushahidi demonstrates connectivity between linking open source software, humanitarian crises, crowdsourcing and adaptable tools (Okolloh, 2009).

Crisis mapping has garnered considerable media attention, volunteer support and funding from numerous agencies (Forrest, 2010; Gao et al., 2011; Greengard, 2011; Morrow et al., 2011; Roche et al., 2013; Zook et al., 2010). According to Meier (2012a; 2012b), these technologies will save the world "one map at a time"; they have high levels of interactivity and are relatively effortless (in terms of resources and compared to traditional Geographic Information Systems, GIS) to build. Crisis mapping platforms have carved a niche in ICT4D (for development) world. A part of the evangelism (Norheim-Hagtun & Meier 2010), is that crisis mapping technologies are repurposable and could be used in fields besides crises, one of which is community development. Community development is a long-term geographically embedded process where community members collaborate by means of an organized intervention with the goal of empowering them vis-à-vis the circumstances that affect their lives (Lyndon et al., 2011). As will be discussed, technology and community development have been linked by the use of information communication technologies (ICTs) for some time. More recently, there have been

several applications of crisis maps in community development (e.g., Living Local in Chequamegon Bay, Community Kitchens, Living the Dream) but their successes are mostly self-reported. We need a critical eye on the utility of these technologies to examine their expansive promise.

This chapter explores the hype about crisis mapping, Web 2.0 platforms and their extension into community development practices. We consider this from an application developer standpoint, since crisis mapping and other mapping applications may not require the zero effort claimed by its users (Meier, 2012a). We examine one-half of the crisis mapping community--those who build and use applications for on-the-ground reporting as opposed to those who largely digitize satellite and other imagery to assist in disaster recovery and humanitarian relief (cf. www.crisismappers.net). We utilized, or rather repurposed, Crowdmap for three community development initiatives in English and Francophone Canada. Crowdmap is the cloud-based version of Ushahidi, the software of the eponymous non-profit software company that develops free and open source software (FOSS) primarily for crisis mapping. Crowdmap allows contributors to send messages via SMS or text messages), email, Twitter, web reports, as well as a smartphone application to a website, hosted by Ushahidi, that visualizes the messages collected on an interactive map. We aimed for a critical examination of participant use, content of local communities and an evaluation of its utility in community development. We were interested in any issues arising from the different goals of community development and crisis response, particularly around the issue of temporality. Is a technology designed for acute events suitable for long-term processes?

3.2 Literature Review

The literature expresses a great deal of hype about crisis mapping. This accompanies the rise of Web 2.0, which itself is supposed to broaden participation to "the long tail"; the technologies can be effortlessly mashed together to create a rich user experience; the technologies put the user first based on content that users, as non-experts, contribute; given this, the sheer volume of users creates a kind of collective intelligence (O'Reilly, 2005). Web 2.0 has inspired many developers to create technologies for humanitarian response, which are proclaimed as liberation technologies (Diamond, 2010; Meier, 2011). Crisis mapping is both a set of software platforms

and an activity. Crisis platforms are said to be pragmatic when confronting a crisis. They are useful tools for collecting information and visualizing data (Gao et al., 2011; Morrow et al., 2011). There is an immediacy that matches the urgency of a crisis: the platforms allow for rapid collection of reports and have the ability to handle and collect unstructured data (e.g., emails, forms, tweets). This is accompanied by an informally coordinated group of volunteers, who can be marshalled for activities like entering information about damaged roads and collapsed buildings; the volunteers can build user interfaces to allow victims to easily report conditions on the ground. The platforms can locate activities--they can geocode messages automatically (using Twitter and smartphones) and manually (using SMS content) (Gao et al., 2011; Roche et al., 2011; Zook et al., 2010). There are growing interests in these platforms by entrepreneurs, academics and Web 2.0 enthusiasts to link technology and socio-political contexts whenever projects arise, and demand critical analyses (Keay, 2010).

By 2011, digital mappers had already utilized new data and new tools to provide situational awareness during paralyzing snowstorms, fires, oil spills, tornados, hurricanes, conflicts, protests, battles, genocides, famines, and earthquakes (Marcus, 2012; Shanley et al., 2013, Ziemke, 2012). Slow-onset chronic conditions like poverty, homelessness, gender based violence, foreclosures and forced eviction were being mapped alongside acute disasters, either natural or man-made. Thus it is argued that crisis mapping allows for the collection and use of real-time information to shed light on a situation as it happens (Meier, 2012a). Maps can also be leveraged to help monitor elections by allowing citizens a space to report intimidation, violence, and fraud at the polling station (e.g., Uchaguzi platform for the 2012 Kenyan elections) (Diamond, 2010; Meier, 2011). Maps also may act as a witness to crimes committed by the state, such as harassment, detention or torture (http://harassmap.org). As more people around the world discover the power of these crisis maps, proponents argue that the scope will expand to include these new use cases (Ziemke, 2012).

Crisis mapping approaches a kind of evangelism amongst its promoters: the non-experts motivated to do good via mapping. There are those who believe that crisis mapping has the potential to save lives (in Arney et al., 2014). Researchers Arney et al. (2014) report that in a remote village in Haiti, "[t]here were three women who were severely injured...had it not been for us using open source information that was available, we wouldn't have been out there and I don't think they would've survived." The exhortations are largely coming from a new set of

actors, crisis mappers, who work in online and offline groups as disaster response teams. These are digital volunteers who contribute geographic content like streets onto digital mapping platforms; some of these informal groups are now interested in applying what is called, base geographic data (i.e., digitizing roads, building footprints, vegetation, points of interest) to humanitarian efforts. Here we speak to the emergence of OpenStreetMap (OSM) and the emergence of the specific Humanitarian OpenStreetMap Team (HOT). In the case of Haiti, HOT consisting of 600 global volunteers, "populated" Port-au-Prince on OSM to build the most comprehensive map of the city's downtown area (Meier, 2012a; Soden & Palen, 2014). These are not distinct actors when it comes to a specific crisis. HOT's map was used for the Ushahidi Haiti Project (Meier, 2012a). From Haiti onwards, HOT claims to have mapped every natural disaster (Arney et al., 2014).

Crisis mapping exists in a realm where there is little need for credentials. Crisis mappers are considered to be a type of what is called neogeographers. Neogeography refers to the practice of amateur cartographers. Admittedly there have been amateur cartographers since the beginnings of mapping; these are "neo" because digital earths have made it far easier to make maps online. Turner (2006) considers it to be 'do it yourself' mapping from the ground up, without the need of experts, government intervention, or the need for professionalization. There is also a sense, amongst the crisis mapping community, that there is no need amongst crisis mappers for credentials in humanitarian relief or crisis response. That role is relegated to those local individuals affected and to relief agencies who have professionalization to coordinate the relief efforts. Justine MacKinnon, CrisisMappers UK as quoted in Arney et al. (2014):

> With few exceptions, these individuals work remotely from the crisis in question.
>
> There is no job in the world that could pay for the way this makes you feel when you actually know you have saved someone's life from sitting in your sitting room, in your pajamas at 2 o'clock in the morning. It's priceless. (n.p.)

Indeed, the remoteness affords a global focus on a specific crisis. That is not to say, the local context is unimportant. HOT asserts that they include the importance of local knowledge and local context (Arney et al., 2014). At Ushahidi, "Ideally, we want a local organization working on this project" (M. Antonsson, personal communication with the first author, July 15, 2014). The local organization will know the context and, by inference, will assume the responsibility of a crisis mapping application built on top of the platform.

The reporting on crisis mapping generally can be found in the grey literature, which is indicative of the speed at which technological innovations emerge and crisis mapping community increases in number, as well as the disdain with which some actors in crisis mapping hold the peer-review process (Hersman, 2013). Other factors aside from the potential for citizen empowerment (e.g., Norheim-Hagtun & Meier, 2010; Pha & Vinck, 2012), concerns technological development of applications, access, as well as differences between software-led humanitarian activism and professional practice. For instance, Ushahidi developers expend large amounts of effort on creating a network of volunteers to aid with user interaction; conversely, traditional humanitarian response organizations emphasize the internal mapping process (Morrow et al., 2011; Zook et al., 2010). Citizen reporting suggests an ad hoc approval process (Okolloh, 2009) and problems with trust of the user contribution (Bishr & Kuhn, 2007). This differs from the process of on-the-ground humanitarian response teams "with often rigid information requirements, which typically require certain types of information at certain times and organized around certain response sectors and geographies" (Morrow et al., 2011, p. 5). Challenges in user involvement exist (Morrow et al., 2011; Okolloh, 2009), often with no standards for technological platform training for volunteer developers and administrators (Morrow et al., 2011). When using crowdsourcing tools, there is no guaranteed accuracy to the information collected, to truth (Okolloh, 2009). Goodchild & Glennon (2010) elucidate that volunteered information may hinder more than help a disaster situation, depicted through poor data quality and citizens finding it difficult to distinguish between authoritative and assertive information. Further, access to technology can be limited (Morrow et al., 2011), which defeats any benefits that could be accrued from crisis mapping. Authors believe there is much room for improvement, hence the prevalent recommendation for strategies of success (Gao et al., 2011; Morrow et al., 2011; Okolloh, 2009).

Crisis mapping builds on a long history of digital mapping for community empowerment. Theory and practices have emerged to explore the value of mapping technologies like GIS for local knowledge production and support for marginalized communities. Participatory GIS has been used variously for community development, for example, to preserve urban parks and identify bad landlords (Elwood & Ghose, 2004; Sieber, 2006). As part of these processes, citizens have reframed public policy debates and, in certain instances, gained control over planning processes, providing more sophisticated analyses and visualizations than the experts

and officials in those processes. Community residents may be seen to have the best knowledge of their community (Burns et al., 2004). Whereas outsiders might view the community as blighted, members of the community might see their community as wealthy in terms of local assets like skills, talents, experience and community relationships (Kretzmann & McKnight, 1993; McKnight & Block, 2010). It is also based on the idea that individuals who live in a locale are best equipped to sense changes in their immediate surroundings (Goodchild, 2007). This is in contrast to experts, who may not understand the context of an area nor be able to respond with sufficient speed and attention. This is not without considerable critique. There is huge potential for reifying digital, class and gender divides, where communities can be simultaneously empowered and disempowered (Fordham, 1999). Community focus on digital tools can come at the expense of more effective forms of action; indeed, their usage can encourage state capture and diversion away from the interest of the citizenry (Stoecker, 2005).

These ICTs are representative of community informatics, a field of technology that aims to bridge economic development to social development at the community level from a bottom-up perspective, which includes developing community networks, online participation, self-help and advocacy (Gurstein, 2007). Critics contend that unlike community development, community informatics practice is limited by specific 'toolboxes' that rely on computers for answers. These 'toolboxes' exclude the use of a broader range of tools, and centralize the computer, which promote the one dimensional perspective of viewing all problems as technological (Pitkin, 2001; Stoecker, 2005). Further, information technology theory is difficult to apply to community settings because anecdotal reports and narratives instead of theory drive much of the research (Stoecker, 2005). Advocates believe community informatics empowers communities by fusing social and technological components (Bradley, 2006; Foth, 2009; Gurstein, 2007; Keeble & Loader, 2001; Molony, 2009; O'Neil, 2002). Community informatics supports technology driven initiatives that engage physical communities in social practices. ICT's impact on communities is largely dependent on the technical and physical tools used in a particular research project. Like the Ushahidi project, Pitkin (2001) states that community informatics is largely supported by techno-optimists, who oversell technology as a solution. A community strives for self-regulation, which is achieved through self-help by surviving, thriving and evolving (Burns et al., 2004). At the end of the day, "information is power" and gatekeepers are substantial for the community-

technology dynamic (Abraham, 2008, p. 5). If the focus is on the community, rather than the technology, there is greater chance in future collaborations (Marshall et al., 2004).

In crisis mapping, the mappers may consider themselves to be new geographers. But often in neogeography practices, actors do not take responsibility for the effects of the mapping technologies they produce or the maps they make (Leszczynski, 2014). Ziemke (2012) argues the crisis mapping field will learn from past and present deployments for future progress. But what is the responsibility of a misplaced road, in the case of a remote mapper, or the responsibility of a mapper who seeks to take humanitarianism into his or her hands by travelling to the site, as has happened with other voluntary efforts? These individuals may create false expectations and impede relief efforts.

Neogeography is also about big data, the ability to scale up from very small projects, to the aggregation of thousands, if not millions of contributions. There is some amount of corporate capture as well. Because citizen contributions may have monetary value, there is much research into understanding the motivations of people to contribute to digital platforms. Individuals may be driven to contribute to digital mapping platforms because of civic activism (Jaureguiberry & Proulx, 2003), pride of place (Coleman et al., 2009), and hobby (Budhathoki & Haythornthwaite, 2012). It is not necessarily a community development traditional environment about community specifics, but an initiative that links small scale information to a global level.

Burns (2014) argues that HOT projects focus on an abstraction of geography, without accounting for on-the-ground local knowledge (e.g., participant collective memories of hazard zones) or other information if it cannot be directly made visible on a map. As many ICT4D are gaining momentum, it is important to not get lost in the hype, and be critical of the work that remains ahead to improve existing technologies. The challenge is to determine ways for individuals to use these tools appropriately for territory management and disaster preparedness (Beland, 2014c).

Let us turn to the mobile portion of crisis mapping. Applications based on platforms like Ushahidi explicitly link mapping and texting, which differentiate them from the rest of online platforms that solely rely on the Internet for user contribution (Zook et al., 2010). Using mobile technology for community development goals has led to progressive outcomes, for example in banking, epidemiology, agriculture and fishing (Abraham, 2007; Aker & Mbiti, 2010; Patnaik et al., 2009; Wong, 2008). The value of mobile technologies is tied to successful community

integration. Authors argue mobile technologies facilitate communication, promote networking, and build social structures for communities (Donner, 2008; Hardey, 2007; Horst & Miller, 2006; Katz, 2011; Yzer & Southwell, 2008). Locals may save time, energy and money to make business transactions online, receive medical aid or ask personal health questions and receive accurate information (Aker and Mbiti, 2010; Alamenciak, 2012; Donner & Tellez, 2008). Online mapping has been combined with smartphone technology to encourage residents to contribute their views of transformations of Chavis Park in the historic South Park East Raleigh, North Carolina, US (Boone, 2012). Here, participants provided rich content (e.g., they documented the space and shared stories about their activities in the Heart of the Park). However, all the smartphones were provided to them so tutorials needed to be conducted to familiarize participants with foreign technology (Boone, 2012). The mere presence of ICTs in a project does not guarantee support from existing community development initiatives, because ICTs are not always viewed as broadening participation nor are they automatically sustainable within the community (Girard & O Siochru, 2006). Researchers must be wary of any tendency to overly optimistic due to initial positive results and forget that mobile phone usage can express or even exacerbate gender, income and other digital divides (Albert et al., 2008). We should remain critical of the downfalls as well as their strengths.

3.3 Methodology

Our research investigates the role of crisis mapping for community development. We worked with three community organizations in Canada. Table 3-1 shows the characteristics of the case studies. Through on-the-ground networking and emails, we contacted the community organizers and activists. We prepared for the meetings with community organization members by creating storyboards (essentially comic books) to explain the process of mapping and contributing content to be mapped. We met and presented the project and showed previous applications. We attended community meetings and developed each application after consultations with the communities. There were numerous iterations of application development, following discussions with community members. The applications were launched once we came to a consensus about site design. Manuals were made to navigate the applications, including information on how to submit texts, tweets, web reports, emails, and smartphone messages (these were submitted via an

Ushahidi app). Specific contributions were categorized based on community concerns (e.g., rezoning, condominium development and gentrification). The methodology strategies were based on participant input. Guidelines were created for contributing appropriate messages (e.g., no foul language). There were variations in our case study approaches, as seen in Table 3-1. For instance Vancouver (i) and (ii) were activist driven, whereas the Montreal case was managed by professional community organizers. The Vancouver cases had motives resembling crises (e.g., immediate rezoning, anti-densification, loss of social housing); the Montreal organizers wished to address longer term issues (e.g., development of community assets).

Each application consisted of three parts: a mapping software platform, telecommunications hardware, and a telecommunications software platform. We used Crowdmap, a FOSS cloud-based platform to develop our applications. We registered each mapping application under a unique URL, chose the base map (e.g., Google Maps or OpenStreetMap) and layout theme; we created an email account and added a Twitter hashtag. We then tested the different ways to send messages (i.e., email, web, Ushahidi smartphone application and Tweets that include the chosen hashtag). The SMS option required an additional set up process. We enabled SMS because most crisis mapping contributions in the developing world come via SMS. Building the SMS portion of the application required telecommunications hardware and software, which, unlike the vision of universality of the cloud, is highly dependent on country infrastructure and regulations. The hardware was unavailable in Canada, so it needed to be acquired from elsewhere, in this case the UK. Mobile network provider inconsistencies were prevalent with hardware and software. Specific mobile networks are used for specific hardware.

After the telecommunications hardware was acquired, another FOSS, FrontlineSMS was needed to act as an intermediary between the SMSs and Crowdmap platform, to accept and parse the incoming text messages. Software interoperability was a challenge. Occasionally, SMSs never appeared on FrontlineSMS. In addition, the hardware and software required by FrontlineSMS is under the Global System for Mobile Communications (GSM) network, not the Code Division Multiple Access (CDMA), which is prevalent in Canada. Our provider options thus were narrowed as we entered a contract with a GSM network provider so our subscriber identity module (SIM) card would match the GSM modem standard.

Table 3-1: Synthesis of Cases (Source: first author)

Case/ Description	**Montreal**	**Vancouver (i)**	**Vancouver (ii)**
Community Description	Low income immigrants, single family housing	Young, middle class families living in subsidized student housing	Low income, multiple ethnicities, renters
Intent	- community assets - community improvements - healthy food - youth engagement	- community assets - community improvements - anti-rezoning - anti-densification	- anti-densification - anti-rezoning - social housing - community plan
Duration	1 year (2 applications created) - first application was based on community assets and improvements; it had few messages - second application was based on one community event and its pre-workshops; application had few messages - most of the time was spent adapting the context and technology to the community organizers' needs	2 months (application use ongoing) - application produced content that was included in a community and student report sent to land administrators land-use changes considerations	1 month (application never launched) - time was allotted to meetings with activist and attending local events and meetings to get to know the community) - although we were both passionate about the community, the suggestion for the new medium of communication did not align with organization's communication strategy
Participants	professionals, adults, youth	activists, volunteers, young families	activist and volunteer run groups, community councils
Recruitment	- workshops - flyers (made by community organizations) - posters (designed by researchers) - community organization meetings - events storyboards (cartoon panels outlining the project and explaining the technology; used to present to community organizers	- community events - multilingual flyers (designed by activists and translated by community members) - posters (designed by activists) - meetings with activists - storyboards (cartoon panels outlining the project and explaining the technology; used to present to activists and community organizers)	- meetings with activist to propose our application and explain the technology - community public meetings

3.4 Findings

This research allowed us to answer the question whether crisis mapping is a platform for undertaking the process of community development. In doing so, we revealed some assumptions in crisis mapping.

3.4.1 The Zero Cost argument

The mashup nature of Web 2.0 may limit project effectiveness. The platform did not always appeal to the community because of its 'crisis-map feel' (e.g., hardcoded 'Get Alerts' tab). To overcome the platform limitation, we created manuals that were available for participants to facilitate the navigation of the website and submission methods. To function at full capacity, a mobile network provider needed to be involved. We enabled the telecommunications hardware and software needed under the Global System for Mobile Communications (GSM) network and acquired a subscriber identity module (SIM) card for a local carrier. Once the website became available, every technical aspect is essential to function with no bugs. However, this is clearly not a realistic outcome. Further, we cannot afford technical flaws when participant recruitment alone is a difficult task. Support for dealing with technical problems varies, and sometimes is solely dependent on beta users and Ushahidi volunteers. Since Crowdmap is cloud-based, the administrator relies on a Tweet or email to Crowdmap or GitHub for support. Dedicated Web 2.0 enthusiasts fix errors, yet the reliance on the crowd is unstable at best.

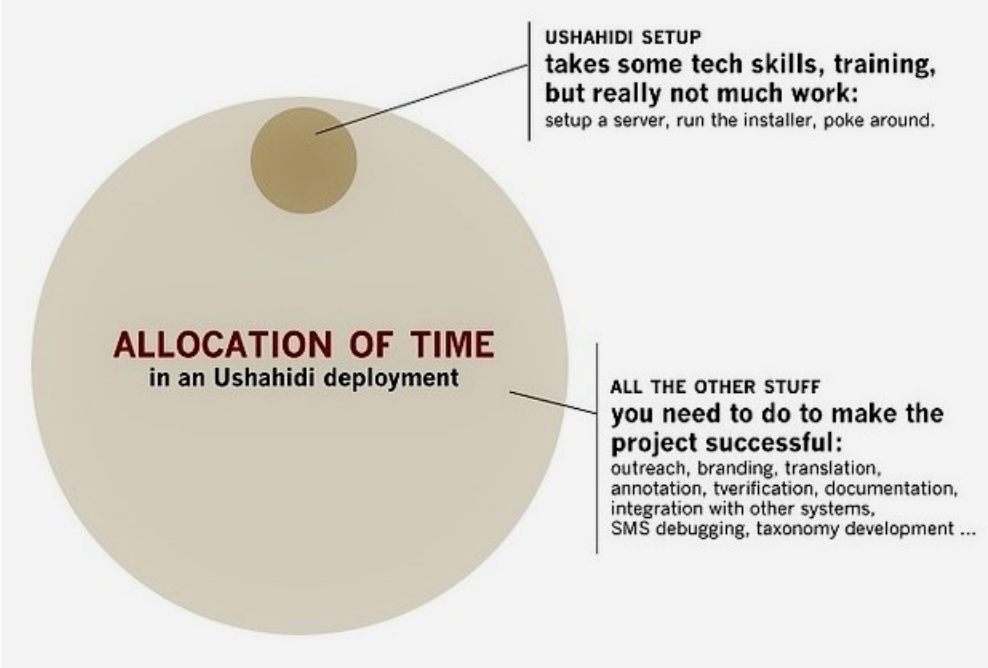


Figure 3-1: Ushahidi Deployments' Management of Time (Source: Blow, 2010)

The challenges of full deployment begin to be revealed in Ushahidi's own 'Allocation of Time' (Figure 3-1). Time expended for technical development (the small circle depicts time allocated towards the 'Ushahidi Setup') is supposedly small; whereas the much larger circle depicting 'All the other stuff' required for an Ushahidi application deployment ("rollout"). The small circle belies the significant skill level required to complete development. Even though there is a division of skills (i.e., large circle versus small circle), technical skills associated with the development process are also present in 'All the other stuff'. "Verification, documentation, integration with other systems, SMS debugging, and taxonomy development" are all critical components that require some level of technical expertise. The time allocation and task division are not as straightforward as the circles represent. This is especially notable since Crowdmap is the easiest of the Web 2.0 mapping platforms. Meier (2012a) emphasized the zero cost of development: that is, crisis mapping platforms have become so easy that it is effortless to set up an application. However, technological and non-technological development is significant for both crisis mapping and our community development case studies. There is great advantage in creating a network of volunteers before a crisis event exists, which Meier (2012a) initiated before the Haiti earthquake. When the earthquake hit, it was easier to mobilize the volunteer

team. By building a different social network, Meier (2012a) erased the expertise of the developer. The cost is not zero; it accounts for the developer's time in the community. Patience, adaptability, flexibility, listening, and receiving feedback are all necessary.

Neogeography may be about do it yourself mapping from the ground up, without the need of experts (Turner, 2006), but Crowdmap demands a different kind of expert. When working with open-source platforms that have additional features like texting, the developer must become comfortable with mobile phone providers and texting hardware/software. Sustainability of technology is further challenged by accommodating new versions of existing products (Crowdmap Classic to New Crowdmap). It will be difficult or even impossible to sustain this project after we leave the community because our on-the-ground presence is integral to participation. The community needs a continuous reminder of the project, as people are busy with their daily lives to contribute to an ongoing project.

3.4.2 Context Matters, particularly IRL

At least where it concerns community development, understanding the local context and being on-the-ground mattered. In our own research, we found that community engagement and technical processes are interconnected. After the initial technical set-up, the recruitment process begins, followed by website administration and upkeep. It was critical to have a sustained physical presence in the community. One example was the recruitment process for map contributors. We needed to be in the community every few days, to hand out flyers and talk to parents at various events throughout the community. We became familiar with the built environment and popular areas, aware of activities listed on physical bulletin boards, taking opportunities to speak with activists and discovering community events that we may have missed otherwise. We gained some trust via our physical presence, a key factor in aligning researcher goals with those of the community (Sullivan, Kone, Senturia, Chrisman, Ciske, & Krieger, 2001). By observing and listening to community members and activists in Vancouver (ii), we discovered the recruitment process could be improved if we advertised it in various languages (i.e., Mandarin, Korean, Spanish and Farsi). We brainstormed messages for the website so the target audience could gain a better sense of the map's purpose.

Physical presence was a necessary but insufficient condition for application success. This was abundantly demonstrated in the Montreal case, where a year of meetings with community members and accommodating shifts in project goals, participation was poor. If mobile phones are not as important as creating a report on the website, then change focus towards advertising the website. Our ideas did not always resonate with the community, which is to be expected. In many ways, acute events provide much greater clarity in their objectives than the protracted nature of community development.

A 'cool' technological project is insufficient; technological and community visions must align. The Vancouver community worked because there was an informal group established. They had a clear mission and a plan in terms of civic activism; to gather information for a specific report and challenge the current land-use change. The land does not only comprise of their studying aspect of their lives but is also the land where they currently reside. Student family housing that is subsidized and therefore affordable. Reducing that land to less than 50 percent is problematic for future students with families.

It would seem that big (crisis) data of "...disaster-affected locations are increasingly becoming digital communities, due to the proliferation of social media..." (Meier, 2013b). However, social media has no organized way to coordinate, share information, resources and coordinate plans for different relief organizations, which crisis mapping uses (Gao et al., 2011; Morrow et al., 2011). It cannot replace the physicality of meetings and other social encounters that provide greater context for an event. Morrow et al. (2011) reported that Ushahidi did not make a credible source to affected communities. It was too new and the platform had unclear parameters. Ushahidi had tremendous networking to the insiders, the developers, yet an ambiguous identity to the public (Morrow et al., 2011).

Vancouver (i) provided the starkest reminder of the need for context. We were sufficiently physically present during the community's consultation process with the city to track the hostility between the city planners and the community. What we did not know was the city had engaged in a prior interactive mapping project through a similar technology. Had we known the full history of distrust with the city and the distrust of technology, we would have done things differently. Our use of crisis mapping tools confirms the importance of the milieu in which the application is being offered. If the mapper just parachutes into a situation, as has been the critique of many humanitarian projects, the community may choose not to respond.

3.4.3 The Importance of Medium

Although studies have shown ubiquity of mobile phone use, ownership of mobile phones ranges. The 'on average' hypothesis does not always work. Sometimes the people who are the heart and soul of their community, who dedicate hours on end to community matters, are also specific about the ways in which they communicate. The ways people interact on a professional or community level do not always mimic their personal interactions. In addition, the capacity to absorb technology ranges, therefore social media use will differ from user to user. Interest in a technology project cannot be based on the technology community organizer/activist uses. A community organizer may own a smartphone, and not use the Ushahidi app. An activist may have a blog and Twitter account, and not have a Facebook account. On the contrary, they feel strongly against it.

People choose how they interact with social media. Different people have different preferences. Even though Twitter and SMS are similar in their character length/limitation, the use of SMS in the case of humanitarian responses is much greater than Twitter. According to Munro & Manning (2012), Twitter is mostly used by the international community. This results in a positive "Twitter bias" in many research papers reporting its usage, when in reality tweets account for less than a percent of the world's communication choices (Munro & Manning, 2012).

SMSs offer the lowest common denominator of service but they present enormous challenges, mentioned above, in system development, but also in capturing and parsing location. In terms of the development and moderation of incoming messages, SMSs were far harder to geo-locate than web reports, tweets, emails and smartphone messages. An SMS cannot offer a map for pinpointing location and limits the message to 160 characters. In some messages, people had much to communicate but this could not be contained within the character limit. Or they had trouble in reporting their location. The paradox of Ushahidi is that, despites its automation of many features, SMSs are geo-located via a volunteer force dedicated to manual parsing of the SMS content. A community organization may have no such labor force motivated to that type of computer activity.

Ways in which communities submitted messages ranged. Montreal focused on submitting messages with mobile phones. Both Vancouver cases favoured the website method. Participants were curious to learn about this project. The application allowed them to explore the map and

messages in great detail. Our advertising in Vancouver (i) emphasized the website, which may have drawn more participants to create web reports. Regardless of the methods of sending messages, in all cases we noted the need for flexibility of interaction.

3.4.4 Disintermediation and the introduction of new roles

Web 2.0 aims to eliminate the need for many intermediaries. Crisis and other types of Web 2.0 mapping supposedly places the user in control; the user interface is transparent; the underlying geography already exists; and there is no need to purchase and geo-register large amounts of satellite imagery. There is no need for a GIS technician to collect data, arrange into databases, and select visualization options. However, the individuals who mobilize critical events in the communities can function as intermediaries, controlling the access, information flow and expertise. In two of the cases, (Montreal, Vancouver (ii)), sole individuals functioned as the main gatekeepers of the community, who had the power to pick up or drop a new project. The current issue that aggrieved the community was the community draft plan by city planners and its imminent deadlines. Introducing a new technology in the midst of existing (and successful) mobilizing tools was not welcomed. Ironically, the activist thought the community draft plan was too intense for a crisis mapping platform. It was suggested the application be used in the community at a later date for people to share sightings of wildlife (e.g., raccoons) in the community. The new technology did not complement (surprisingly for a crisis platform) existing methods of crisis-resembling communication and activism. Online petitions, surveys, rallies, public meetings, blogs, Twitter and letters to city representatives were considered tried and true methods. Community gatekeepers resisted change because what they already use works.

Mapping applications contain their own gatekeepers, disintermediating the traditional GIS developers and introducing new bottlenecks. These are the data curators, the individuals who have to parse the geography out of the SMSs. Any new technology will introduce its own gatekeepers. These are individuals with cartographic literacy and expertise in system maintenance. A community activist is the gatekeeper to the community; the researcher is the gatekeeper to the new technology. The approval and verification process of the new technology is substantial, because both gatekeepers now control the information flow based on incoming messages. Where self-help in community development is encouraged (Burns et al., 2004; Florin

& Wandersman, 1990), this partial shift in control to outside actors can be destabilizing. Community development practices confirm the difficulty of introducing new technologies in communities (Leson, 2013).

We cannot underestimate the role of both the private sector and social entrepreneurs in crisis mapping and, more generally, Web 2.0 mapping use. Web 2.0 mapping relies on an ecosystem of distributed geospatial services comprised of individual firms and user communities to provide the complete mapping application. Among them are the mapping platform providers such as Google, the crisis mapping platform providers such as Ushahidi, data providers (e.g., for up to date satellite imagery, which are frequently digitized by the crisis mapping user community), coding user communities (e.g., Linux operating systems), browser companies (e.g., IE Explorer and Firefox), telecommunications hardware, and other service providers (e.g., for geocoding). There are ultimately many gatekeepers outside the platform administrator's control. In an ecosystem where all components must remain interoperable for optimal functionality, there is high fragility in system maintenance.

We know that reliance on the private sector for community empowerment is problematic. Crisis mapping arises out of innovations in tools, but also constraints on the part of the state to respond sufficiently quickly to disasters. We therefore delegate citizens to communicate and map their concerns. This is at once a state failure and a neoliberal agenda of downloading state services to the impacted individuals but also places citizens at the mercy of larger private sector and other interests (Leszczynski, 2012). Google may or may not "do no evil" but community empowerment is not their prime business model.

By contrast, social entrepreneurs are explicitly engaged in appropriating technology for civic good and citizen empowerment. This describes the developers of Ushahidi, who built their platforms to advance social activism and public accountability. They are not simply software developers, but software developers for social good. They remain gatekeepers of the technology, deciding which platforms advance and which platforms are left behind. All of the current Crowdmap applications may not be supported as new applications launch (e.g., New Crowdmap). Ushahidi moves to a new platform because of cost issues, among other reasons (Leson et al., 2013). Social entrepreneurs also must remain solvent. Crowdmap became a popular alternative to the Ushahidi platform because Ushahidi financed the cloud services. It no longer became sustainable and will therefore affect all applications.

Similarly to Crowdmap, FrontlineSMS has recently built FrontlineCloud, an online, cost-based platform. After a free 30 day trial, users will be charged. Sustainability of the technological platform does not equal continuation of the service. One must continue to understand the impact the technological applications have on local capacity development, ownership, the global network community, and the influence of integral actors and donors (Morrow et al., 2011).

3.4.5 Temporality the Crisis versus the Chronic (and Dead Ushahidi)

Temporality is a key loci for our research because crises and community development possess temporal elements. Crisis events appear to occur at a singular point or a short duration in time (e.g., earthquakes). Chronic events (e.g., poverty) are long-term and, to some, seemingly intractable. Chronic events receive less attention than crisis based events, where there is "unequal power of spectacular and unspectacular time" (Nixon, 2011, p. 6). Nixon is referring to slow violence, the structural, extra-jurisdictional factors that defy the definition of events as singular, acute points in time. Community development work exposes the need to express crises that do not happen instantaneously and involve long term degradation, but warrant our consideration. Yet, the sense of urgency to communicate community crises does not parallel disaster-driven crisis situations. It should be noted that disasters themselves are increasingly considered complex socio-technical events (Fordham, 1999; Frickel, 2008) with long time horizons. According to Okolloh (2009, p. 67), "Humanitarian-based crisis situations do not usually start with one flashpoint. They generally result from a number of events and factors that have happened over time." We simply put our attention and our energies towards the blip in time.

When deploying a crisis mapping application, Okolloh (2009) notes the importance of raising awareness in community, translating information, using simple yet effective tools, having clear project goals, gaining community trust, relying on two-way information flows, and creating a sharing culture. The challenge is that in a crisis, the developer may not know, nor has the time to know a community or the target population. That is a temporal advantage of community development, should the developer take the time to know the community as we did. This is not essential to all community development mapping projects, which occasionally have spawned a

number of what essentially are geospatial web "carpetbaggers" who develop mapping applications from afar in the hopes that communities will find them useful (Sieber et al., 2009).

Temporality, in terms of duration of stay, is reflected in the different case studies (Table 3-1). A year was spent in Montreal working with the community with minimal outcomes. A month was spent in Vancouver (i), although the platform remains a viable portal for continuous discussion. Vancouver (ii) was a passionate community, yet the platform never launched. This resonates with marginalized communities to which community development is applied. Time spent in communities is critical, where a constant presence is needed for continuation of projects by attending events and community meetings, and further collaborating with local groups.

Dead Ushahidi emerged as a response to the media hype around Ushahidi and overwhelming positive feedback that neglected to describe both sides of the story; that in fact, Ushahidi deployments, when aggregated, are mostly inactive, dead. Anon (2012) suggests a time bound mapped event does not mean it is a complete project, and provides some metrics to gauge the success or failure of Ushahidi and Crowdmap deployments. One measure is a formula (# of submissions / # of registered voters > .0001) means that message submissions per participants have to be greater than 0.0001. This does not only quantify success but also defines the value of a crisis map in terms of timing. If some events are time bound (e.g., elections), more submissions are crucial for a map to stay 'alive'. If the maps are built for ongoing participation, another measure of failure is allocated. A map is 'dead' if no one (let alone a crowd) has submitted a report to the map in the last 12 months.

In these measurements, success is purely a function of value, where the emphasis is placed on reports. "As dead Ushahidis are now outnumbering live ones on the deployment list" (Anon, 2012), does it mean funders and investors will not support them? Meier (2012c) finds that a significant challenge remains in the low average of reports per map. A quantifiable measure of success for these deployments may limit their scope. Norheim-Hagtun and Meier (2010, p. 87), reporting on the use of Ushahidi in Haiti, suggested that the application generates a perception of immediate assistance: "Haitians were being asked to text needs and location into 4636, yet the [text to shortened phone number] was set up without any formal guarantee of action by any local responder". A similar expectation was raised, to a somewhat less life critical effect, in the Montreal case. A mother, who reported a damaged playground wondered if she reported the issue to the mapping application, would a city official fix the playground so she

would allow her child to play. The applications inferred both an immediacy of contribution in its access and ease of use but also an immediacy of response.

Acuteness/emergency alone was an insufficient condition. Concerns in Vancouver (ii) issue were imminent but generated no urgency for application deployment. Because the context was misinterpreted, community leaders were unwilling to take up the application. When the two align, however, the application is rapidly adopted. We approached Vancouver (i) in the midst of an imminent rezoning of student family housing due to land-use changes. Fifty percent of the community needed to be evacuated by August 2013 for future development and land use plans. The application garnered support from activists and community members because there was a need to express community concerns in new ways. There was no limitation to the length of message submission (if submitted via web or email), and it provided a safe environment (e.g., confidentiality and anonymity were assured). One measure of success was the acceptance by a tight knit community that was open to new technology projects and channels of communication. Another measure of success is the speed of deployment and response time to the project, where the application was successful at mobilizing submissions in a short time frame.

3.5 Conclusion

This chapter explored the reality behind the hype of crisis mapping technologies and revealed that hype through its repurposing to community development. Applying crisis mapping to community development relied on physical participation of researchers in the communities. That is, the applications development extended the physical community to a virtual community. We confronted the zero cost argument, found numerous technology constraints, which confirmed the challenges of introducing a new technological medium in community development processes. Additionally, we recognized the importance of the media communities already use, and the complexities in having our new technologies complement existing community development processes. Our integration often resulted in disintermediation, exposing new bottlenecks, which included the intrusion of social entrepreneurs and the private sector. This added to the complexity of the nature of crisis-to-community-mapping context.

Temporality was expressed in interesting ways. At once, it revealed the attraction towards the acute and not the chronic, although the acute was perhaps not as singular as envisaged.

Having a situation be acute was appeared a necessary but insufficient condition for a crisis mapping approach to be used in a community setting. Context could upend even the most perfect opportunity for crisis communication via a mapping platform.

The challenges of introducing ICTs like crisis mapping persist and their sustainability remain uncertain. The Ushahidi project based in Haiti had lesser impact on-the-ground than expected, and considered "a shadow operation that was not part of the emergency response plan" (Morrow et al., 2011, p. 16). While the researcher strives for long-term project commitment, community gatekeepers may fail to have the resource capacity. We are aware that technology, disintermediation, context and temporality challenges exist. Historical context may prevent communities from trusting new mapping technologies. If applications do gain the community's trust and are passionate about these new technologies, who will be accountable for solving the chronic and crisis events derived from the participant's messages? There cannot be accountability without a strong application that relies on context, the audience it gains, relevant information it presents and community relationships it builds.

The next Chapter will address the challenges experienced in integrating telecommunications, online mapping and geo-location in communities.

Chapter 4: The Challenges of Integrating Mapping and Texting for Community Development

Preface

Chapter 4 is co-authored by Brandusescu, Dr. Sieber and Dr. Jochems. It was presented by Brandusescu at the conference, *Using ICT, Social Media and Mobile Technologies to Foster Self-Organisation in Urban and Neighbourhood Governance*, Delft Institute of Technology in Delft, Netherlands. Brandusescu retains the copyright. We plan to submit the chapter to the *Journal of Urban Technology*. Each author contributed the following: Brandusescu and Dr. Sieber framed the research in the chapter. Brandusescu wrote the chapter. Dr. Sieber and Dr. Jochems edited the chapter. Dr. Jochems made introductions and attended initial meetings in Lachine. The *Table de concertation jeunesse de Lachine* provided funding for research in Lachine. Brandusescu conducted the research in McGill University, Lachine, Acadia Park and Grandview-Woodland. The objective of the chapter is to examine the challenges in the process of integrating mapping and texting community development in Canada in contrast to the developed world context. Moreover, to uncover the substantial difficulties these challenges mean to community participatory mapping practices.

Abstract

Computerized mapping has been used for community development since the early 1990s. Increasingly computerized mapping has moved to the mobile phone, either as an interface for a cloud-based mapping platform or as a stand-alone geospatial data collection device. This movement reflects the ubiquity of mobile phones, the ease of use, and the integration of location, communication and photography. Nevertheless, any new technology poses challenges in adoption. This paper discusses technical components and challenges of a coupled mapping-texting for community development in Canada. Research was conducted over two years in five deployments in Eastern and Western Canada. We found challenges related to the nature of national mobile network providers and mobile modem locks, interoperability of mapping and telecommunications software, parsing of locations, issues of content moderation and anonymity, and long-standing sustainability of diffusing ICTs to community based organizations.

4.1 Introduction

Computerized mapping has had a long history for community development. We define community development as a process where community members collaborate by means of an organized intervention with the goal of empowering them vis-à-vis circumstances that affect their lives (Florin & Wandersman, 1990; Lyndon et al., 2011). Barndt (1998) and Huxhold (1991) developed some of the earliest geographic information systems (GISs) for community based organizations (CBOs) in Milwaukee, Wisconsin, where they digested US Census Bureau data for local use and input them into the Esri mapping software. They would combine census data with municipal data (e.g., roads, building footprints, permit data). There they would assist CBOs in building their own databases and guide them through map creation. One successful application was an inventory of bad landlords, those individuals with high rates of building permit violations. CBOs would use these maps to advocate on behalf of poor tenants. Not that the technology was easy to use; indeed, the authors actually installed the software in a community technology centre and had to provide considerable technological and data handling assistance.

Increasingly computerized mapping has moved to the mobile phone, either as an interface for a cloud-based mapping platform or as a stand-alone geospatial data collection device. Mobile phones, regardless of their mapping applications, hold high promise for community development. Mobile phones could act as medium for community members to voice their opinions; individuals could connect to economic opportunities in distant locations; they could receive vital information unavailable or denied to them in their community; they could even pay for goods with their phones (Aker & Mbiti, 2010). A predominant use of mobile phones is for sending texts. These texts can be geolocated in various ways. Geolocated content can be mapped on an online platform. Thus community members can use mobile phones to collect local knowledge, which can then be rendered into a visually compelling output. The hope is that it can compel local government, for example by attracting media attention, to listen to community concerns and recognize community assets (Elwood & Ghose, 2004). Given that CBOs are interested in innovative ways to broaden public participation in place-based activities, texting and mapping appear a good fit because mobile phones are relatively ubiquitous and are a tool many locals already own. Most of the research in the developing world is SMS based, where SMSs are the common denominator in handsets. SMSs are more affordable than smartphones,

which are more expensive in terms of hardware acquisition, battery usage, and data plans. SMSs are also easier to use because no application needs to be downloaded, and are seamlessly built into the operating system of all mobile phones.

The combination of SMS and mapping is rapidly evolving through computerized mapping platforms. We sought to integrate mapping and texting applications to encourage community members to get more involved in community development. We hypothesized that being able to text content about places familiar to them would increase their interest in public participation. Our application used the online mapping platform Crowdmap, made by Ushahidi, and the texting platform FrontlineSMS, for community development in a North American setting. Ushahidi is the best-known example of a mapping platform used for critical events and natural disasters. The Ushahidi developers integrated mobile technologies into their mapping by allowing for texting/short message service (SMS) to collect citizen reports. Online mapping platforms allow non-experts to visualize, organize and create a dialogue of events. We used Crowdmap, Ushahidi's cloud-based mapping platform, to investigate whether citizens could "text community development": to contribute SMSs in a meaningful way about community assets (e.g., eateries, parks and schools). We customized the platform to develop five applications for community development initiatives in four communities in Canada: McGill University campus (Montreal), Lachine (Montreal), Grandview-Woodland (Vancouver) and Acadia Park (Vancouver).

This paper discusses technical components and challenges of a coupled mapping-texting deployment in Canada. We found challenges related to the nature of Canadian mobile network providers and mobile modem locks, interoperability of mapping and telecommunications software, parsing of locations, issues of content moderation and anonymity, and long-standing sustainability of diffusing ICTs to CBOs. These new computerized mapping platforms are perceived as transparent entries into mapping but instead they have no independent effects. Context, outreach and contribution are still necessary components. Little research has been done on the mobile phone-mapping platforms with focus on mapping platforms alone. The impact of mobile devices and, in particular, the contribution of mapping-texting is two-fold: it either impedes or helps contributions. The main discourse is that they are useful given their flat learning curve, ease of use and ubiquity. However, a transparent connection between the person and the map is not apparent though: 1) the developer perspective, and 2) the user perspective. By

focusing on community development, we sought to question the utility of these crisis-driven platforms towards persistent community based conditions. To counter certain challenges, we employed methods like storyboarding for communicating with both non-technical and multilingual audiences. The resulting application provides visualizations of maps and user statistics. For an automated system, the application required substantial manual interventions for day-to-day operations. We conclude by discussing broader implications and prospects of mobile-enabled mapping for community development.

4.2 Literature Review

4.2.1 Mapping for Community Development

A substantial literature considers digital mapping for community development. Most of this exists in the fields of public participatory Geographic Information Science (PPGIS) and community informatics. The former is a discipline centered on mapping for citizen participation in low-income, disadvantaged communities and by marginalized groups (Sieber, 2006). PPGIS is a bottom-up process, with goals of community empowerment, especially in resource poor settings (Elwood & Ghose, 2004). Mapping by community members appears compelling because they have the best knowledge of their community (Burns et al., 2004). Whereas outsiders might view the community as blighted, members of the community might see their community as wealthy in terms of local assets like skills, talents, experience and community relationships (Kretzmann & McKnight, 1993; McKnight & Block, 2010). There is considerable potential for the integration of texting and mapping for less acute events like community development. PPGIS processes have empowered community members to advocate on the basis of place-based knowledge. Community groups have used GIS to preserve local parks under threat of demolition and identify bad landlords (Elwood & Ghose, 2004; Sieber, 2006). They have reframed public policy debates and, in certain instances, gained control over planning processes, providing more sophisticated analyses and visualizations than the experts and officials in those processes (Goodchild & Li, 2012; Haklay, 2010; Sieber, 2006).

Leitner, McMaster, Elwood, McMaster and Sheppard (2002), Sieber (2006) and more recently Brown and Pullar (2011) sketched out the challenges of using ICTs, especially mapping

technologies, for community development. These include the steep learning curve of learning a GIS and the challenges of sustaining that geo-computing knowledge and the underlying hardware/software/data over time. Overall, we see risk of applying purely technical solutions to societal problems, leading to a kind of techno-optimism (Pitkin, 2001; Stoecker, 2005; McIver, 2003). Indeed, ICT initiatives require proper non-technical training to facilitate democratic discourse within communities (Steyaert, 2000). A bottom-up process, ICTs administered by locals, can ameliorate some problems. However, local administration does not guarantee broad participation (Barney, 2004; Girard & O Siochru, 2006). In fact, these can enhance the digital divide, perceived as "the difference between those for whom ICTs are an instrument of power and autonomy, and those for whom digital technologies mark a continuing lack of same" (Barney, 2004, p. 161). As a result, ICTs often do not represent poor and vulnerable groups, whose issues are considered social and not technical. Indeed, the introduction of new technology may disrupt the social processes in a community (Pickles, 1995). It can be recognized as a distraction, an illusion to the context of the issue at hand. Creating local dialogues by meeting information requirements, supporting financial opportunities and enabling access to technology can facilitate ICT efforts in communities (Rideout & Reddick, 2005).

Even newer cloud-based systems require technical skills. In considering the potential for the Geoweb for rural development, community organization members reported that "most GeoWeb/Web 2.0 applications [for rural communities] were in a continuous development cycle; they are never quite finished and therefore are always changing" (Tudge, 2010, p. 11). A system in continuous "beta" demands ongoing training of personnel. "This extra training, along with ever emerging software bugs resulted in some volunteer community members losing interest, getting frustrated and sometimes leaving the project" (Tudge, 2010, p. 11). Up skilling people in mapping skills can empower those individuals to leave the community in search of a better job (Sieber, 2006).

4.2.2 Mobile Phones

Mobile phones are more than a user interface; they possess their own impacts on community development. There is now a substantial literature on mobile technology that connects community with technology. Using mobile technology for community development goals has led

to progressive outcomes, for example in banking, epidemiology, agriculture, and fishing (Abraham, 2007; Aker & Mbiti, 2010; Patnaik et al., 2009; Wong 2008). The value of mobile technologies is tied to successful community integration. Authors argue mobile technologies facilitate communication, promote networking, and build social structures for communities (Donner, 2008; Hardey, 2007; Horst & Miller, 2006; Katz, 2011; Yzer & Southwell, 2008). Locals may save time, energy and money to make business transactions online, receive medical aid, or ask personal health questions and receive accurate information (Aker & Mbiti, 2010; Alamenciak, 2012; Donner & Tellez, 2008). Like mapping, researchers must be wary of any tendency to be techno-optimists due to initial positive results and forget that mobile phone usage can express or even exacerbate gender, income and other digital divides (Albert et al., 2008).

Most research on mobile phones and community development is conducted in the developing world (Aker & Mbiti, 2010; Bailard, 2009; de Souza e Silva et al., 2011; Tortora & Rheault, 2011; Wong, 2008). The developed world has much to learn from the developing world, for example methods and tools for resource-poor, disadvantaged communities and the managing of heterogeneous handsets. Lessons learned could be useful because, compared to developing countries, mobile phone penetration in Canada is significantly lower. Canadian mobile phone providers have the highest profit margins in the world because of near monopolistic conditions and rigid regulations that restrict mobile users' flexibility of phone plans and prices (Blackburn-Cabrera, 2012). In terms of accessibility, cost, and flexibility in mobile phone plans, Canada is the most limited in the developed world (Blackburn-Cabrera, 2012). Despite "over 98 percent of Canadians hav[ing] access to high-speed wireless services and average Canadian mobile wireless prices hav[ing] fallen by more than 10 percent since 2008" (Government of Canada, 2011). Canadian mobile users still incur the highest global costs (Blackburn-Cabrera, 2012). The hope is that we can learn from the developing world creative solutions to our "first world problems".

4.2.3 Mobile Mapping

Mobile phones offer a potential user interface for mapping. That being said, there is very little research done on mobile mapping; most mobile mapping has the mapping directly on the mobile device (e.g., mapping-enabled GPS units – see Li, 2011). One such application is from Boone (2012). Online mapping has been combined with smartphone technology to allow residents to

contribute their views of transformations of Chavis Park in the historic South Park East Raleigh, North Carolina, US (Boone, 2012). In the Chavis Park example, participants provided rich content, but no one owned the smartphones, so tutorials needed to be conducted to familiarize participants with a "foreign" technology (Boone, 2012). Using smartphones for community participation expects that the residents own smartphones; a high expectation to have, especially in a disadvantaged community. Rather than buying smartphones for the participants, we wanted for participants to be able to engage in the project with the use of a tool they already have (e.g., texting using a "dumb" mobile phone, accessing the mapping application on the web).

We are interested in combining texting with online and mobile mapping. This integration comes from the crisis mapping community as texting is seen as a fast and well-understood (in terms of user interface) method to contribute content about natural or human disasters. Crisis mapping is based on the idea that the contributors—individuals who live in a locale—are best equipped to sense changes in their immediate surroundings (Goodchild, 2007). This is in contrast to experts, who may not understand the context of an area nor be able to respond with sufficient speed and attention. Crisis mapping platforms tend to differ from GIS, in that they separate the reporting of content from the mapping of that content. The Ushahidi platform is considered to be the first Web 2.0 mapping platform developed specifically for crisis mapping. Applications based on platforms like Ushahidi explicitly link mapping and texting, which differentiate them from the rest of online platforms that solely rely on the Internet for user contribution (Zook et al., 2010). Ushahidi was originally created to allow for easy and fast reporting of post-election violence in Kenya (http://legacy.ushahidi.com/). Since then it has been used in numerous applications; the best known example is the Haiti Earthquake (Forrest, 2010; Roche et al., 2013), where individuals could report damaged buildings, missing individuals and violence. Online mapping-texting has broadened from acute events like natural disasters to acute community problems. The Ushahidi platform has been used to build HarassMap in 2005, which allows people to report incidents of sexual harassment (http://harassmap.org).

4.3 Methodology

Our goal was to determine the feasibility and challenges of mapping-texting as a medium for community development, specifically where it concerned developing, deploying, diffusing, and sustaining a mapping-texting application. We worked with four communities in Canada and built

five mapping-texting applications. The first appplication, University Spaces, was created for the McGill University student, faculty and staff community, which included university students that reside in temporary residences. The second and third applications, *Espaces Lachine* (Lachine Spaces) and *Saine Alimentation* (Healthy Eating) were created for Lachine, Quebec. Lachine is a poor community in Montreal, consisting of 7,340 low-income residents (18% of the population in Lachine) (Statistics Canada, 2006); these residents are also physically separated from other areas by heavy industry (Centraide, 2012). We worked with the *Table de concertation jeunesse de Lachine* (Table for Youth Dialogue in Lachine) from *Concert'action Lachine*. The *Table* is an umbrella non-profit organization of numerous community based organizations that coordinate/organize activities and events for Lachine youth, professionals, and adults.

A fourth application, Let The People Speak, was created for the Grandview-Woodland community of Vancouver. The community comprised of a mixed low and middle income population with multiple ethnicities that are largely renters (66%) (City of Vancouver, 2012). A fifth application, Acadia Park Spaces was created for Acadia Park, a community of Vancouver, British Columbia consisting of young, middle class families living in subsidized student housing, with a total population of 1,700 (Mahal, 2013), with more than half (58%) reporting an annual income of less than $30,000 (Bigam, 2013). We worked with the collective Acadia Families for Sustainable Communities, formed of current and former student families that are concerned about the risk of the community's land-use changes.

The methodological framework consists of mapping application development, hardware acquisition, telecommunications software development, diffusion of the mapping-texting applications via storyboards, posters, flyers and manuals, and data collection with community based organizations. We acquired the necessary hardware and software. We developed the applications, based on consultations with the community groups. The community groups directed our development of diffusion/educational materials (what the applications were for; how to maintain the applications; how to manage data collection). Members of the community groups did the data collection. We initially administered the system and managed the data contributions once they were received by the software. Table 4-1 describes the cases. As with crisis mapping applications, these were applications only expected to have a limited duration.

Table 4-1: Case study comparison: Implementing technological methodology with community based and activist organizations. (Source: first author)

Case/ Descriptor	**Case Study 1**	**Case Study 2**	**Case Study 3**	**Case Study 4**
Community	McGill University, Montreal	Lachine, Montreal	Grandview- Woodland, Vancouver	Acadia Park, Vancouver
Application Name	University Spaces	*a) Espaces Lachine* *b) Saine Alimentation*	Let The People Speak	Acadia Park Spaces
Category Types	buildings	a) parks, institutions, business, events b) food based questions	social housing, danger zones, rezoning & density, events, transit & sign changes	green spaces, social spaces, play spaces, housing
Community Outreach	- flyers - posters - emails - attended local events - University Spaces Facebook page - contacted student societies - promote project in Geography graduate course	- posters (created by authors) - flyers (created by organizers) - community organization meetings - events storyboards (cartoon panels outlining the project and explaining the technology; used to present to community organizers) - workshops	- meetings with activist to propose our application and explain the technology - community public meetings	- email lists - advertising on Acadia Families for Sustainable Communities Facebook page, - community events - multilingual flyers (designed by activists and translated by friends) - posters (designed by activists) - meetings with activists - storyboards (cartoon panels outlining the project and explaining the technology; used to present to activists and community organizers)
Duration	1 month	a) 6 months b) 1 day	n/a - sample site only includes messages collected based on community meeting comments	1 month
Total Reports (Messages)	137	a) 29 b) 27	n/a	61

4.3.1 Developing the Mapping Portion of the Applications

We used the free and open source software (FOSS) mapping application, Crowdmap, which is the less technical version of Ushahidi. Ushahidi allows users to create online deployments, by downloading, installing, and hosting the application on a Web host server. Technical expertise such as PHP (Hypertext Preprocessors) coding is required to develop the application and handle any errors. In contrast to Ushahidi, Crowdmap is a cloud-based platform. Cloud-based services mirror copies of digital content on multiple servers, so that if any hosting servers are unavailable, the 'cloud' of other servers can still provide the content. The Crowdmap configuration does not require PHP coding, which gives Crowdmap an advantage over Ushahidi for the less-technical experts. Crowdmap also has a friendlier cloud-based user interface as compared to development on in-house servers.

4.3.2 Acquiring the Hardware

Building a mapping-texting application requires a telecommunications modem with a subscriber identity module (SIM) card; the SIM card contains the phone number and storage for texts. Specific mobile networks are used with specific hardware. The hardware required by FrontlineSMS (described below) is under the Global System for Mobile Communications (GSM) network. Unfortunately, two thirds of Canada's mobile network providers are under the Code Division Multiple Access (CDMA) network (Bell and Telus). After trial and error with Bell, we entered a contract with Fido (Rogers) so our SIM card would match the GSM modem standard.

Traditionally modems were required for dial-up systems to modulate the transmission from telephone lines to computer systems. One thinks of the clunky box, an acoustic coupler system that cradled a telephone receiver, so a computer could connect to the Internet. Currently modems are used to modulate telecommunications signals containing SMS and data with the digital signal needs of a computer. We needed a modem that supported SMS. In Canada, hardware is only available for data plans. A second-hand GSM modem was acquired from the UK, under the Vodafone mobile carrier. Hardware purchased from mobile providers can only be used with a SIM plan under that specific company. Therefore, a GSM modem had to be unlocked to work in Canada, due to the 'SIM lock' mechanism of mobile providers. An unlock procedure

(online system) was performed on the modem to function with a SIM card from another mobile carrier.

4.3.3 Developing the Texting Portion of the Applications

There are three main functions an administrator can enable for SMSs on Crowdmap (Figure 4-1). We enabled the telecommunications hardware and software, and the SMS gateway plugin (SMSSync) for participants using Android smartphones.

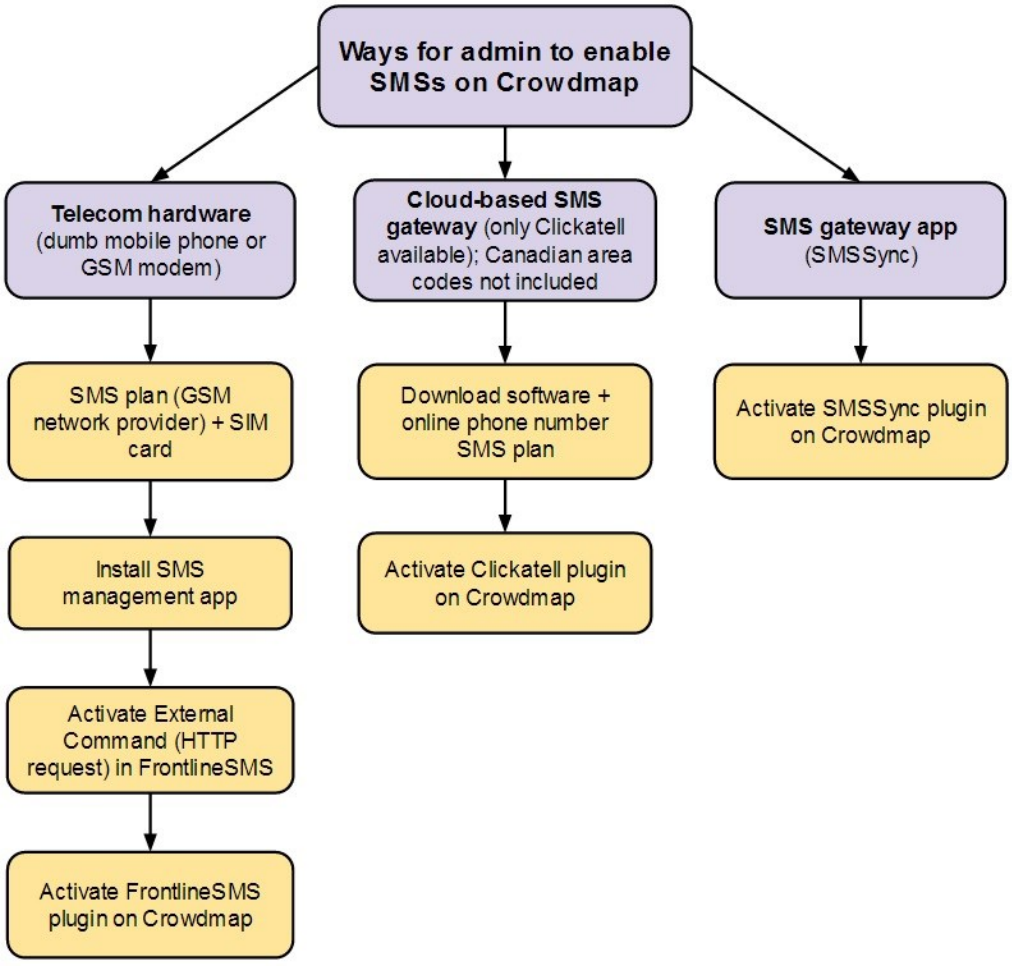


Figure 4-1: Crowdmap SMS Architecture for Developers/Administrators (Source: first author)

Telecommunications software setup requires the use of a software package to collect SMSs from the GSM modem. We used called FrontlineSMS. The SMSs stored on the GSM modem were recognized by its mobile carrier broadband system, Vodafone. A SIM card for GSM network based mobile carrier, Fido (Rogers), was purchased with an all-texting monthly plan. The Vodafone mobile broadband system was downloaded to recognize and upload SMSs from the SIM card to the computer. By activating an external command in FrontlineSMS, the software was linked to Crowdmap. On Crowdmap's end, the FrontlineSMS plugin was activated.

The cloud-based SMS gateway (Figure 4-1) also could be used to receive SMSs on Crowdmap. By creating an account with Clickatell, (the only cloud-based SMS gateway compatible with Crowdmap), and subscribing to a texting plan, an online phone number is provided. The Clickatell add on/plugin needs to be activated in Crowdmap. The SMS gateway application, SMSSync's add on/plugin also had to be activated in Crowdmap to receive participant SMSs that have been sent through the SMSSync application.

4.3.4 Enabling Messages Sent to the Applications

A challenge and an opportunity of our mapping-texting platform is that participants have five ways by which they can contribute content: SMS, smartphone application, email, Twitter or a post directly on the Crowdmap deployment website. First, participants could send messages as SMSs by using "dumb" mobile phones, GSM modem and supporting software, smartphones, and the android smartphone SMS gateway (e.g., SMSSync). Second, a smartphone application, 'Ushahidi', would be downloaded to send messages. Third, an email message could be sent to the corresponding Crowdmap email address. Fourth, Tweets with the hashtag(s) used for the Crowdmap page (e.g., #universityspaces, #espaceslachine/ #lachinespaces, #gwcommunity, #acadiaparkspaces) could be sent as messages. A fifth way for participants to contribute messages was by posting directly on the Crowdmap deployment website. We enabled all five methods so participants could use the technology message type with which they were most comfortable.

4.3.5 Diffusing the Applications

We employed several methods to diffuse information about the applications to the communities. University Spaces was used to collect university students' perceptions of place but it also tested the system. After deploying University Spaces, we learned that the applications, at least for developers, can be somewhat onerous. To address this challenge, we borrowed a concept from film to present the subject, step-by-step through storyboards. In particular, the use of comics in our storyboards allowed for a flexible method, for both the authors as creators and the audience they were intended for. Literature has expressed the effective use of storyboards by researchers, developers and designers to support visual thinking at the initial stages of a project (Lieberman, 1992; Muller, 2001). The combination of words and pictures used to transition from one concept to another proves storyboards and narratives to be suitable complements for project proposals (Haesen, Van den Bergh, Meskens, Luyten, Degrandsart, Demeyer, & Coninx, 2010). In addition, storyboards provide a common visual language for a diverse group of people (Van der Lelie, 2005), which further helped introduce the project to multilingual communities. The comic style used to create the storyboard panels served as a visual and narrative tool for engaging community organizations and activists by facilitating communication between academia and practice.

Storyboards provide "tangible and very rich data that 'speaks to the truth' in research and outcome assessment in vulnerable and hard-to-reach groups" (Keller, Fleury, Perez, Ainsworth, & Vaughan, 2008, p. 432). The comic style storyboards were used to introduce the larger project to community organizers (Figure 4-2). This included the concepts of texting and mapping for community development, especially for the inventorying of community assets. It also included some caveats to the use of ICTs as a "fix" for community development.

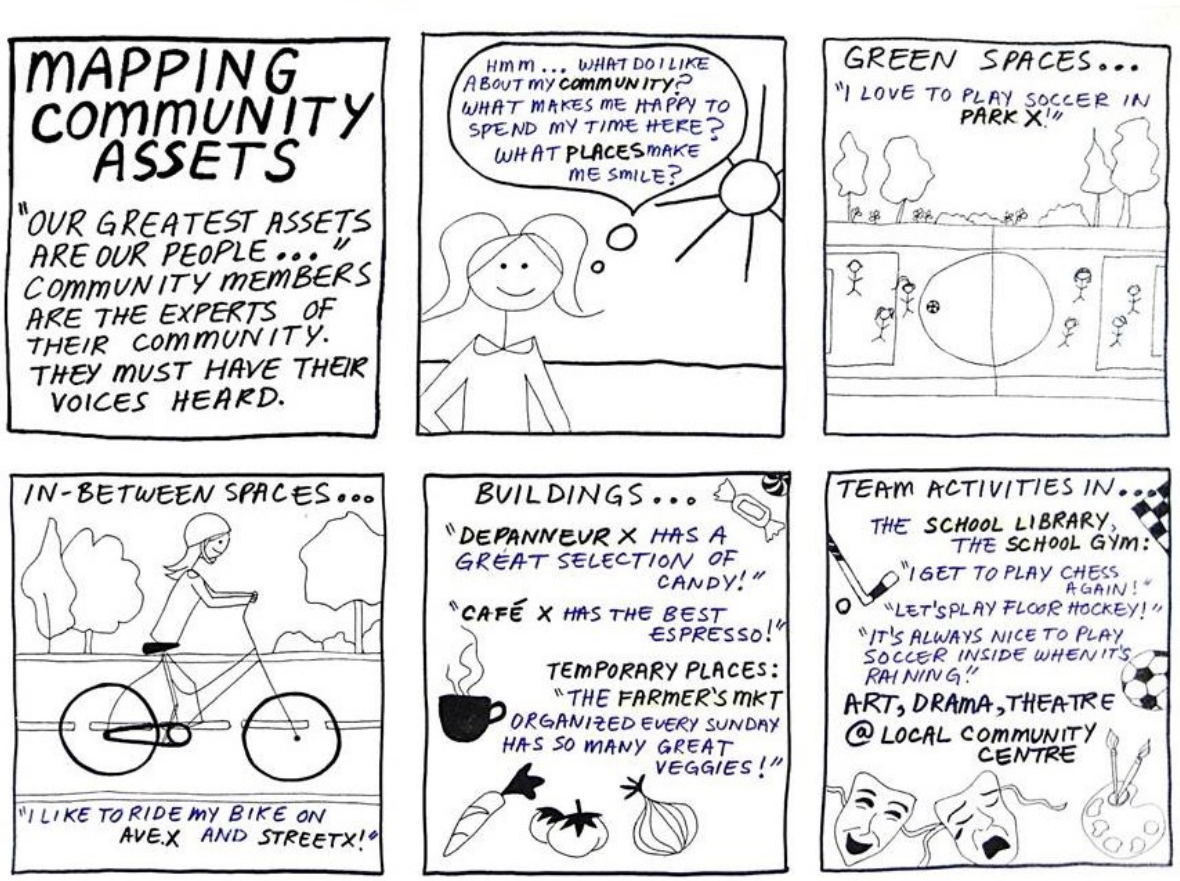


Figure 4-2: Storyboards in cartoon form (English is shown here) were used to present mapping/texting application to community-based organizations (Sources of symbols: http://www.frontlinesms.com/ for FrontlineSMS symbol (\o/) and http://www.ushahidi.com/ for Ushahidi symbol (globe)) (Source: first author)

We created manuals to facilitate the community organizer's management (our administrator once the applications were diffused) and the end users' (participant) use of Crowdmap. For Lachine, we used a large map of the community to explain to both administrators and participants the significance of reporting explicit locations in messages. SMSs are not accompanied by explicit locations like Global Positioning System coordinates so we needed to explain a sufficiently geolocated SMS and an insufficiently geolocated SMS. We included the poster along with manuals for the community's *Saine Alimentation* (Healthy Eating) event, where we had a booth and worked together with community organizers to get youth to text about healthy food places in Lachine. In Acadia Park, we created multi-lingual posters to hang in common areas and flyers to

hand out to local events and the main playground. Both posters and flyers were designed by community based representatives. We attended local meetings and developed each application after consultations with the communities. There were numerous iterations of application development, following discussions with community members. In Grandview-Woodland, we had several consultations with community activists, and a sample application was built from messages from a community meeting.

4.3.6 Collecting Geo-located Texts

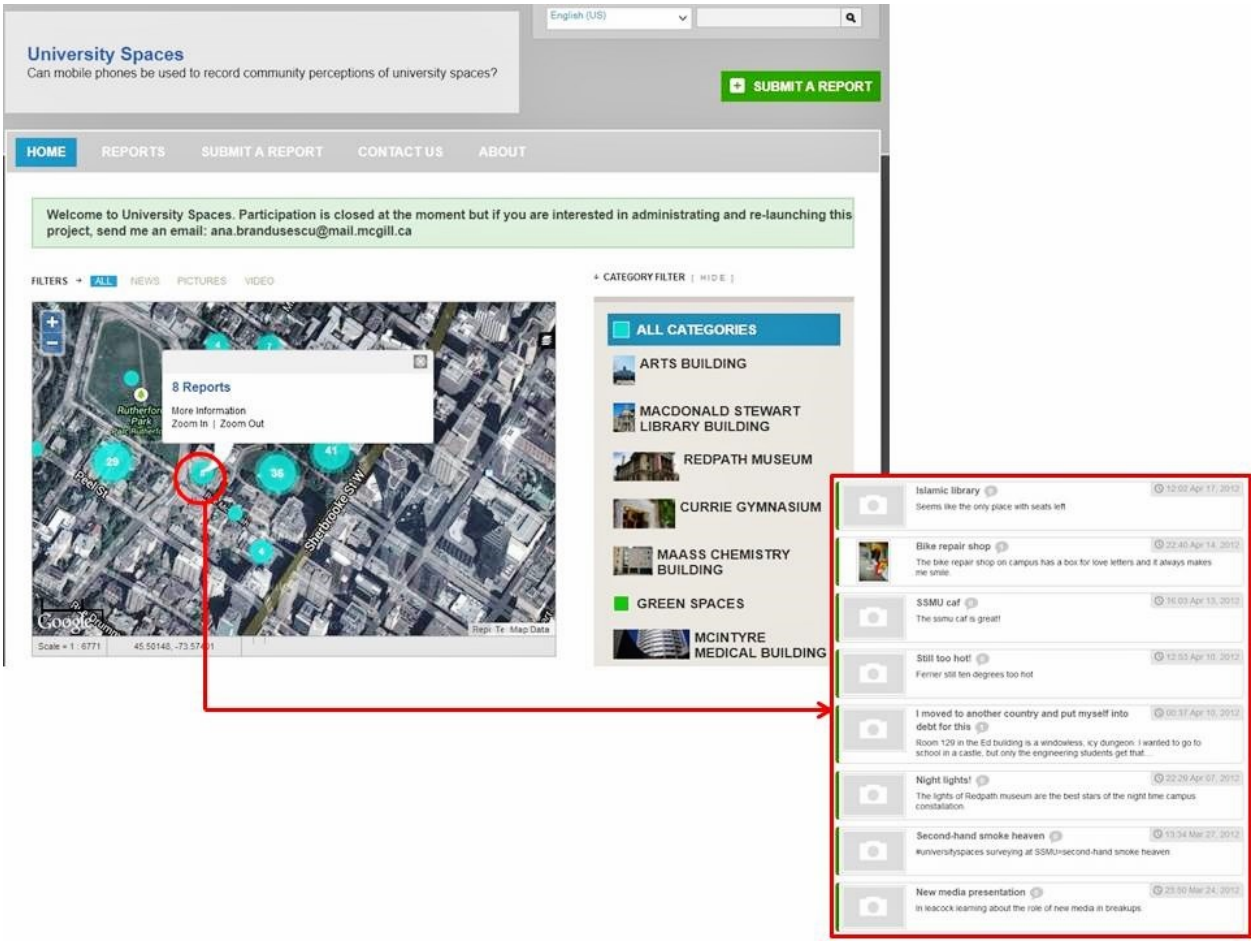


Figure 4-3: A screenshot of the mapping-texting application, University Spaces. Users can view submitted messages by clicking on aggregated dots (blue). All messages sent for that area will appear in a list (outlined by red box). (Source: universityspaces.crowdmap.com)

Once the applications were completed, we promoted them by sending emails, flyers and posters that we created in collaboration with community organizers, which were then distributed in the communities. Controlled tests were conducted before all applications were activated to ensure all SMSs were received and the different components were interoperable.

We generated a total of 254 reports from the five applications (Table 4-1). In Case Study 1, University Spaces, 137 reports were collected based on campus building locations. When a new building was mentioned in a message, it was manually added as a new category. We aimed to determine the use of mobile phones to collect and geographically display student, faculty, and staff perceptions of university places they encounter in their everyday lives.

In Case Study 2, two applications were built. The first, *Espaces Lachine*, was created for participants to write about places not to miss in Lachine. The community organizers set up the categories for *Espaces Lachine*. A total of 29 reports were collected in digital form and paper form. For participants that were more comfortable with physical contributions, messages were written on paper tabs, and placed on a large paper map. The SMSs were phoned in and then stored in the modem. A moderator would check each text, excise the originating phone number, infer the geolocation, and then 'post' it to the map.

After a six month period of meetings and community outreach changes, we realized that there was not enough participation for *Espaces Lachine*. We found that community organizers/participants kept reorienting the goals of the application; there was debate about the proper communication medium (texts versus website reporting) and the venue of contributions (i.e., as a group in a workshop or an event or individually on-the-ground). Given this, we created a second application, *Saine Alimentation*, based on a healthy food event in the community. Twenty-seven reports were collected based on a set of five food-related questions.

In Case Study 3, Let The People Speak, reports were added based on comments made during a community meeting for the community draft plan. Concerns were voiced based on places in Grandview-Woodland and the Greater Vancouver Regional District, and later mapped as quotes in a sample application we built. This application was presented to community activists but rejected for use during this crucial rezoning period in the community.

In Case Study 4, Acadia Park Spaces was launched for the Acadia Park community. In the Vancouver case, we had more variety in message contribution. 61 reports were submitted. The majority of Acadia Park Spaces message spatial distribution was found in 3 subcategories:

'Social Spaces' (30%), 'Play Spaces' (24%) and 'Green Spaces' (22%). On the Acadia Park Spaces map, clusters formed around communal areas and play spaces for children (e.g., playgrounds, community centre). There was less spatial distribution in 'Places I Want Changed' than in 'Places I Love'.

4.4 Findings

We have five main findings. First, the applications frequently demanded skills that resembled technical system administration. Second, availability of telecommunications resources in Canada complicated application development and diffusion. Third, the legality of telecommunications hardware usage can constrain mapping-texting systems. Fourth, geolocation parsing is more complicated than advertised. Finally, keeping up with the continual 'beta' of the system adds complexity to the system structure, management, and outcomes.

4.4.1 Becoming a System Administrator

Applications built on Web 2.0 platforms are supposed to be simple. These are based on the ideals as well as design of Web 2.0 platforms where components like the Google Maps Application Programming Interfaces (APIs) are immensely powerful and graphical user interfaces are designed so that users can easily "mashup" components (O'Reilly, 2005). Both Crowdmap and Ushahidi are promoted as mashable tools for crises, when there is little time to develop and deploy the system. All one supposedly needs to do is to connect the pieces together.

The challenges of actual development and deployment are revealed in Ushahidi's own 'Allocation of Time' (Figure 4-4). Time expended for technical development (the small circle depicts time allocated towards the 'Ushahidi Setup') is supposedly small; whereas, the much larger circle depicting 'All the Other Stuff' is required for an Ushahidi application deployment ("rollout"). The small circle belies the significant skill level required to complete development. Even though there is a division of skills, technical skills associated with the development process are also present in 'All the Other Stuff'. "Verification, documentation, integration with other systems, SMS debugging, and taxonomy development" are all critical components that require some level of technical expertise. The time allocation and task division are not as straightforward

as the circles represent. This is especially notable since Crowdmap is supposedly one of the easiest most accessible of the Web 2.0 crisis mapping platforms (Keay, 2010).

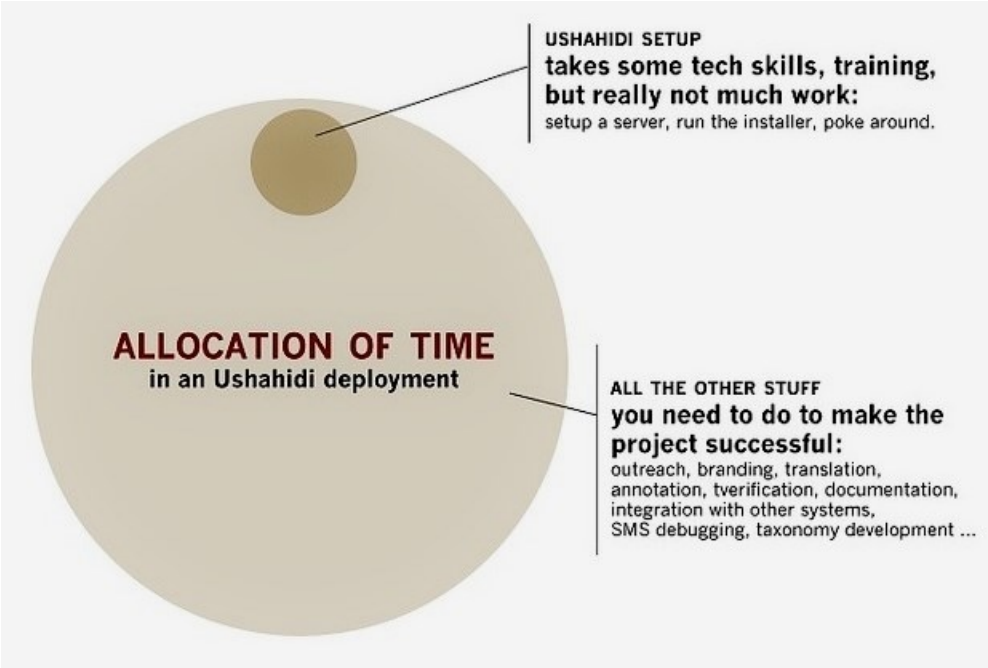


Figure 4-4: Ushahidi deployments' management of time (Source: Blow, 2010).

We administered the University Spaces application to first understand and learn how to use the Crowdmap application. Part of understanding the application was learning the system administration requirements. As part of application development, we created a routine of checking messages, daily (morning and evening) to manually upload to the website. There is a potential for automatic uploading, but we needed to consider the potential of inappropriate messages (e.g., defamation, cursing). As a system administrator, we had to dedicate a percentage of our day to this work. We also had to geocode each contribution (see Section 4.4.4). After the one month period, we found the time allocation significant. A community administrator would have to spend considerable time managing the application.

In Lachine, the plan was to co-manage the applications with the *Table*. The *Table* was determined to assume responsibility of the entire technical process. The community organizers began by assisting in promotion and also content management and organization. They established categories/questions and the layout in *Espaces Lachine* and *Saine Alimentation*.

Community organizers reported that they found the storyboards, paper map and site analytics--the products of the application--to be useful explanations for the process and potential. Indeed, the *Table* preferred the analytics (i.e., pie charts, columns and dynamic graphs) of Crowdmap to the map of Crowdmap. But the *Table* began to find the high skill level of technical management daunting. A part time employee was supposedly dedicated to this application but the *Table* did not follow through. The *Table* also found the lack of customizability frustrating. For example, they wanted to change the page tabs from 'Reports' and 'Get Alerts' to 'Messages' and 'Get Messages' but most of the interface cannot be modified in Crowdmap. There was a trade-off in the choice of a more off-the-shelf easier-to-use Crowdmap installation and the customizable Ushahidi solution. The latter demanded additional technical skills, although even Crowdmap proved too difficult. Over time, some confidence in the project was lost due to technical requirements of the process. These findings are unsurprising: there is a long history demonstrating the technological sustainability challenges for ICTs like mapping technologies that improve opportunities for citizen advocacy (Sieber, 2006). Stoecker (2005) extols the need to ensure technically skilled personnel are imbued with community development expertise. However, community development organizations routinely underestimate technical resources required for projects and we researchers can be similarly misled by company x or institution y as we get caught up in their techno-optimistic fervour.

Based on our lessons from Lachine, we decided to fully administer the Acadia Park Spaces application. We collaborated with Acadia Families for Sustainable Communities who assisted with community outreach. We co-designed posters and flyers. Their graphic designer created logos to match the content of advertisements to previous events. To not overburden the community organizers to learn a new technology, we decided to allocate our time on the technical end and allocate their time on the community outreach end. As a result, we had more on-the-ground engagement with the community.

4.4.2 Contending with Resource Availability

Prior to the hardware setup, we confronted difficulties in the acquisition of hardware and the lack of software compatibility with Crowdmap. Restrictions on availability exist in any telecommunications hardware integration and in this case, hardware that receives SMSs on

Crowdmap. Mobile phones and GSM modems required by FrontlineSMS are unavailable in Canadian mobile provider stores. We found hardware second hand or new to purchase online. Often we looked to sources in Europe. Product availability varied and was unpredictable. "Creative solutions" like second hand hardware do not provide for generalizable methodological practices.

We attempted to replicate part of our method by purchasing a new GSM modem. We purchased a modem from Romania, but from the same mobile provider as our first modem. The same online system that was used to unlock the UK modem failed because the modem model was too new. The company was unable to acquire the IMEI code and the GSM modem could only be unlocked in person at a Vodafone retail outlet. Support needed to be received from a small electronic firm in Romania. Even our creative solutions existed in a state of continuous change.

Crowdmap also allows for integration with the cloud-based SMS gateway Clickatell; however the service offers no phone numbers with area codes in Canada. Consequently, if a participant used the application's phone number, they would pay long-distance fees. No other online phone number system is compatible with Crowdmap. Rogers Wireless has a Rogers One Number SMS gateway but does not provide integration APIs, making it not possible to connect a phone number to the Crowdmap application. Finally, FrontlineSMS, although a FOSS, has limited hardware interoperability. Only a recommended list of mobile phones and modems are compatible with the software. All of the modems are based on the GSM network. This feature excludes the North American market, leaving the developer to acquire a plan with the only GSM network mobile carrier that may not have the cheapest SMS monthly plan. These difficulties will manifest in any Canadian community project. In conclusion, crisis mapping technologies assume the universality of telecommunications systems (according to crisis mapping advocates) and the ability to overcome their limitations with workarounds.

4.4.3 Confronting the Telecommunications Providers

Implementing a mapping-texting platform requires interoperability with telecommunications providers. Network preference of mobile network providers increases the difficulty of implementing such a project in Canada, which reveals the constraints that mobile providers place

on text-enabled community initiatives. The GSM network, although prevalent in the rest of the world, is uncommon in North America. The CDMA network predominates among mobile providers in Canada (Kayne, n.d.). Only three providers exist in Canada (Bell, Rogers and Telus); all others buy their services from these three companies. Of the three, only Rogers Wireless has a GSM network, which limits the range of the type of SMS plan and prices to use for the project. In spite of or because of deregulation of the Canadian telecommunications industry, Canada experiences a near monopolistic telecommunications environment (Clement et al., 2013).

Finding the right provider was not a straightforward procedure during the application development. We first set up an account with Bell. We tested the GSM modem with a Bell SIM card and were unsuccessful in collecting texts on FrontlineSMS. We discovered that Bell's telecommunications network is CDMA, which is not interoperable with GSM hardware. We created a new account with and acquired a SIM from Fido (Rogers), the only mobile provider under the GSM network in Canada. To accommodate the requirements of the SMS software and a restricted telecommunications environment meant that our hardware had to be purchased from a foreign country (originally locked by that foreign mobile phone carrier), unlocking it via an additional mechanism, finding an appropriate Canadian SIM card and a suitable data plan.

Challenges in Canada may be unique but, with slight variations, may exist or emerge elsewhere in the world. As of January 26, 2013, the Library of Congress made unlocking mobile phones illegal in the United States (Gowan, 2013). Some exceptions do exist. Certain carriers allow unlocking of mobile phones if the hardware is purchased without a contract or once the contract ends. Even though the law applies to mobile phones and not GSM modems, the overall attitude towards restricting usage raises difficulties in realizing the interoperability potential of the various tools we are using.

4.4.4 Obtaining a Geo-location from Contributions

There were five ways to contribute content. The smart phone application was the only way to derive explicit locational information. There is no automatic geocoding from SMSs or tweets (unless the location is turned on) or emails. Geographic information is not embedded in a text message; a contributor must explicitly type a location in the body of the message. The process of

geo-locating texts resulted in four findings, parsing geocoding, revealing confidential information, relying on human intervention, and using different reporting strategies.

The first refers to parsing of geolocations in the actual SMSs. Because there is no automatic geocoding available from SMSs, existing texting/mapping platforms cannot automatically geolocate SMSs. This is not obvious from the literature on Ushahidi or Crowdmap applications, which promotes the ease and speed of mapping contributions ("Nothing to install, minimal configuration. Sign up for free"). One must infer a location from the text of an SMS. An example message might be 'I love picnics at the park'. There were several parks in the case study communities. Certainly a location was mentioned but this was place as location. Participants tend not talk about where they live in terms of x, y coordinates (e.g., latitude, longitude). They describe place in familiar and colloquial ways. Turning the unstructured text into an x,y proved quite difficult. We also should remember that each SMS is 160 characters; depending on the exactness of the location, a participant could run out of characters for other content. A second example related to the difficulty in parsing is 'The best food is at home'. Home is particularly problematic in French because it would contain identifying features (e.g., Chez Tremblay). Moderators needed to make decisions about masking locations that revealed identities, for example moving geolocations to the nearest intersection.

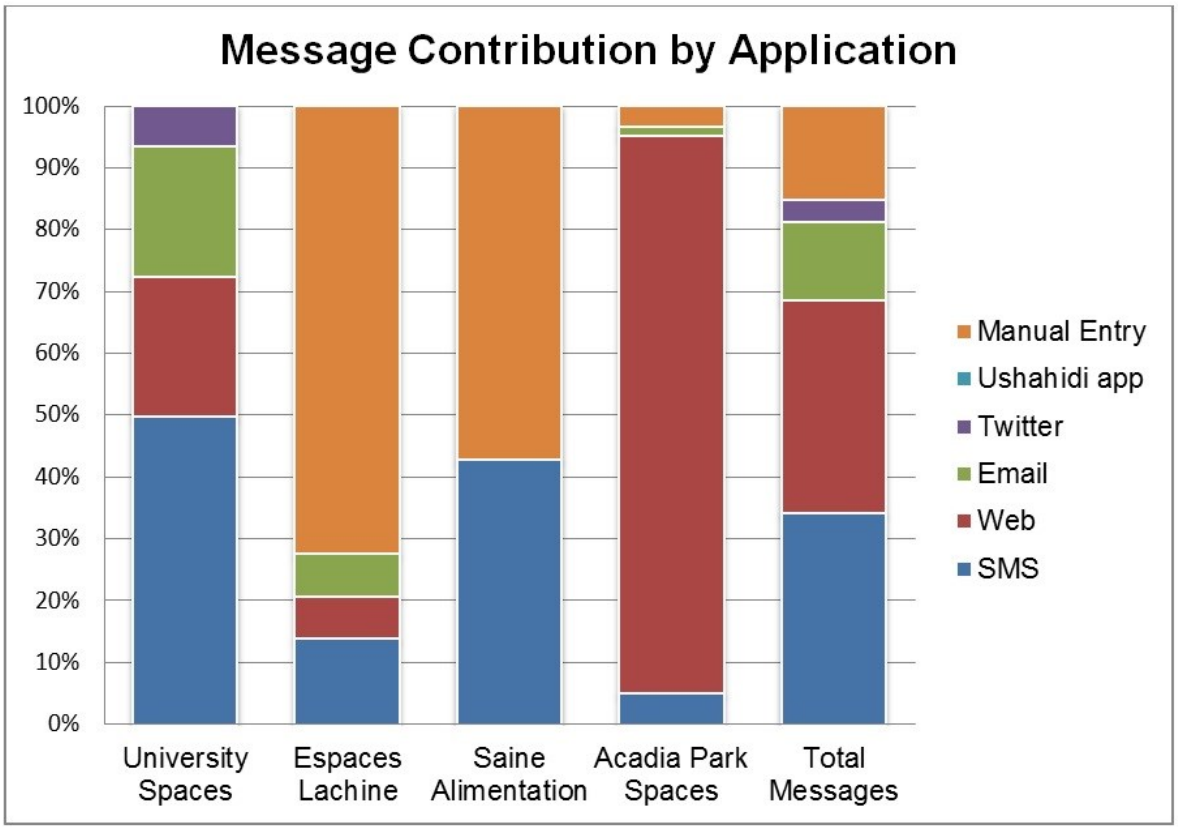
Third, these platforms demand human intervention. Human intervention can be used to screen content but it is essential to infer location. A feature of Web 2.0 is its immediacy—a contributor expects to see his/her contribution right away. Human moderation delays the posting of content to the map. It also renders manual geolocation a difficult task for an outsider. For example, we received SMSs describing a particular detail of a sculpture in a (unnamed) park. This may be identifiable to community members but not to those unfamiliar to the specific communities. We as well as many of the professional community development staff lived outside the community. It also opens the geolocation to possible manipulation, should the administrator wish to highlight some sites over others.

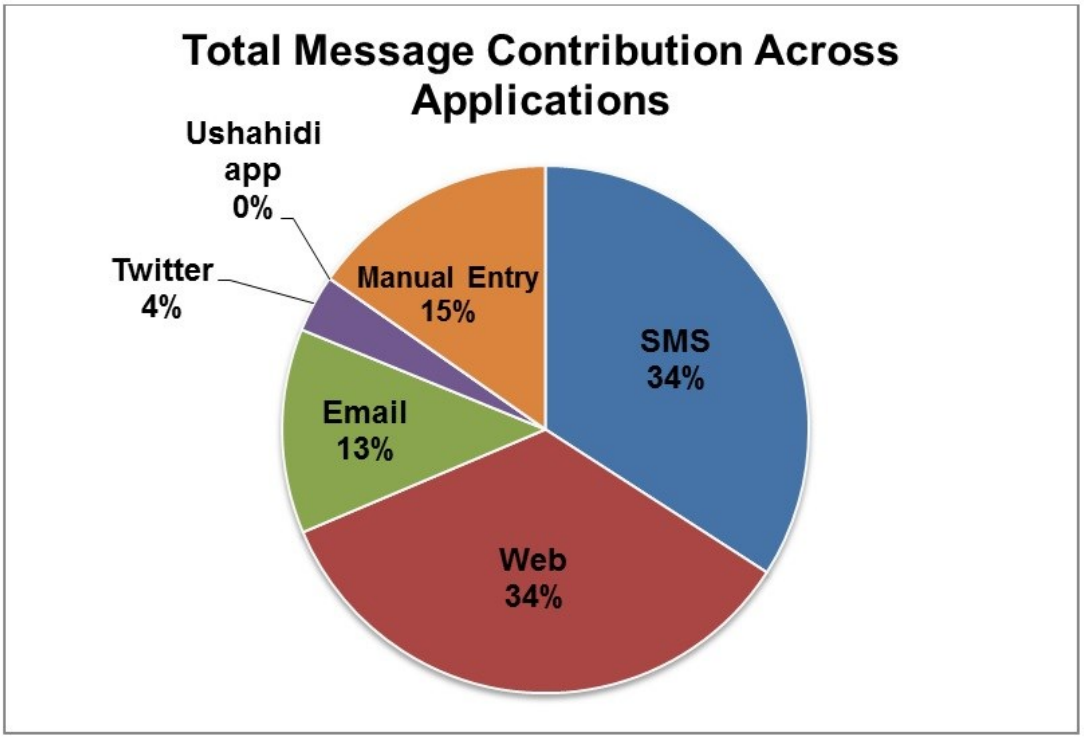
Fourth, certain methods of contributing were more effective for users than others. In one community workshop, smartphone-owning participants had trouble downloading the Ushahidi application because they had to manually enter the URL of the Crowdmap application. The smartphone application would allow participants to geotag their contributions, which would be more beneficial to the application administrator. A participant might own and be engaged in

smartphone technology. However, small hurdles in the learning curve resulted in participants giving up on the automatic geotagging and instead sending messages via a simple SMS. Administrators may learn over time which methods are preferred and techniques to ease the use of other methods. They still will likely have to build the application with all possible messaging methods and customize learning to community conditions.

4.4.5 Preferred Communication Medium

In our case studies, we found that the use of mobile phones did not facilitate dialogue outside the university setting (University Spaces), despite positive literature found on mobile phone use in developing world communities (Abraham, 2007; Aker & Mbiti, 2010; Patnaik et al., 2009; Wong, 2008). Instead, the message contribution venue relied on tools locals already own and use. In the Lachine cases, mobile phones were used to record what people considered community assets and answer food based questions created by community organizers. The process focused on message contributions at community based events rather than on independent submissions. As a result, few messages were submitted on an individual basis. In this sense, the tension between traditional community participation and VGI processes is expressed. People did not contribute messages on their own time, spontaneously, but during workshops and community events. Even though mobile phones were used as a final step for message submission, the primary medium for communication was manual entry through post-it notes and conversations with community members during workshops and events. These were submitted on the application via mobile phones by the organizers or the application administrators (first author); few messages were sent directly as texts from individual mobile phones. In both applications, texting was a secondary activity to the existing community events. It was not promoted in an independent community initiative. *Espaces Lachine* involved community organizer meetings and workshops with young mothers discussing community assets. *Saine Alimentation* was based on a set of conducted workshops before the healthy food event. During the main event, we set up a booth to start a conversation with participant youth (Table 4-1). Even though the mobile phone was used as the main medium of communication, it did not imply it was the preferred medium. As community development processes involve much on-the-ground work in community meetings and events, the difficulties of embracing technology within the community development process is not new.





Figures 4-5: Message contribution by application (5 cases) and total message contribution (6 ways) found in all five applications. (Source: first author)

On the other hand, in the Vancouver case, online message contribution was the preferred communication medium. Activists believed advertising the Acadia Parks Spaces URL was the most effective way to introduce and engage residents, to pave a successful road for participation. Through previous work in the community, activists have experience with initiating new projects and events. For example, an online survey was conducted earlier in 2013 to document the land-use plan changes in directions of Acadia Park's future that garnered many respondents (~200) (Mahal, 2013), proving online participation to be effective. In university-community partnerships, researchers need to be flexible with the community; even though we initially focused on the use of mobile phones in communities, if the Internet was a better venue for community participation, we could not ignore it. Most residents had Internet access but only some owned mobile phones. Residents can visit the website, view the interactive map and begin exploring it. They may leave it as a point in the middle of the community (set by the administrator as a starting point). They chose to draw a line to depict their favourite walks. They also chose polygons to explain particular areas of the community. This high level of interaction the website provides makes for a preferred medium of communication within the Acadia Park community.

4.4.6 Keeping Pace with Change

Web 2.0 technology is heralded for its ease of use and also its speed in innovations. But innovations require time to keep up. Lachine and Grandview-Woodland displayed challenges in using Crowdmap. Keeping up was reflected in shifting goals of the community as well as in marshalling the resources to learn the latest versions. In Lachine, the *Table* struggled to keep up with the developments in the application. The goals of the application changed over time. The project narrowed in scope by having animators ask youth a specific set of questions. In Grandview-Woodland, the application never launched because of existing methods of community participation were felt to be working and learning a new platform was unfeasible given the rapid responses needed at the time. Sometimes an application will not be used because the anticipated time needed to invest in implementing a new platform in the community network of communication and tools appears too extensive.

Application development and deployment will likely exceed the time used to acquire the actual texts. The Ushahidi/Crowdmap platform was less generalizable than originally thought. Since its origin, Ushahidi has been spun-off as an ICT4D incubator in Nairobi with 29 employees and 50 volunteers. Even a large team can only spend so much time keeping pace with the sheer heterogeneity of handsets, user contribution mechanisms, modems and SIMs, and useful APIs. The rapid changes mean that platforms will be optimized for a subset of hardware, APIs and software. Ushahidi and Crowdmap applications tend to be developed by individuals with software engineering backgrounds (M. Antonsson, personal communication with the first author, July 15, 2014) and support only one medium of contribution and handset.

Given Ushahidi's own challenges, it was perhaps not surprising to find that the *Table* struggled to keep pace with changes during application development. McIver (2003, p. 40) states that "A major reason for poor designs is a failure to adequately involve the target user community in the design process." We disagree. It is possible that involving Lachine community organizers at every step discouraged them more than if some of the application development challenges remained opaque. Indeed, developers may have to balance what they reveal and what they hide during the entire development process.

A final instance of keeping pace has to do with Crowdmap itself. Crowdmap released a new platform in May 2013. The Crowdmap version on which all applications are based is now 'Classic Crowdmap'. The platform was supposed to retire and have existing applications and features transferred to the new Crowdmap platform by the end of 2013. The plans have been delayed and upward compatibility is not assured. Crowdmap software refinement has added missing features such as custom plugins, non-hard coded tabs and updated languages (features, currently only available on the Ushahidi platform). The new Crowdmap has less focus on a particular area/community and encourages a collaborative global mapping process. However, a key important feature no longer has the same functionality: SMS messaging. Now, the number is automatically generated to a created map that has an area code for Sweden, implying international SMS fees for anyone outside of Sweden. Moreover, Crowdmap Plus is in the process of being launched as a paid consulting mapping service. As a result, Ushahidi appears to want to move away from SMS services to web-based data entry given their focus on front-end development and striking mapping visualizations.

4.5 Conclusion

Most mobile applications for community development emphasize big data harvesting or texting-only analyses, or access to handsets or sociological/communications studies of phone use (e.g., de Souza e Silva et al., 2011). Our research focused on 'small data' and the method by which one develops an in-house mapping-texting application. We utilized Web 2.0 and mobile technologies, which promise ease-of-use on the participants' and developers' part. We found the application challenging to develop and deploy. In many ways, the mapping-texting application does not significantly diverge from the well-known challenges in ICT sustainability in community development. The application was further complicated by the nature of the mobile technology industry in Canada.

If mapping-texting applications to encourage participation in community development people is so difficult then should we even try? The near future of mobile phone providers in Canada suggests that this environment may not improve. However, creative solutions and innovations in Web 2.0 suggest that new workarounds continue to emerge. For major and minor natural and human disasters, there are frequently multiple teams of technical support, including ready pools of individuals who will map data (Arney et al., 2014; Burns, 2014; Gao et al., 2011; Ziemke, 2012). One does not require this level of support to deploy a Crowdmap application. There may be no pool of crisis mapping technically-enabled volunteers who fervently support a community development process. In addition to transplanting a technological process, we also transplant a technological practice that is accompanied by motivations to contribute expertise to specific events and have the capacity to track technological changes.

Arguments remain to support text-mapping enabled community development. If the poor work in 10 hour/day jobs and they also have mobile phones then we should find a medium that allows them to project their voices to larger structures (the community, the city, the state). Mobile technologies offer a connection to their physical community when they have less time to be physically connected. It allows them to more easily and quickly report neighborhood problems, which has proved successful with crisis mapping. Early lessons learned with the integration of these technologies; how those lessons resemble existing ICT deployments; and how the ICTs present new challenges and opportunities, even to the extent of transforming community norms, are important to our understanding of how best to make applications sustainable and relevant. At the same time, critics who point to failures of numerous community

based initiatives should be reminded that their stressing of the particularities of context mean that one cannot always generalize lessons learned from one place and one platform to another. Sometimes one must try, particularly when initiatives are internally supported, even if motivations and resources shift over time. There is value, in terms of funding and other resources, for an organization to be labeled an early technological adopter (Rogers, 2003). Early adoption involves risk. Risk-taking is a significant variable in the text-mapping equation. One must anticipate uncertainties, whether positive or negative, in what is a creative but hardly linear process.

Chapter 5: Crisis Mapping for Community Development

Preface

Chapter 6 was authored by Brandusescu and Dr. Sieber. A version of this chapter was presented at the *Spatial Knowledge and Information Canada* conference in Banff, Canada with the title "Can we use a crisis mapping platform for community development?" and appeared in the proceedings. It was presented at the Association of American Geographers in Tampa, USA, "Can we use a crisis mapping platform to help tame the wicked problem of participation?" Brandusescu retains the copyright. We plan to submit the chapter to *Environment & Planning A*. Each author contributed the following: Brandusescu framed the research in the chapter. Brandusescu wrote the chapter. Dr. Sieber edited the chapter. Dr. Jochems made introductions and attended initial meetings in Lachine. The *Table de concertation jeunesse de Lachine* provided funding for research in Lachine. Brandusescu conducted the research in Lachine, Acadia Park and Grandview-Woodland. The objective of the chapter is to examine the temporal and small data limitations of using a crisis mapping platform for community development.

Abstract

Crisis mapping is a rapidly evolving field in the information and communications technology for development (ICT4D) movement. Used to connect and empower marginalized citizens during emergency events, crisis mapping is a way for those impacted by natural and human disasters can share and provide information. Crisis mapping information can further be used by agencies to improve service delivery. We investigate the repurposing of crisis mapping to more long-term or 'chronic' community development practices. We apply the crisis mapping platform, Crowdmap (a platform developed by Ushahidi), for three cases in Montreal (2 communities) and two cases in Vancouver (2 communities), Canada. Creative methods like storyboarding were employed for communicating with both non-technical and multilingual audiences. Our case studies show mixed results about the adoption and use of these applications for community development. In particular, temporality plays out in unexpected ways in acute and chronic events in communities.

5.1 Introduction

Crisis mapping has carved a niche in the information and communications technology for development (ICT4D) movement as a method of connecting and empowering marginalized citizens during emergency events. Those impacted by natural and human disasters can share and provide information. The platform Ushahidi is the best known crisis mapping/reporting platform. It originally was created to allow for easy and fast reporting of post-election violence in Kenya (http://legacy.ushahidi.com/), that is local individuals could contribute messages via SMS, web, email or Twitter. Its best known application is the Haiti Earthquake, where victims of the earthquake could report being stranded, needing food or aid (Forrest, 2010). It was touted as utilizing citizen sensing that can lead to more immediate and accurate pinpointing of problems, broadcasting concerns to a wider community, promoting volunteerism, connecting online and offline communities, and improving government responsiveness, and ultimately saving lives (Goodchild, 2007; Bittner & Turk, 2012; Meier & Leaning, 2009; Arney et al., 2014; Meier, 2012a; Soden & Palen, 2014; Palen & Liu, 2007). Crisis maps also emerged to partially address the inequities in Internet access--people could contribute geographic content by phones; they would not have to input content onto an online map (Ziemke, 2012).

Ushahidi later extended its use for non-crisis scenarios and non-experts by creating the Crowdmap application. Indeed, an argument emerged that crisis mapping could be used to address more chronic issues. HarassMap was built in 2005 to allow people to report incidents of sexual harassment (http://harassmap.org). It utilized the Ushahidi crisis mapping platform because of the ease in reporting, the anonymity of reporting, and the ability to contest the dominant culture and existing state practices. It appears that it may be useful for community development. By community development we mean, actions by community based organizations, community development corporations and members of civil society. It prioritizes the role for these individuals and groups, vis-à-vis to determine their community needs, meet their abilities, skills and capacities (Burns et al., 2004; Florin & Wandersman, 1990; Kretzmann & McKnight, 1996; Lyndon, 2011). So crisis mapping could theoretically extend the goals of community development: local empowerment (e.g., visualize importance of social/green spaces, playgrounds to contest in the face of demolishing/rezoning plans), social capacity (e.g., group members learning the software), communication of concerns, broadening of participation (e.g., potentially

fix damaged sidewalks that are mapped by citizens), and shifting of the public discourse and public policy (e.g., group members could point out social housing issues and critical living conditions).

We sought to repurpose the crisis mapping platform for community development. Community development is important because it aims to empower citizens by giving them control over their community, to take charge and use tools they have to have their voices heard (Bhattacharyya, 1995; Burns et al., 2004; Lyndon, et al., 2011). In this paper, we repurpose a crisis mapping platform for community development practices for two reasons: 1) to test the ease and reusability of the crisis platform based on developer promises (its 'hype'); and 2) to determine its usability and usefulness by local residents of urban communities. We do so by examining the use of disseminating local information submitted by citizens via an online mapping platform, to determine its use for community dialogue about local places. From the myriad of Web 2.0 tools available, we focus on a platform that combines online mapping with texting (SMS) and online message submission. We examine the use of SMS, web reporting, email, Twitter and smartphone applications as communication mediums.

5.2 Literature Review

Crisis mapping is promoted as a medium by which impacted individuals can easily contribute and share information related to natural and human disasters; agencies can use crisis mapping to improve service delivery; these benefits extend to potentially counter the power dynamics of the state (Meier, 2011). Crisis mapping has garnered considerable media attention, volunteer support and funding from numerous agencies (Forrest, 2010; Gao et al., 2011; Greengard, 2011; Morrow et al., 2011; Roche et al., 2013; Zook et al., 2010). Despite challenges (e.g., access to technology, developer / administrator training, information accuracy), it demonstrates connectivity between linking open source software, humanitarian crises, crowdsourcing and adaptable tools (Okolloh, 2009).

Crisis mapping builds on a long history of digital mapping for community empowerment. For example, Participatory GIS processes have emerged to assist in community development, to preserve urban parks and identify bad landlords (Elwood & Ghose, 2004; Sieber, 2006). There are challenges and opportunities of local knowledge production and support for marginalized

communities. Community residents are seen to have the best knowledge of their community (Burns et al., 2004). As part of these digital participatory or contributory practices, citizens have reframed public policy debates and, in certain instances, gained control over planning processes, providing more sophisticated analyses and visualizations than experts and officials (Goodchild & Li, 2012; Haklay, 2010; Sieber, 2006).

The platform Ushahidi was originally created to allow for easy and fast reporting of post-election violence in Kenya (http://legacy.ushahidi.com/) and the Haiti Earthquake. Yet, the very definition of a crisis is often questioned, which then affects what events are considered important and how individuals then interact with them via the digital mapping platform (Petersen, 2013). In crisis mapping, a crisis can be reduced to an acute event. The reasons earthquakes, as addressed in the famous application of Ushahidi to Haiti, may cause so much damage may be due more to poor building practices than to the natural acute event itself. Most research on crisis mapping focuses on post impact response, which is just a fraction of the life span of crisis events (Palen & Liu, 2007). Continuously evolving, the organizational structures of these messages are still forming and not definitive in terms of being viewed as formal emergency response systems.

Over time, crisis platforms extended their use for non-crisis scenarios. How do citizens contribute this content? Applications based on platforms like Ushahidi and Crowdmap explicitly link mapping and texting, which differentiate them from the rest of online platforms that solely rely on the Internet for user contribution (Zook et al., 2010). Using mobile technology for community development has been linked to progressive outcomes, for example, in banking, epidemiology, agriculture, and fishing (Abraham, 2007; Aker & Mbiti, 2010; Patnaik et al., 2009; Wong, 2008). A significant part of what drives this usage is the potential for increasing community integration. Authors argue mobile technologies facilitate communication, promote networking, and build social structures for communities (Donner, 2008; Hardey, 2007; Horst & Katz, 2011; Miller, 2006; Yzer & Southwell, 2008). However, researchers must be wary of any tendency toward technological evangelism and promotion of initial positive results, and later neglect the ways that mobile phone usage can express or even exacerbate gender, income and other digital divides (Albert et al., 2008). Therefore, the mere presence of ICTs in a project does not guarantee support from existing community development initiatives because ICTs are not always viewed as broadening participation (Girard & O Siochru, 2006). Ultimately an application is only as good as the audience it can gain and the relevant content it can present.

Web 2.0 literature states that these technologies are easy to deploy, but practice suggests otherwise. This reflects in community development literature, where resources and networks are described as complex. Community development creates formalized institutions with loose connections to their membership (Botes & Van Rensburg, 2000; Cornwall, 2008; Silverman, 2005). There are two different types of community development organizations: 1) community based organizations (CBOs) and 2) community development corporations (CDCs). CDCs are a professionalized form of community development that emerged in response to the state's failure to represent the concerns of certain sectors (e.g., poor, women, ethnic minorities, women, disabled). CDCs are therefore subject to two particular types of participation: instrumental and grassroots. The former prioritizes the state needs whereas the latter expands citizen contribution in local decision making processes (Silverman, 2005). CBOs (e.g., non-profits, civil-society groups) lead informal community activities that differ from concerted actions managed by CDCs. There is, therefore, tremendous diversity that exists in this respect, both in terms of purpose/mandate and capacity.

Historically, community development practices were prescribed non-universal and pre-industrial social configurations by social theorists (e.g., sociology, anthropology) and multilateral organizations/conventions (United Nations, the Ashridge Conference, the Cambridge Conference, International Cooperation Administration) (Bhattacharyya, 1995). These actors sought the definition of community development referred to rural, agricultural and small towns (Bhattacharyya, 1995), but excluded urban communities from the definition. Moreover, community development practices aim to be distinctive and universal (i.e., applicable to individual communities and replicable to other communities); particularly, solidarity and agency are recognized as deeply important to shared identity (Bhattacharyya, 1995). Yet, traditional development activities tend to be agency-destructive because of the existing power dynamics: those in control (e.g., the state, development professionals) prioritize goals and determine outputs that decide the fate of the powerless (e.g., the poor and marginalized. Bhattacharyya, 1995; Botes & Van Rensburg, 2000). Other community development downfalls include: skewed reporting of successes, selective participation, conflicting interest groups, gate-keeping by local elites, excessive pressures for immediate results, and the general lack of public interest in participation (Botes & Van Rensburg, 2000, p. 55). That said, we would argue that in international development contexts, crisis mapping exists in a supportive set of institutional relations that

allows for easier deployment. By contrast, in the developed world there is a lack of existing networks between organizations to facilitate the deployment of these projects in a similar manner.

In theory, community-based development activities are designed to give communities "direct control over key project decisions, including management of investment funds" (Mansuri & Rao, 2004, pp.1-2). However, the financial distribution of funds is usually set up by a central authority. The result of community development with CDCs is that instead of using increased professionalization and technical skills as factors that empower communities they often muzzle citizen participation and diminish community control (Silverman, 2003; Warren, 2001). Therefore, participation is perceived as "a terrain of contestation, in which relations of power between different actors, each with their own 'projects', shape and reshape the boundaries of action" (Cornwall, 2008, p. 276).

Moreover, assessing project efficiency is difficult, as unclear methodologies are difficult to examine and evaluate. Less technical projects were found to be more successful, and developed world projects had more participation (Mansuri & Rao, 2004). Mansuri and Rao (2004) found that a small number of studies examined the dynamics between community-based development projects and collective action capability. Here, exclusion is difficult to avoid even when managed by experienced staff (Katz & Sara, 1997 in Mansuri & Rao, 2004). Further, replication of community development projects also seemed difficult; in many cases, facilitators take the form of the state, especially when funded by multilaterals like the World Bank. Community participation thus becomes a process of producing short term goals with fast results (Mansuri & Rao, 2004), rather than encouraging a long-term sustainable process.

5.3 Methodology

We worked with four communities in Canada and built five applications. The first, University Spaces, was created for the McGill University student, faculty and staff community, which included university students that reside in temporary residences. The second and third, *Espaces Lachine* (Lachine Spaces) and *Saine Alimentation* (Healthy Eating) were created for Lachine, Quebec. Lachine is a disadvantaged community in Montreal, consisting of 7,340 low-income residents (18% of the population in Lachine) (Statistics Canada, 2006); these residents are also

physically separated from other areas by heavy industry (Centraide, 2012). We worked with the *Table de concertation jeunesse de Lachine* (Table for Youth Dialogue in Lachine) from *Concert'action Lachine*. The Table is an umbrella non-profit organization of numerous community based organizations that coordinate/organize activities and events for Lachine youth, professionals and adults. The fourth application, Acadia Park Spaces was created for Acadia Park, a community of Vancouver, British Columbia consisting of young, middle class families living in subsidized student housing, with a total population of 1,700 (Mahal, 2013), with more than half (58%) reporting an annual income of less than $30,000 (Bigam, 2013). We worked with the collective Acadia Families for Sustainable Communities, formed of current and former student families that are concerned about the risk of the community's land-use changes. A fifth application, Let The People Speak, was created but never launched for the Grandview-Woodland community of Vancouver. The community comprised of a mixed low and middle income population with multiple ethnicities that are largely renters (66%) (City of Vancouver, 2012).

Through on-the-ground networking and emails, we contacted the community organizers and activists. We prepared for the meetings with community organization members by creating storyboards (presented as a comic book) to explain the process of mapping and contributing content to be mapped. We met and presented the project and, to give them insight into the potential, showed previous applications. We attended community meetings and developed each application after consultations with the communities. There were numerous iterations of application development, following discussions with community members. The applications were launched once we reached a consensus. Multi-lingual flyers were designed by community based representatives. Manuals were written so that the organization could navigate the applications. Guidelines were created for what constituted an appropriate message (e.g., no foul language).

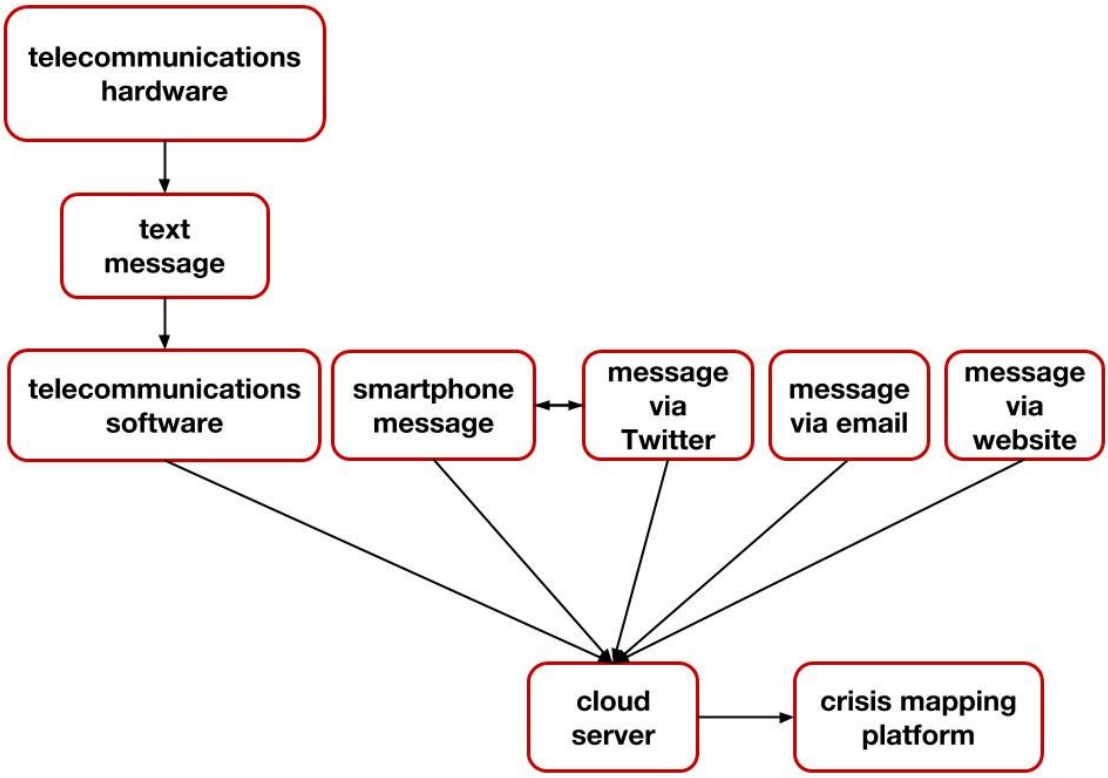


Figure 5-1: Crowdmap architecture of message submission for developers/administrators (Source: first author)

Each application we launched consisted of three parts: a mapping software platform, telecommunications hardware, and a telecommunications software platform (Figure 5-1). We used Crowdmap, a free and open source cloud-based mapping platform to develop our applications. Building the application required telecommunications hardware and software, which, unlike the vision of universality of the cloud, is highly dependent on country infrastructure and regulations. Ultimately, telecommunications issues dominated the development time. Mobile network provider inconsistencies were prevalent with hardware and software. We used FrontlineSMS, which integrates with Ushahidi, as our telecommunications software. The hardware and software required by FrontlineSMS is under the Global System for Mobile Communications (GSM) network, not the Code Division Multiple Access (CDMA), which is prevalent in Canada. Our provider options thus were narrowed as we entered a contract

with a GSM network provider so our subscriber identity module (SIM) card would match the GSM modem standard.

Our case study approaches varied based on community management and motivations for the adoption of the platform. The University Spaces application was built for the McGill University community to understand and learn how to use the Crowdmap application. Part of understanding the application was learning the system administration requirements. We created a routine of checking messages, daily (morning and evening) to manually upload to the website. We needed to consider the potential of inappropriate messages (e.g., defamation, cursing), even though the automatic uploading feature is available. As a system administrator, we had to dedicate a percentage of our day to this work. We also had to geocode each contribution.

The Vancouver cases were activist-driven; whereas the Lachine case was managed by community organizers. The Vancouver cases had motives resembling crises (e.g., immediate rezoning, anti-densification, loss of social housing). The Lachine organization had longer term goals (e.g., community asset development). Lachine relied primarily on texts; Acadia Park relied on contributions via the website. Commonalities included flyer distribution, poster creation, attending community events, and meetings. Despite the similarities, the differences determined many of the results.

5.4 Findings

Specific contributions were categorized into map legends, which appear as 'Categories' in Figure 5-2, based on community assets and concerns. Figures 5-2 and 5-3 display the websites of two of the four applications created. In Figure 5-2, the homepage of the Acadia Park Spaces application is illustrated. It shows an interactive map that aggregates messages represented as blue circles. The map allows for users to zoom to different scales and explore messages. In the categories section, 'Places I Love' and 'Places I Want Changed' are tabs that can expand to reveal specific categories (e.g., 'Play Spaces', 'Green Spaces', 'Housing', 'Hazards'). The 'How to Report' box displays the available ways to submit messages (phone number is no longer in service) to the website.

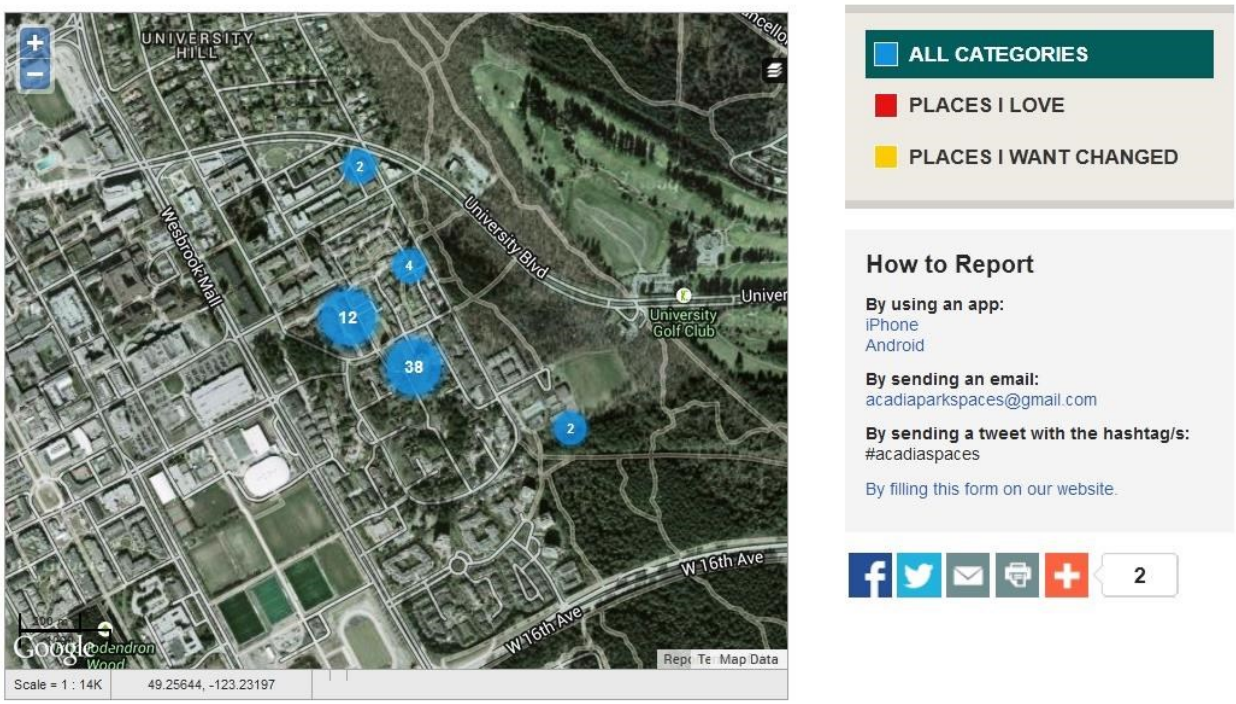


Figure 5-2: Acadia Park Spaces includes an interactive map that aggregates messages (blue circles), where users can zoom to different scales and explore messages. The 'How to Report' box displays ways to submit messages. Specific contributions were categorized into map legends based on community assets and concerns. The 'Categories' section includes tabs that can expand to reveal subcategories. The categories and subcategories are defined by community organizers and activists. (Source: acadiaparkspaces.crowdmap.com)

Figure 5-3: A message submitted (red placemark on map) to *Espaces Lachine*, sectioned in the categories, 'Rivers and Green Spaces'. The yellow placemarks represent other submitted messages. (Source: espaceslachine.crowdmap.com)

We interpreted our title, *Crisis mapping for community development*, as an issue of time. That is, is there an embedded temporality to a technology developed for crises that can or cannot be translated to more long-term, non-event-driven, conditions? We found four key points in relation to acute and chronic issues in communities, which are (1) the sheer acuteness of the event, (2) the singularity of purpose (3) the motivations of contributing to non-acute events, (4) the connection of contribution to action and (5) the issues of small data use. The term 'acute' is defined as a non-chronic, single instance issue.

5.4.1 Level of 'Acute' Matters

Our first finding suggests that an acute issue may be too acute for crisis platforms used in community development. For example, Grandview-Woodland is a passionate community with imminent concerns; yet the application never launched because community leaders (the gatekeepers) were unwilling to adopt it. Reliable methods of community practices, like online

and offline petitions, community meetings, emails and rallies, were already being used for voicing opinion and taking action against a recent community draft plan proposed by city officials. Community leaders may have anticipated dilution of their efforts or message fatigue among participants, regardless of the time frame. Indeed, we were drawn to this case both because of its use of ICTs and the crisis-nature of its activities. Ushahidi and Crowdmap are proposed for urgent situations. Their platforms are developed to be rapidly configured, installed and launched; their user interfaces are designed to easily enable urgent communications. However, we sometimes undervalue the role of the organized crisis mapping community. A community can marshall an army of technical assistance; volunteers (physical and virtual), on-the-ground organizations, international development teams and academics, indirect involvement and promotion (face-to-face and online/social media use). This ecosystem of crisis mapping makes crisis platforms functional, which is missing in community development. Lacking that support, a community development organization may ill-afford the distraction of a new application, despite any other proven value in that application. However, economies of scale here are not linear. Even for small scale projects, teams are needed. A part of the non-linearity is that there is a constant need for people to be around all the time to vet contributions.

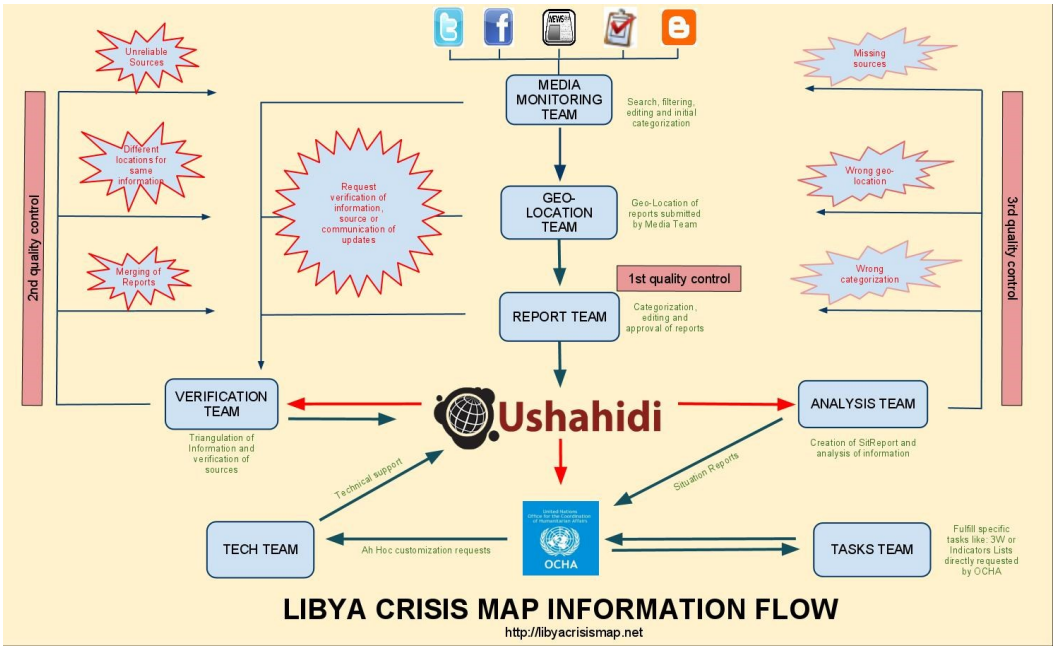


Figure 5-4: An information flowchart of the digital humanitarian Libya Crisis Map (Ushahidi) response team. (Source: http://libyacrisismap.net)

In contrast to Grandview-Woodland, McGill University and Acadia Park rapidly adopted the platform. For McGill University the platform had rapid adoption because we, as researchers, had full direction over project goals. Participants were able to send messages (mostly SMS) and voice their opinions on their experiences in different buildings on campus. By prioritizing buildings, we were able to geolocate their messages.

We approached Acadia Park in the midst of an imminent rezoning of student family housing. This was due to a land-use change plan that had an unsatisfactory consultation process with the community. Fifty percent of the housing needed to be evacuated by August 2013 for future development and land use plans. The application garnered support from the activists and community members because there was demand for a mapping-based method to express community concerns. There was no limitation to the length of message submission (if submitted via web or email) and it provided a safe environment for contributions (e.g., confidentiality and anonymity were assured). The likely reason for uptake here was the acceptance by a tight knit community, which was open to new technology projects and channels of communication. The community was able to quickly deploy and offer feedback on the project and obtain submissions in a short time frame.

5.4.2 Importance of Development Times

O'Reilly (2005) argues that Web 2.0, via application programming interfaces (APIs) and mashups, has completely transformed the time to develop applications. This would appear to be advantageous for crisis mapping, as an urgent event would demand an urgent solution. By implication, a chronic event might demand a slow development time. It would take time to fully embed oneself in a community to understand the complexities of poverty and develop and application sensitive to the concerns of and in collaboration with the community. Our second finding questions that relationship. A chronic event does not mean it necessarily benefits from a long development cycle. Nor does it automatically benefit from the researcher situating herself for a long time in the community. Indeed, a lengthy embedding in a community may mire the application in the complex fractures within that community.

This finding was most apparent in Lachine, where a year was spent working with the community (cf., one to three months at the other cases). Participants kept reorienting the goals of

the application; there was debate about the proper communication medium (e.g., texts versus website reporting) and the venue of contributions (e.g., as a group in a workshop or a fare or individually on-the-ground). One might think that a longer development process would make the application more effective when launched, but longer development times may work against a singular purpose. By definition, a lengthy development will not work with an event-driven crisis due to lack of preparation time and the immediacy of need (although Petersen {2013} would argue that even crises are usually manifestations of a chronic set of interlocking acts that occur in a lengthy period of time before the acute event).

By contrast, the University Spaces and Acadia Park applications were quickly adopted, even though development times were long in terms of the telecommunications hardware and software setup. This was particularly the case for University Spaces, since it was the first time we deployed and administered the Crowdmap application. In the deployments, we found that the linearity of time is not proportional. First, more time spent deploying the application does not equate to a better project. Second, a chronic, longer event also does not result in a better project; if we have a chronic event such as poverty in the community, it does not mean it should be married to a longer development time for the application. The longer we worked with the community, the more we became embedded in the community, the more the fractures show. Sometimes it is an advantage for a community to work with an outsider that has a fresh perspective. The importance of social distance (and temporal distance) was dramatically illustrated by Alinsky (1971) and gave rise to the entire field of community organizing, external experts who came into a community with a fresh set of eyes, perspectives, professionalization (dangerous word, there) to a problem full of entrenched interests. We were not perfect; we came in with our own biases. But we managed to establish relationships with local organizers and work together, despite our differences in goals and expectations.

5.4.3 Motivations for Participation

Our third finding implies that the motivations for participating on the application also were impacted by temporality. Motivations to contribute to mapping platforms are driven by personal, social or technological goals and vary amongst users (Budhathoki, 2010, p. 31). People here could contribute because they perceive an outlet for creative and independent self-expression.

Contributors may wish to be altruistic and evoke a pride of place (Coleman et al., 2009), which could be interpreted in a disadvantaged place as future aspirations of a community. However, the motivations literature does not consider the intensity or urgency prompting those contributions as well as the clarity of the goals of the site.

Sending a SMS in crisis mapping is completely different than sending a SMS for community development. A crisis is more timely, where issues are quickly spelled out: short messages, few key words based on location and need that demand for immediacy in action. This is perhaps secondary to an explicit fire, where one still needs to call an emergency number or contract on-the-ground humanitarian teams for immediate urgent needs instead of sending an SMS to be mapped. In community development, this action is not secondary to already existing, traditional participatory methods. It may not even be an action for multiple reasons. Most likely it is harder to talk about community development in 160 characters. Many messages submitted on the web had multiple sentences, if not paragraphs, suggesting alternatives to city planning decisions and rezoning actions. Community development is complex and people may not have the ability to be succinct about how they express their thoughts pertaining to acute issues and/or chronic issues.

In addition, anonymity or the weak ties of Web 2.0 presents an interesting challenge for community development. Anonymity is sought out in crisis mapping scenarios when the majority of instances, the place and issue are more important than the sender themselves. The broadcast nature of these suggests that the crisis mapping personnel have identified some disembodied audience. Here, location and content are key. However, in community development this can be perceived as problematic because community conversations are largely built on trust. The name behind the message therefore matters, as gate you have to build trust. Community gatekeepers, the ones invested in many of local organizations want to know who is contributing, and what they are saying (Anon., personal communication with the first author, June, 8, 2013). If anonymity is optional, they may not trust comments made that do not have a name linked to them. What if outsiders are making comments, taking away from the close-knit community element? Although citizens are talking to each other, they may communicate their issues with outsiders on a secondary basis.

5.4.4 Unclear Contribution-to-Action Link

Our fourth finding shows that the connection between contribution and action is unclear. In the Lachine case, a mother concerned about her child's safety--he had broken an arm on the playground before--reported a damaged playground. She asked whether her reporting to the mapping application would induce the city to fix the playground. A sense of immediacy of response is created by the application that does not guarantee an immediacy of action (or any action, no matter the time). The irony is that crisis mapping *presumes* action is tied to reporting because of the urgency of the event.

The needs were real to the members of all communities but were not viewed with the same urgency. Community development proved too amorphous a goal for Lachine in terms of its applications (hence the two applications) and there were no identifiable easy causal links (i.e., fix this and the problem will be solved). Conversely, Acadia Park had intensity linked to motivations.

5.4.5 Small Data in a Big Data World

Big data has become the new frontier in terms of VGI. During the ongoing big data evolution, any data that is not 'big' is framed as small data. Usually, traditional small data processes have been used to draw inferences and generalizations because they assure documentation, replicability and thorough sampling that is managed by experts (Goodchild, 2013). These are factors that big data does not generally provide. We worked with small data that is atypical compared to traditional small data, because it has big data characteristics: it is unstructured, uses big data practices and does not have an expert driven process. The implication of positioning "small datasets" or case studies as small data is challenging. In particular, we found issues with small data use for community development in a non-traditional way. For our data collection, we used SMSs and Tweets as small data. Yet, sending SMSs and Tweets (Zikopoulos et al., 2012) are deemed as big data practices (Burns, in press).

Two sub-issues arise. First, in big data, the role of volume is substituted for accuracy. If there is not enough data, the only way to attain accuracy is through precision. Precision is defined by large datasets, inevitably creating a number bias. Therefore, the goal of collecting

these datasets becomes less about broadcasting a voice in the community and more about obtaining accuracy.

Second, two contrasting goals form: a community voice versus the accuracy in datasets. The accuracy we are trying to achieve based on a comment's geo-location may be sufficiently accurate for the people in a community, where geographic precision is relative. In our experience with Lachine, a map was less significant than the usability of the content added to the applications. Big data epistemologies focus on explicit numerical data analysis, instead of "highlighting qualitative understanding, communal and situated lay knowledges, and connections with social theory" (Burns, in press). Small data has value that may not be found in big data, particularly in research conducted where the appropriate data size is the former not the latter (boyd & Crawford, 2012). Therefore, we should question who the big data practices are for and who guides big data research and frameworks. There are instances, in community development, where SMSs and Tweets can be used for non-traditional small data practices. Skepticism remains in the use of social media platforms to collect big data (boyd & Crawford, 2012).

Our findings represent a limitation to the use of crisis mapping platforms for community development due to temporality issues. Crisis events appear to occur at a singular point or a short duration in time (e.g., earthquakes). Chronic issues (e.g., poverty) are long-term, complex and, to some, seemingly intractable. Chronic issues receive less attention than crisis based events, where there is "unequal power of spectacular and unspectacular time" (Nixon, 2011, p. 6). Community development research exposes the need to express crises that do not happen instantaneously and involve long term degradation, but warrant our consideration. Yet, the sense of urgency to communicate community crises does not parallel disaster-driven crisis situations. It should be noted that disasters themselves are increasingly considered complex socio-technical events (Frickel, 2008; Fordham, 1999) with long time horizons. We simply place our attention and our energies towards the blip in time. A temporal advantage of community development over crisis mapping is that the developer has the luxury of time to know the community as we did. This is not essential to all community development mapping projects, which occasionally have spawned a number of what essentially are geospatial web "carpetbaggers" who develop mapping applications from afar in the hopes that communities will find them useful (Sieber et al., 2009).

5.5 Conclusion

We planned to determine whether we can use a crisis mapping platform for community development. The results were mixed. Community development events are highly complex issues that do not have clearly identifiable causative events. Moreover, temporality is a key overarching factor in the adoption of our platform by the case study communities found in our four main results. First, the adoption of technology during acute community events was not always successful. One community chose not to adopt the new platform based on effective methods for responding to acute situations that were already in use. However, another community found the platform useful for voicing opinions. Second, a chronic community development issue may not work as well as an acute driven issue on crisis mapping platforms due to development times and goal reorientation. Third, motivations for participating on the application also were impacted by temporality, where the sense of urgency and intensity of issues differed depending on the communities these represented. Fourth, there is a presumption that the application guarantees an immediacy of action, which is often not the case. Our results represent a limitation to the use of crisis mapping platforms for community development due to the issues of temporality and small data use.

Chapter 6: Conclusions and Future Work

In this research, I sought to integrate mapping and texting for community development. The mapping-texting applications were a repurposing of a crisis mapping platform. The first question was primarily concerned with the benefits and challenges of integrating texting/SMS practices with online mapping applications. Given the novelty of SMS practice for community development, the technical process had mixed results and the following challenges were identified: becoming a system administrator, contending with resource availability, confronting the nature of the Canadian mobile network providers, obtaining a geo-location from a text message and keeping pace with change. These are discussed at great length in Chapter 4.

The second question answered the use of geo-tagged texting/SMS for implementation in community development practices. This question was answered through the preferred communication medium, collection and spatial distribution, and the limitations of platform/to participation. The challenges were identified as differences in the nature of problem in community groups, gatekeepers involved, representation and inclusiveness of participation, and the quality of deliberation. Chapters 4 and 5 provide answers to this question.

The third question answered the use of a crisis mapping platform by repurposing it for community development. By use, I mean adoption and sustained usage, which I defined as a process of three steps: (1) adoption of the platform by the community, (2) community use of the platform with my assistance and co-administration, and (3) independent community use and administration of the platform after the co-administrative phase. In the Lachine applications, adoption and use was low: only 56 messages were submitted to these applications. Additionally, the Grandview-Woodland application was never launched. In these cases where adoption and use were low or not at all, technologies and/or non-technologies were already existing and effective in communities; this made the adoption and diffusion of new ICTs less attractive to community based organizations and activists. In the two high-adoption applications, McGill University and Acadia Park, communities embraced new technologies, and the mapping component was well received. This included 137 and 61 messages respectively for these two applications. In Chapter 5, findings are based on the acuteness of the event, the singularity of purpose, the motivations of contributing to non-acute events, the connection of contribution to action, and the constraints of

small data. There is an embedded temporality to a technology developed for crises that is difficult to translate to more long-term, non-event-driven, conditions.

In crisis mapping, as well as community development, it is never easy to integrate technology in communities and simultaneously use new online and offline processes. My findings confirm this, and further imply that for a participatory online mapping project to work we need to find a community that has both an absolute crisis and is willing to embrace a new technology. Further, we must focus and adapt to the demographics and technology particular to the area of the project. Originally, ICT4D was facilitated by local government's pro-technology stance, massive growth in mobile phone penetration, and the pervasive use of basic mobile phones. For example, Kenya started the ICT4D movement because of an existing large technology community with a spirit of innovation. However, in other crises and campaigns, motivations and incentives often diverge. Tangible incentives are often introduced, but these do not necessarily lead to long-term and sustainable projects.

In my case studies, I had hoped that pride of place and civic activism would be sufficient to promote participation; however, in some cases this was not enough. Influencing factors are not easily answered and remain a work in progress as community development events are highly complex issues that do not have clearly identifiable causative events. Thus, even a seemingly perfect storm of crisis and motivations may not be enough to result in a successful mapping application. Contrary to the findings of mobile technology literature, texting was not the method preferred by participants. There is irony in this as it was the most difficult to set up the telecommunications system with the mapping platform but the least used. If all the components to make the texting part of the platform work are not readily available in Canada, how would community organizers and activists initiate this process independent of the researcher's involvement in the community? In contrast to texting, online submission proved to be the preferred means of communication in Acadia Park. However, the adoption of a platform does not ensure project sustainability; only a handful of messages were submitted before participation seized after my physical departure from the community.

ICT practices highly contrast with traditional community development practices. Therefore, future work includes developing more participatory technologies according to existing community development frameworks. There is a need to adapt behavior and learn changes made in software development. This is due to a constant influx of newly released

versions of software and manuals being published. There were many frustrations of the workarounds that had to be created as they were necessary for the applications to run properly. Additionally, details such as the importance of simplifying the consent forms cannot be overlooked. The use of traditional academic consent forms are outdated and counter-active to new technologies. At times, their rigidity and clinical nature sometimes alienated the participants. Consent forms should be changed to conform to new technology research (e.g., disclaimer on website). Also, trust in communities is difficult to gain, especially by an outsider. If trust is formed, the sharing of content can be powerful and valuable for a community. However, it is important to consider the implications of proprietary content and privacy concerns. On the other hand, future work towards developing automatic geolocation for message submission would facilitate the spatial distribution of data, where community patterns could then be visualized.

Scale in terms of physical settings, numbers of participants and temporalities are important for communities. In a sense, crisis mapping is an instance of Cox's (1998) jumping scales and network associations, where such movements jump beyond the confines of political jurisdictions. Yet the technology used will work for community development only if there is a project demand and the people involved relate to the context presented. Even though people have used the Crowdmap platform for events in their urban communities (Internews, 2012) it does not mean the platform will be used and sustained for every project. A technical project means different skill sets to different audiences, where there is no consensus for technical expertise. In community development practices, physicality is still key: there must be a connection between online and offline communication. Even if a technology is accessible by the participant, our on-the-ground presence is essential to gain and maintain an audience.

Moreover, diminishing physical contact may lead to a kind of "communicative capitalism", a democracy that speaks without responding (Dean, 2009). This is one consequence of doing crisis mapping or using the new Web 2.0 approaches for community development. Here, networked information technologies are in control of expansions, intensifications and interconnections; the act of message exchange is more important to the sender and recipient than the actual message content, where quantity is favoured over quality (Dean, 2009). If we follow this argument, our participation in the geoweb/Web 2.0 is a mere facade for advancing neoliberal capitalism and its increased consumer culture. In this space, we overlook technology's limitations

and view it as the primary and essential instrument and solution for societal problems (Dean 2012; Morozov, 2013). Dean's argument in the previous section is supported by authors who examine and critique mobile technology use within the context of shifts in neoliberal urban governance (Elwood, 2006a; Elwood & Leitner, 2003; Haklay, 2013; Lin, 2007; Sieber, 2006; Wilson & Graham, 2013). Further, typologies of capitalism are transformed and reflected by telecommunications, "creating and rapidly recreating nested hierarchies of spaces technically articulated in the architecture of computer networks" (Warf, 1995, pp. 375-376). With a reaffirmed severity, these systems allow for exploitation of spaces and the people they represent.

Moreover, it is difficult to diffuse technologies in GIS, and certain aspects of technology diffuse more rapidly than others (Sieber, 2006). Time and trust conflict will not diminish with chronic conditions (Williams, 2008). It takes time to build trust between agencies and the people sending messages/reporting on-the-ground, where handling data with different formats is especially difficult. Given the rapid pace of these deployments, how does one build trust in just a few days, perhaps instantaneously? Moreover, a community suffering from internal disagreement may face several challenges in reporting content: members may practice self-censorship in an attempt to protect themselves, and gatekeepers may censor content if they wish to control broadcast information. Communities are not homogenous; even though people belong to a particular community, they may disagree with the people in charge. A reason could be that their content is monitored and moderated, in an instance where anonymity is feared. This contradicts the intent of these crisis platforms as 'liberation technologies' that pursue a democratic process and is a surprising implication given their expectations.

Despite these challenges, the geoweb/Web 2.0 has the potential to flourish in ways Web 1.0 did not; eliminating a rigid infrastructure enhances the creative process. Moreover, social networks have changed our communication patterns and the ways in which we share information. The information can be used to increase awareness of the world that is physically unreachable to them. And yet, there is an inherent problem with the use of Web 2.0 to solve Web 2.0 problems. We can overlook its limitations and view the Web 2.0 solution as a 'fix' in our society. One significant limitation of Web 2.0 is the lack of standards, which can make for a difficult learning process. Web 2.0 evangelism pushes researchers and the development of new tools forward. As a result, older versions become unusable due to lack of maintenance. This is a difficult process, because developers and entrepreneurs are reluctant to be critical of this new

pace of development. There is a constant need to learn new technologies, which is counterintuitive for community development long-term practices and relationship building strategies. Therefore, research should be directed towards improving participation in an ever changing technological ecosystem. Moreover, the changes and shift from one type of data entry to another is a consequence of being hostage to the technological ecosystem and being resilient to the changes in that ecosystem; a goal that may be impossible to achieve due to the sheer number of players and pieces involved. In a marketplace that often values disruption, it is uncertain how we can adequately plan for this.

Abrupt changes happen often, either to the technology or in the system administration support. A perfectly viable technology may exist, but the developers may no longer have the resources to support it. Privacy implications are also perceived as weakening collaboration and progress in communities (Geser, 2004; Patnaik et al., 2009; Shilton, 2009). Even though we need to be aware of the accessibility and limitations of using mobile devices, the content/data produced is often valuable for communities, as data sharing amongst a community is often considered a strength (Johnson & Sieber, 2012). Nonetheless, the power of these online mapping applications derives from their ability to track change over time (Shanley et al., 2013). This, in turn, can occur through the unfolding of acute and chronic community issues with spatial distributions and patterns that have the potential to facilitate their understanding.

Substantial time is needed for any new technology to improve and advance in functionality and for users to adjust to the constant increase of noise and quantity that can often obfuscate meaning and quality. Ten years later, the question of whether online mapping/collaborative technology is inclusive remains unknown (Elwood & Ghose, 2004). We should further investigate acute and chronic issues in communities and their importance for participation, community asset building and improvement. We must be persistent and strive for fruitful use of interactive technology for communities. There is still hope for creating novel patterns and insights of places, their value and perhaps need for improvement. Uncharted territories remain in discovering mediums to connect virtual community participation to local places.

References

Abraham, R. (2007). Mobile phones and economic development: Evidence from the fishing industry in India. *Information Technologies and International Development, 4*(1), 5-17.

Adewunmi, F. (2011, November 25). Africa now second biggest mobile market in the world. Retrieved August 8, 2014, from http://www.howwemadeitinafrica.com/africa-now-second-biggest-mobile-market-in-the-world/13598/

Aker, J., & Mbiti, I. (2010). Mobile phones and economic development in Africa. *Journal of Economic Perspectives, 24*(3), 207-32.

Alamenciak, N. (2012, March 24). How the developing world is using cellphone technology to change lives. Toronto Star. Retrieved August 10, 2014, from http://www.thestar.com/news/world/article/1150416--how-the-developing-world-is-using-cellphone-technology-to-change-lives

Albert, S., Flournoy, D., & LeBrasseur, R. (2008). *Networked communities: Strategies for digital collaboration.* IGI Publishing.

Alinsky, S. (1971). Rules for radicals: A pragmatic primer for realistic radicals. New York, NY: Vintage Books.

Anon. (2012). So you're saying maps won't bring about iRevolutions? [Blog] *deadushahidi.tumblr.com*. Retrieved August 10, 2014, from http://deadushahidi.tumblr.com/post/26911851928/what-ushahidi-thinks-of-dead-ushahidi-and-the-90-rule

Arney, K. (Writer, Director), Salisbury, C., & Jenkins, J. (Producers). (2014, February 23). Mapping the void. England: BBC Radio 4. Retrieved August 10, 2014, from http://www.bbc.co.uk/programmes/b03s6mf0

Bailard, C. S. (2009). Mobile phone diffusion and corruption in Africa. *Political Communication, 26,* 333-353.

Barndt, M. (1998). Public participation GIS—Barriers to implementation. *Cartography and Geographic Information Systems, 25*(2), 105-112.

Baron, S., Goutard, F., Nguon, K., & Tarantola, A. (2013). Use of a text message-based pharmacovigilance tool in Cambodia: Pilot study. *Journal of Medical Internet Research, 15*(4).

Beland, P. [pierzen]. (2014a, March 18). @disruptivegeo @hotosm empower=Human actions, build links, mutual confidence with local communities and partners, learn to work together [Tweet]. Retrieved August 10, 2014, from https://twitter.com/pierzen/status/446019302123397122

Beland, P. [pierzen]. (2014b, March 18). @mhaklay for #openstreetmap humanitarian activations, we observe experience is a major factor for both quality and speed #geoWebChat [Tweet]. Retrieved August 10, 2014, from https://twitter.com/pierzen/status/446021450206806016

Beland, P. [pierzen]. (2014c, March 18). @re_sieber #geowebchat Challenge is for the people to use tools appropriately for example, Territory management, disaster preparedness [Tweet]. Retrieved August 10, 2014, from https://twitter.com/pierzen/status/446026467265110017

Bennett, C. J., & Crowe, L. (2005). Location-based services and the surveillance of mobility: An analysis of privacy risks in Canada. Office of the Privacy Commissioner of Canada.

Berkowitz, B. (1984). *Community dreams*. San Luis Obispo, CA: Impact.

Bhattacharyya, J. (1995). Solidarity and agency: Rethinking community development. *Human Organization, 54*(1), 60-69.

Bhattacharyya, J. (2004). Theorizing community development. *Community Development, 34*(2), 5-34.

Bigam, S. (2013, September 11). Acadia Park report praises park design, reprimands university for unsatisfactory consultation. The Ubyssey. Retrieved August 10, 2014, from http://ubyssey.ca/news/acadia-park-343/

Bishr, M., & Kuhn, W. (2007). Geospatial information bottom-up: A matter of trust and semantics. In *The European Information Society* (pp. 365-387). Berlin, Germany: Springer.

Bittner, C. & Turk, C. (2012). Deconstructing web 2.0 maps. In panel session *Theorizing the Geoweb I*. Association of American Geographers, New York, NY, 24-28 February.

Blackburn-Cabrera, J. A. (2012). Cell Phone Freedom Act: A small step or a giant leap in Canadian policy making? *International Journal of Liability and Scientific Enquiry, 5*(1), 1-21.

Blow, C. (2010). Allocation of time: Deploying Ushahidi. [Blog] *ushahidi.com*. Retrieved August 10, 2014, from http://blog.ushahidi.com/2010/05/19/allocation-of-time-deploying-ushahidi/

Boone, K. (2012). Cellphone diaries: Mobile technology and self-authored digital videos in asset mapping. *PRISM: A Journal of Regional Engagement, 1*(2), 7.

Botes, L., & Van Rensburg, D. (2000). Community participation in development: Nine plagues and twelve commandments. *Community Development Journal, 35*(1), 41-58.

boyd, danah, & Crawford, K. (2012). Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon. *Information, Communication & Society, 15*(5), 662–679.

Boyte, H. C. (1980). *The backyard revolution: Understanding the new citizen movement.* Philadelphia, PA: Temple University Press.

Bradley, G. (2006). *Social and community informatics: Humans on the net.* London: Routledge.

Brimicombe, A., & Li, C. (2009). *Location-based services and geo-information engineering*. Oxford: Wiley-Blackwell.

Budhathoki, N. R., Bruce, B. C., & Nedovic-Budic, Z. (2008). Reconceptualizing the role of the user of spatial data infrastructure. *GeoJournal, 72,* 149-160.

Budhathoki, N. R. (2010). Participants 'motivations to contribute geographic information in an online community. PhD Dissertation, University of Illinois at Urbana-Champaign, IL.

Budhathoki, N. R., & Haythornthwaite, C. (2013). Motivation for open collaboration: Crowd and community models and the case of OpenStreetMap. *American Behavioural Scientist, 57*(5), 548-575.

Burns, D. P., Williams, C., & Windebank, J. (2004). *Community self-help.* Palgrave Macmillan.

Burns, R. (2014). Moments of closure in the knowledge politics of digital humanitarianism. *Geoforum, 53*, 51-62.

Burns, R. (in press). Rethinking big data in digital humanitarianism: Practices, epistemologies, and social relations. *GeoJournal.*

Canadian Wireless Telecommunications Association. (2013). Facts and figures: The Canadian market. Retrieved from August 10, 2014, http://cwta.ca/facts-figures/

Cassidy, R. (1980). *Livable cities: A grass-roots guide to rebuilding urban America*. New York, NY: Holt, Rinehart & Winston.

Centraide of Greater Montreal. (2012). Lachine: Territorial analysis. Retrieved August 10, 2014, from http://www.centraide-mtl.org/en/communities-served/lachine/

Chapman, K. (2013). Humanitarian response team beginnings and response today. Retrieved August 10, 2014, from http://www.slideshare.net/wonderchook/humanitarian-openstreetmap-team-beginnings-and-response-today

Clement, A., Gurstein, M., Longford, G., Moll, M., & Shade, L. R. (2013). *Connecting Canadians: Investigations in community informatics.* Au Press.

Coleman, D. J., Georgiadou, Y., & Labonte, J. (2009). Volunteered Geographic Information: The nature

and motivation of produsers. *International Journal of Spatial Data Infrastructures, 4*, 332-358.

Concert'Action Lachine. (2012). La Table de concertation jeunesse de Lachine (TCJL). Retrieved August 10, 2014, from http://concertactionlachine.com/comites-et-tables-2/table-de-concertation-jeunesse-de-lachine/

Corbett, J. (2013). "I Don't Come from Anywhere": Exploring the Role of the Geoweb and Volunteered Geographic Information in Rediscovering a Sense of Place in a Dispersed Aboriginal Community. In *Crowdsourcing Geographic Knowledge* (pp. 223-241). Netherlands: Springer.

Cornwall, A. (2008). Unpacking 'Participation': models, meanings and practices. *Community Development Journal, 43*(3), 269-283.

Cox, K. R. (1998). Spaces of dependence, spaces of engagement and the politics of scale, or: Looking for local politics. *Political Geography, 17*(1), 1-23.

Craig, W. J., Harris, T. M., & Weiner, D. (Eds.). (2002). *Community participation and geographical information systems.* CRC Press.

Crampton, J. W., Graham, M., Poorthuis, A., Shelton, T., Stephens, M., Wilson, M. W., & Zook, M. (2013). Beyond the geotag: Situating 'big data' and leveraging the potential of the geoweb. *Cartography and Geographic Information Science, 40*(2), 130-139.

Crisis Cleanup. (2014). About. Retrieved August 10, 2014, from https://www.crisiscleanup.org/about

Crisis Commons. (2014). About. Retrieved August 10, 2014, from http://crisiscommons.org/about/

de Souza e Silva, A., Sutko, D.M., Salis, F.A., & de Souza e Silva, C. (2011). Mobile phone appropriation in the favelas of Rio de Janeiro, Brazil. *New Media and Society, 13*(3), 411-426.

Dean, J. (2009). *Democracy and other neoliberal fantasies: Communicative capitalism and left politics.* Duke University Press.

Dean, J. (2012). *The communist horizon (pocket communism)*. Verso Books.

Diamond, L. (2010). Liberation technology. *Journal of Democracy, 21*(3), 69-83.

Donner, J. (2008). Research approaches to mobile use in the developing world: A review of the literature. *The Information Society, 24*, 140-159.

Donner, J., & Tellez, C.A. (2008). Mobile banking and economic development: Linking adoption, impact, and use. *Asian Journal of Communication, 18*(4), 318-332.

Dunn, C. E. (2007). Participatory GIS—a people's GIS? *Progress in Human Geography, 31*(5), 616-637.

Edwards, M. (Ed.). (2011a). Civic knowledge. *The Oxford Handbook of Civil Society*. New York, NY: Oxford University Press.

Edwards, M. (Ed.). (2011b). Civil society in the digital age. *The Oxford Handbook of Civil Society*. New

York, NY: Oxford University Press.

Elwood, S. (2006a). Beyond cooptation or resistance: Urban spatial politics, community organizations, and GIS-based spatial narratives. *Annals of the Association of American Geographers, 96*(2), 323-341.

Elwood, S. (2006b). Critical issues in participatory GIS: Deconstructions, reconstructions, and new research directions. *Transactions in GIS, 10*(5), 693-708.

Elwood, S., & Ghose, R. (2004). PPGIS in community development planning: Framing the organizational context. *Cartographica, 38*(3/4), 19-33.

Elwood, S., & Leitner, H. (2003). GIS and spatial knowledge production for neighborhood revitalization: Negotiating state priorities and neighborhood visions. *Journal of Urban Affairs, 25*(2), 139-157.

Elwood, S., & Leszczynski, A. (2013). New spatial media, new knowledge politics. *Transactions of the Institute of British Geographers, 38*(4), 544-559.

Elwood, S., Goodchild, M.F., & Sui, D. (2013). Prospects for VGI research and the emerging fourth paradigm. In Sui, D., Elwood, S., & Goodchild, M. (Eds.), *Crowdsourcing Geographic Knowledge* (pp. 105–122). Netherlands: Springer.

Feenberg, A. (1999). *Questioning technology*. New York, NY: Routledge.

Feick, R., & Roche, S. (2013). Understanding the value of Volunteered Geographic Information. In *Crowdsourcing Geographic Knowledge*, D. Sui, S. Elwood, and M. Goodchild, (Eds.), (pp. 15–29). Netherlands: Springer.

Fisher, L. (2013). Change by us: The Potential and peril of social media and civic engagement. Conference presentation. *Using ICT, Social Media and Mobile Technologies to Foster Self-Organisation in Urban and Neighbourhood Governance*, Delft Institute of Technology. Delft, Netherlands. Retrieved August 10, 2014, from http://www.bk.tudelft.nl/fileadmin/Faculteit/BK/Over_de_faculteit/Afdelingen/OTB/Studeren/Presentaties_studiedagen/2013-Conference_ICT__Social_Media/Keynote3_Lee_ Fisher_ Change_ by_us.pdf

Florin, P., & Wandersman, A. (1990). An introduction to citizen participation, voluntary organizations, and community development: Insights for empowerment through research. *American Journal of Community Psychology, 18*(1), 41-54.

Fordham, M. (1999). The intersection of gender and social class in disaster: Balancing resilience and vulnerability. *International Journal of Mass Emergencies and Disasters, 17*(1), 15–36.

Forrest, B. (2010). Technology saves lives in Haiti: Text messages and mapping tools are helping victims of the earthquake. *Forbes Online*. Retrieved August 10, 2014, from http://www.forbes.com/2010/02/01/text-messages-maps-technology-breakthroughs-haiti.html

Foth, M. (2009). *Handbook of research on urban informatics: The practice and promise of the real-time city*. New York, NY: IGI Global.

Freifeld, C.C., Chunara, R., Mekaru, S.R., Chan, E.H., Kass-Hout, T., Iacucci, A.A., & Brownstein, J.S. (2010). Participatory epidemiology: Use of mobile phones for community-based health reporting. PLoS Med 7(12): e1000376.

Frickel, S. (2008). On missing New Orleans: Lost knowledge and knowledge gaps in an urban hazardscape. *Environmental History, 13*, 643-650.

Friedmann, J. (1992). *Empowerment: The politics of alternative development*. Massachusetts: Blackwell Publishers.

Gao, H., Barbier, G., & Goolsby, R. (2011). Harnessing the crowdsourcing power of social media for disaster relief. *Cyber-Physical-Social Systems*. Institute of Electrical and Electronics Engineers Intelligent Systems.

Geser, H. (2004). *Towards a sociological theory of the mobile phone. Sociology of the mobile phone.* Zurich: Switzerland.

Girard, B., & O Siochru, S. (2006). (Eds.). Communicating in the information society. *United Nations Research Institute for Social Development.* Geneva, Switzerland: UNRISD.

Gladwell, M. (2010). Small change. *The New Yorker, 4*, 42-49.

Goodchild, M. F. (2007). Citizens as sensors: The world of volunteered geography. *GeoJournal, 69*(4), 211-221.

Goodchild, M. F. (2009). NeoGeography and the nature of geographic expertise. *Journal of Location Based Services, 3*(2), 82-96.

Goodchild, M. F., & Glennon, J. A. (2010). Crowdsourcing geographic information for disaster response: A research frontier. *International Journal of Digital Earth, 3*(3), 231-241.

Goodchild, M. F., & Li, L. (2012). Assuring the quality of volunteered geographic information. *Spatial Statistics, 1*, 110-120.

Goodchild, M. F. (2013). The quality of big (geo) data. *Dialogues in Human Geography, 3*(3), 280-284.

Goolsby, R. (2010). Social media as crisis platform: The future of community maps/crisis maps. *ACM Transactions on Intelligent Systems and Technology*, *1*(1), 7.

Gouveia, C., & Fonseca, A. (2008). New approaches to environmental monitoring: The use of ICT to explore volunteered geographic information. *GeoJournal, 72*(3), 185-197.

Government of Canada. (2011, August). Navigating convergence II: Charting Canadian communications change and regulatory implications. *Convergence Policy, Policy Development and Research.* Retrieved August 10, 2014, from http://www.crtc.gc.ca/eng/publications/reports/rp1108.htm#t45

Gowan, M. (2013, January 25). Unlocking cellphones becomes illegal Saturday. NBC News. Retrieved August 10, 2014, from http://www.crtc.gc.ca/eng/publications/reports/rp1108.htm#t45

Graham, S. (2002). Bridging urban digital divides? Urban polarisation and information and communications technologies (ICTs). *Urban Studies, 39*(1), 33-56.

Graham, M. (2012, March 9). Big Data and the End of theory? *The Guardian*. Retrieved August 10, 2014, from http://www.guardian.co.uk/news/datablog/2012/mar/09/big-data-theory

Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, 1360-1380.

Greengard, S. (2011). Following the crowd. *Communications of the Association for Computing Machinery, 54*(2), 20-22.

Gurstein, M. (2001). Community informatics, community networks and strategies for flexible networking. In *Community Informatics: Shaping computer-mediated social networks*, 263-283. Eagle, D., Hague, B., Keeble, L., & Loader, B. D. (Eds.). Routledge.

Gurstein, M. (2007). *What is community informatics (and why does it matter)?* (Vol. 2): Polimetrica Publishing Studies.

Gurstein, M. (2012). Toward a conceptual framework for a Community Informatics. In Clement, A., Gurstein, M., Longford, G. Moll, M., & Shade, L.R. (Eds.). *Connecting Canadians: Investigations in Community Informatics* (pp. 35-60). Vancouver, BC: UBC Press.

Haesen, M., Van den Bergh, J., Meskens, J., Luyten, K., Degrandsart, S., Demeyer, S., & Coninx, K. (2011). Using storyboards to integrate models and informal design knowledge. In *Model-Driven Development of Advanced User Interfaces* (pp. 87-106). Springer Berlin Heidelberg.

Haklay, M., Singleton, A., & Parker, C. (2008). Web Mapping 2.0: The Neogeography of the GeoWeb. *Geography Compass, 2*(6), 2011-2039.

Haklay, M. (2010). How good is volunteered geographical information? A comparative study of OpenStreetMap and Ordnance Survey datasets. *Environment and Planning B, 37*(4), 682-703.

Haklay, M. (2013). Neogeography and the delusion of democratisation. *Environment and Planning A, 45*(1), 55-69.

Hardey, M. (2007). The city in the age of web 2.0 a new synergistic relationship between place and people. *Information, Communication and Society, 10*(6), 867-884.

HarassMap. (2013). How and Why We Began. Harass Map. Retrieved August 10, 2014, from

http://harassmap.org/en/who-we-are/how-and-why-we-began/

Harvard Humanitarian Initiative. (2011). Disaster Relief 2.0: The Future of Information Sharing in Humanitarian Emergencies. Washington, D.C. and Berkshire, UK: UN Foundation & Vodafone Foundation Technology Partnership.

Haugh, H., & Kitson, M. (2007). The Third Way and the third sector: New Labour's economic policy and the social economy. *Cambridge Journal of Economics, 31*, 973–994.

Haythornthwaite, C. (2007). Social networks and online community. *The Oxford Handbook of Internet Psychology*, 121-137.

Hennink, M., Kiiti, N., Pillinger, M., & Jayakaran, R. (2012). Defining empowerment: Perspectives from international development organisations. *Development in Practice*, *22*(2), 202-215.

Horst, H., & Miller, D. (2006). *The cell phone: An anthropology of communication*. Oxford & New York, NY: Oxford International publishers.

Humanitarian OpenStreetMap Team. (2014). About. Retrieved August 10, 2014, from http://hot.openstreetmap.org/about

Humanity Road. (2014). About. Retrieved August 10, 2014, from http://humanityroad.org/aboutus/

Huxhold, W. E. (1991). *An introduction to urban geographic information systems.* Oxford University Press Catalogue.

International Network of Crisis Mappers. (2014). Retrieved August 10, 2014, from http://crisismappers.net/

International Telecommunication Union. (2013, October 7). ITU releases latest tech figures & global rankings. [Blog]. *www.itu.int*. Retrieved August 10, 2014, from http://www.itu.int/net/pressoffice/press_releases/2013/41.aspx#.U0xhddKwLzo

Internews Centre. (2012). Mapping the maps: A meta-level analysis of Ushahidi & Crowdmap. CrowdGlobe. Retrieved August 10, 2014, from http://irevolution.files.wordpress.com/2013/01/internewswpcrowdglobe_web-1.pdf

Jaureguiberry, F., & Proulx, S. (Eds.). (2003). Internet, nouvel espace citoyen? l'Harmattan.

Johnson, P. A., & Sieber, R.E. (2012). Motivations driving government adoption of the Geoweb. *GeoJournal, 77*(5), 667-680.

Jones, B., & Silva, J. (1991). Problem solving, community building, and systems interaction: An integrated practice model for community development. *Journal of the Community Development Society, 22*(2), 1-21.

Katz, J. E. (2011). *Mobile communication: Dimensions of social policy.* Rutgers State University of New Jersey, NJ: Transaction Publications.

Kayne, R. (n.d.). What is the difference between GSM and CDMA. Conjecture Corporation. Foster, N. (Ed). Retrieved August 10, 2014, from http://www.wisegeek.org/what-is-the-difference-between-gsm-and-cdma.htm

Keay, A. (2010). Ushahidi and Crowdmap: Micro-streaming as time-binding media. *3PM Journal of Digital Research Publishing, 1*(2), 116-125.

Keller, C., Fleury, J., Perez, A., Ainsworth, B., & Vaughan, L. (2008). Using visual methods to uncover context. *Qualitative Health Research, 18*(3), 428-436.

Kingston, R. (2007). Public participation in local policy decision-making: The role of web-based mapping. *The Cartographic Journal, 44*(2), 138-144.

Kretzmann, J., & McKnight, J. (1993). Building communities from the inside out: A path toward finding and mobilizing a community's assets. Chicago, IL: ACTA Publications.

Kupper, A. (2005). *Location-based services: Fundamentals and operation.* New York, NY: John Wiley & Sons.

Leitner, H., McMaster, R. B., Elwood, S., McMaster, S., & Sheppard, E. (2002). Models for making GIS available to community organizations: dimensions of difference and appropriateness. *Community Participation and Geographic Information Systems*, 37-52.

Leson, H. (2012). Map it, change it, disrupt it. TEDx SilkRoad. [Video file]. Retrieved August 10, 2014, from http://www.youtube.com/watch?v=-s0i2SS_yas

Leson, H. (2013). How to attract and share with a Crowd: Budget, location and nature of project. Ushahidi Toolkits. [Blog] *wiki.ushahidi.com*. Retrieved August 10, 2014, from https://wiki.ushahidi.com/display/WIKI/Ushahidi+Toolkits

Leson, H., Herbert, B., & Sims, E. (2013). Crowdmap public beta: Get a demo and learn more [Blog]. *ushahidi.com.* Retrieved August 10, 2014, from http://blog.ushahidi.com/2013/05/06/crowdmap-public-beta-get-a-demo-and-learn-more/

Leszczynski, A. (2012). Situating the geoweb in political economy. *Progress in Human Geography, 36*(1), 72-89.

Leszczynski, A. (2014). On the neo in neogeography. *Annals of the Association of American Geographers, 104*(1), 60-79.

Li, R. (2011). Mobile Mapping: An Emerging Technology for Spatial Data Acquisition. In Dodge, M., Kitchin, R., & Perkins, C. (Eds.) *The Map Reader: Theories of Mapping Practice and Cartographic Representation*. Chichester, UK: John Wiley & Sons, Ltd.

Lin, G. C. (2007). Chinese urbanism in question: State, society, and the reproduction of urban spaces. *Urban Geography, 28*(1), 7-29.

Liu, S. B., & Palen, L. (2010). The new cartographers: Crisis map mashups and the emergence of neogeographic practice. *Cartography and Geographic Information Science, 37*(1), 69-90.

Lyndon, N., Moorthy, R., Er, A.C., & Selvadurai, S. (2011). Native understanding of participation and empowerment in community development. *Journal of Social Sciences, 7*(4), 643-8.

Mahal, K. (2013). Acadia Park Community Needs Assessment Results. Office of VP Academic and University Affairs, University of British Columbia. Retrieved August 10, 2014, from http://www.ams.ubc.ca/wp-content/uploads/2013/08/AMS-Acadia-Park-Community-Needs-Assessment-Results-August-27-2013.pdf

Mansuri, G., & Rao, V. (2004). Community-based and-driven development: A critical review. *The World Bank Research Observer, 19*(1), 1-39.

Marcus, A. D. (2011, December 3). Citizen scientists. *Wall Street Journal*. Retrieved August 10, 2014, from http://online.wsj.com/article/SB10001424052970204621904577014330551132036.html

Marshall, S., Taylor, W., & Yu, X. (2004). *Using community informatics to transform regions.* Hershey, PA: Idea Group Publishing.

McGill University. (2012). Student enrollment statistics. Retrieved August 10, 2014, from http://www.mcgill.ca/es/sites/mcgill.ca.es/files/fall_2012_-_overview_by_level.pdf

McGill University. (2013). Faculty and administrative staff statistics. Retrieved August 10, 2014, from http://www.mcgill.ca/about/quickfacts/staff/

McIver, W. Jr. (2003). A community informatics for the information society. In Girard, B., & Ó Siochrú, S. (Eds.) *Communicating in the Information Society*. United Nations Research Institute for Social Development, (33-64).

McKnight, J., & Block, P. (2010). *The abundant community: Awakening the power of families and neighborhoods.* San Francisco, CA: Berrett-Koehler Publishers, Inc.

Meier, P., & Leaning, J. (2009). Applying technology to crisis mapping and early warning in humanitarian settings. Harvard Humanitarian Initiative.

Meier, P. (2011). Do "Liberation technologies" change the balance of power between repressive states and civil society? PhD Dissertation, Tufts University, USA.

Meier, P. (2012a). Crisis mapping in action: How open source software and global volunteer networks are changing the world, one map at a time. *Journal of Map & Geography Libraries, 8*(2), 89-100.

Meier, P. (2012b). DeadUshahidi: Neither dead right nor dead wrong. [Blog] *iRevolution.net*. Retrieved August 10, 2014, from http://irevolution.net/2012/07/05/deadushahidi/

Meier, P. (2012c). Patrick Meier: Crisis mapping. National Geographic Live. [Video file].

Retrieved August 10, 2014, from http://video.nationalgeographic.com/video/specials/nat-geo-live-specials/meier-mapping-lecture-nglive/

Meier, P. (2013a). Haiti: Lies, Damned Lies and Crisis Mapping. [Blog] *iRevolution.net*. Retrieved August 10, 2014, from http://irevolution.net/2013/02/26/haiti-lies/

Meier, P. (2013b). Crisis maps: Harnessing the power of big data to deliver humanitarian assistance. *Forbes Online.* Retrieved August 10, 2014, from http://www.forbes.com/sites/skollworldforum/2013/05/02/crisis-maps-harnessing-the-power-of-big-data-to-deliver-humanitarian-assistance/

Meier, P. (2014). Crisis-Mapping in Areas of Limited Statehood. Bits and Atoms: Information and Communication Technology in Areas of Limited Statehood, 130.

Merrick, M. (2003). Reflections on PPGIS: A view from the trenches. *URISA Journal*, 15(APAII), 33-40.

Mocke, C. A. (2005). Location based services: Developing mobile GIS applications. Doctoral dissertation. University of Stellenbosch, South Africa.

Molony, T. (2009). Carving a niche: ICT, social capital, and trust in the shift from personal to impersonal trading in Tanzania. *Information Technology for Development, 15*(4), 283-301.

Morrow, N., Mock, N., Papendieck, A., & Kocmich, N. (2011). Independent evaluation of the Ushahidi Haiti Project. Development Information Systems International Ushahidi Haiti Project. Retrieved August 10, 2014, from http://ggs684.pbworks.com/w/file/fetch/60819963/1282.pdf

Morozov, E. (2013). *To save everything, click here: The folly of technological solutionism.* New York, NY: PublicAffairs.

Munro, R., & Manning, C. D. (2012). Short message communications: Users, topics, and in-language processing. Proceedings of the *2nd ACM Symposium on Computing for Development*, March 11-12, 4, (pp.1-10). Atlanta, GA. ACM.

Neis, P., Singler, P., & Zipf, A. (2010). Collaborative mapping and emergency routing for disaster logistics-case studies from the Haiti earthquake and the UN portal for Afrika. *Geospatial Crossroads@ GI_Forum*, 10.

Neis, P., Zielstra, D., & Zipf, A. (2013). Comparison of volunteered geographic information data contributions and community development for selected world regions. *Future Internet, 5*(2), 282-300.

Nixon, R. (2011, June 13). Slow violence and environmental storytelling. In: Nieman Storyboard. Retrieved August 10, 2014, from

http://www.niemanstoryboard.org/2011/06/13/slow-violence-and-environmental-storytelling/

Norheim-Hagtun, I., & Meier, P. (2010). Crowdsourcing for Crisis Mapping in Haiti. *Innovations, 5(*4), 81-89.

Okolloh, O. (2009). Ushahidi, or 'testimony': Web 2.0 tools for crowdsourcing crisis information. *Participatory Learning and Action, 59*(1), 65-70.

O'Neil, D. (2002). Assessing community informatics: A review of methodological approaches for evaluating community networks and community technology centers. *Internet Research, 12*(1): 76-102.

O'Reilly, T. (2005, September 30). What is Web 2.0: Design patterns and business models for the next generation of software [Blog]. *http://oreilly.com/blogs*. Retrieved August 10, 2014, from http://oreilly.com/web2/archive/what-is-web-20.html

Ostermann, F. O., & Spinsanti, L. (2011). A conceptual workflow for automatically assessing the quality of volunteered geographic information for crisis management. In *Proceedings of AGILE*, 2011, pp. 10–14.

Palen, L., & Liu, S. B. (2007, April). Citizen communications in crisis: anticipating a future of ICT-supported public participation. In Proceedings of the SIGCHI conference on Human factors in computing systems (pp. 727-736). ACM.

Patnaik, S., Brunskill, E., & Thies, W. (2009). Evaluating the accuracy of data collection on mobile phones: A study of forms, SMS, and voice. In *Information and Communication Technologies and Development (ICTD)*, 2009 International Conference on (pp. 74-84). Institute of Electrical and Electronics Engineers. Retrieved August 10, 2014, from http://dspace.mit.edu/handle/1721.1/60077

Petersen, K. (2013). What do you mean by disaster? How diverse notions of time and space interact in emerging disaster mapping practices. In panel session *Crowdsourcing Crisis in the GeoWeb: A critical look*. Association of American Geographers, Los Angeles, CA, April 9-13.

Pham, P.N., & Vinck, P. (2012). Technology fusion and their implications for conflict early warning systems, public health, and human rights. *Health and Human Rights: An International Journal, 14*(2), 106-117.

Pickles, J. (1995). *Ground truth: The social implications of geographic information systems.* Guilford Press.

Pigg, K. (2001). Applications of community informatics for building community and enhancing civic society. *Information, Communication and Society, 4*(4), 507-527.

Pitkin, B. (2001). Community informatics: Hope or hype? In *34th Annual Hawaii International Conference on System Sciences* Maui, HI, January 3-6.

Proulx, S. (2005). Penser les usages des technologies de l'information et de la communication aujourd'hui: enjeux—modèles—tendances. In Vieira, L., & N. Pinède, N. (Eds.) *Enjeux et usages des TIC: aspects sociaux et culturels*, Vol. 1, pp. 7–20. Bordeaux: Presses universitaires de Bordeaux.

Rideout, V. N., & Reddick, A. J. (2005). Sustaining community access to technology: who should pay and why. *The Journal of Community Informatics, 1*(2).

Roche, S., Propeck-Zimmermann, E., & Mericskay, B. (2011). GeoWeb and crisis management: Issues and perspectives of volunteered geographic information. *GeoJournal, 78*(1), 1-20.

Rogers, E. M. (2003). *Diffusion of Innovations.* New York, NY: Free Press.

Sahana. (2014). About. Retrieved August 10, 2014, from http://sahanafoundation.org/about-us/

Schilderman, T. (2002). Strengthening the knowledge and information systems of the urban poor. Practical answers to poverty. *Department of International Development.* Retrieved August 10, 2014, from http://www.ucl.ac.uk/dpuprojects/drivers_urb_change/urb_society/pdf_health_educ/ITDG_Schilderman_strenghthening_knowledge.pdf

Schiller, J. H., & Voisard, A. (2004). Location-based services. San Francisco, CA: Elsevier.

Scholz, T. (2008). Market ideology and the myths of Web 2.0. *First Monday, 13*(3).

Shanley, L. A., Burns, R., Bastian, Z., & Robson, E. S. (2013). Tweeting up a storm: The promise and perils of crisis mapping. *Photogrammetric Engineering and Remote Sensing, 79*(10), 865-879.

Shanmugavelan, M. (2000). IT in developing nations. *Intermedia, 28*(1), 29-32.

Shilton, K. (2009). Four billion little brothers? Privacy, mobile phones, and ubiquitous data collection. *Communications of the ACM, 52*(11), 48-53.

Sieber, R. E. (2003). Public participation geographic information systems across borders. *The Canadian Geographer/Le Géographe canadien, 47*(1), 50-61.

Sieber, R. E. (2004). Rewiring for a GIS/2. *Cartographica: The International Journal for Geographic Information and Geovisualization, 39*(1), 25-39.

Sieber, R. E. (2006). Public participation geographic information systems: A literature review and framework. *Annals of the Association of American Geographers, 96*(3), 491-507.

Sieber, R. E., Dodge, M., Turner, A., Gorman, S., & Skupin, A. (2009). *Neogeographers meet Paleogeographers*. Panel session. Association of American Geographers Annual Meeting, Las Vegas, NV, March 22-27.

Seeger, C. J. (2008). The role of facilitated volunteered geographic information in the landscape planning and site design process. *GeoJournal, 72*(3-4), 199-213.

Silverman, R. M. (2003). Progressive reform, gender and institutional structure: a critical analysis of

citizen participation in Detroit's Community Development Corporations (CDCs). *Urban Studies, 40*(13), 2731-2750.

Silverman, R. M. (2005). Caught in the middle: community development corporations (CDCs) and the conflict between grassroots and instrumental forms of citizen participation. *Community Development, 36*(2), 35-51

Smith, S., Bellaby, P., & Lindsay, S. (2010). Social inclusion at different scales in the urban environment: Locating the community to empower. *Urban Studies, 47*, 1439-1459.

Soden, R., & Palen, L. (2014). From Crowdsourced Mapping to Community Mapping: The Post-Earthquake Work of OpenStreetMap Haiti. Chiara Rossitto· Luigina Ciolfi, 311.

Standby Task Force. (2014). About. Retrieved August 10, 2014, from http://blog.standbytaskforce.com/

Statistics Canada. (2007, March 13). Lachine, Quebec (Code2466057) (table). 2006 Community Profiles. 2006 Census. Statistics Canada Catalogue no. 92-591-XWE. Ottawa. Retrieved August 10, 2014, from http://www12.statcan.ca/census-recensement/2006/dp-pd/ prof/92-591/index.cfm? Lang=E

Steyaert, J. (2000). Local governments online and the role of the resident government shop versus electronic community. *Social Science Computer Review, 18*(1), 3-16.

Stoecker, R.R. (2005). Is community informatics good for communities? Questions confronting an emerging field. *The Journal of Community Informatics, 1*(3), 13-26.

Spreitzer, G. M. (1997). Toward a common ground in defining empowerment. In National Academy of Management Meetings, 1995, Vancouver, BC: Elsevier Science/JAI Press.

Sullivan, M., Kone, A., Senturia, K. D., Chrisman, N. J., Ciske, S. J., & Krieger, J. W. (2001). Researcher and researched--community perspectives: Toward bridging the gap. *Health Education Behaviour, 28*(2), 130-149.

Thompson, M. M. (2012). The city of New Orleans blight fight: Using GIS technology to integrate local knowledge. *Housing Policy Debate, 22*(1), 101-115.

Tortora, B., & Rheault, M. (2011, September 16). Mobile phone access varies widely in sub-Saharan Africa: Average phone owner is more likely to be male, educated, and urban. *Gallup News*. Retrieved August 10, 2014, from http://www.gallup.com/poll/149519/mobile-phone-access-varies-widely-sub-saharan-africa.aspx?version=print

Tudge, P. (2010). Connecting rural and remote communities through the geoweb. Workshop Report. November 18-20th, 2010, McGill University, Montreal, QC.

Tulloch, D. L., & Shapiro, T. (2003). The intersection of data access and public participation: Impacting

GIS users' success. *URISA Journal, 15*(2), 55-60.

Turner, A. (2006). Introduction to neogeography. O'Reilly Media, Inc.

Unwin, P. T. H. (Ed.). (2009). ICT4D: Information and communication technology for development. Cambridge University Press.

Warf, B. (1995). Telecommunications and the changing geographies of knowledge transmission in the late 20th century. *Urban Studies, 32*(2), 361-378.

Warkentin, M., Gefen, D., Pavlou, P. A., & Rose, G. M. (2002). Encouraging citizen adoption of e-government by building trust. Electronic markets, 12(3), 157-162.

Wellman, B. (1999). The network community: An introduction. Networks in the global village. *Life in Contemporary Communities*, 1-47.

Wellman, B., & Leighton, B. (1982). Networks, neighborhoods, and communities: approaches to the study of the community question, in L. S. Bourne (Ed.), Internal Structure of the City: Readings on urban form, growth and policy, New York, NY: Oxford University Press.

Wiggins, A., & Crowston, K. (2011). From conservation to crowdsourcing: A typology of citizen science. In *System Sciences (HICSS)*, 2011 44th Hawaii International Conference on Systems Sciences 1-10. Institute of Electrical and Electronics Engineers.

Williams, M. C., (1985). *Neighborhood organizations: Seeds of a new urban life.* Westport, CT: Greenwood.

Wilson, M. W., & Graham, M. (2013). Situating neogeography. *Environment and Planning A, 45*(1), 3-9.

Wong, A. (2008). The impact of mobile phones on the new urban poor: Leaving an urban footprint? *Journal of Urban Technology, 15*(3), 25-38.

Van der Lelie, C. (2006). The value of storyboards in the product design process. *Personal and Ubiquitous Computing, 10*(2-3), 159-162.

Van Zomeren, M., & Iyer, A. (2009). Introduction to the social and psychological dynamics of collective action. *Journal of Social Issues, 65*(4), 645-660.

Young, N. (2013, February 3). MOOCs, crowdsourcing, crisis mapping. The Spark (205). CBC. Retrieved August 10, 2014, from http://www.cbc.ca/player/Radio/Spark/ID/2331377119/

Yzer, M. C., & Southwell, B.G. (2008). New communication technologies, old questions. *American Behavioral Scientist, 52*(1), 8-20.

Ziemke, J. (2012). Crisis Mapping: The Construction of a New Interdisciplinary Field? *Journal of Map & Geography Libraries, 8*(2), 101-117.

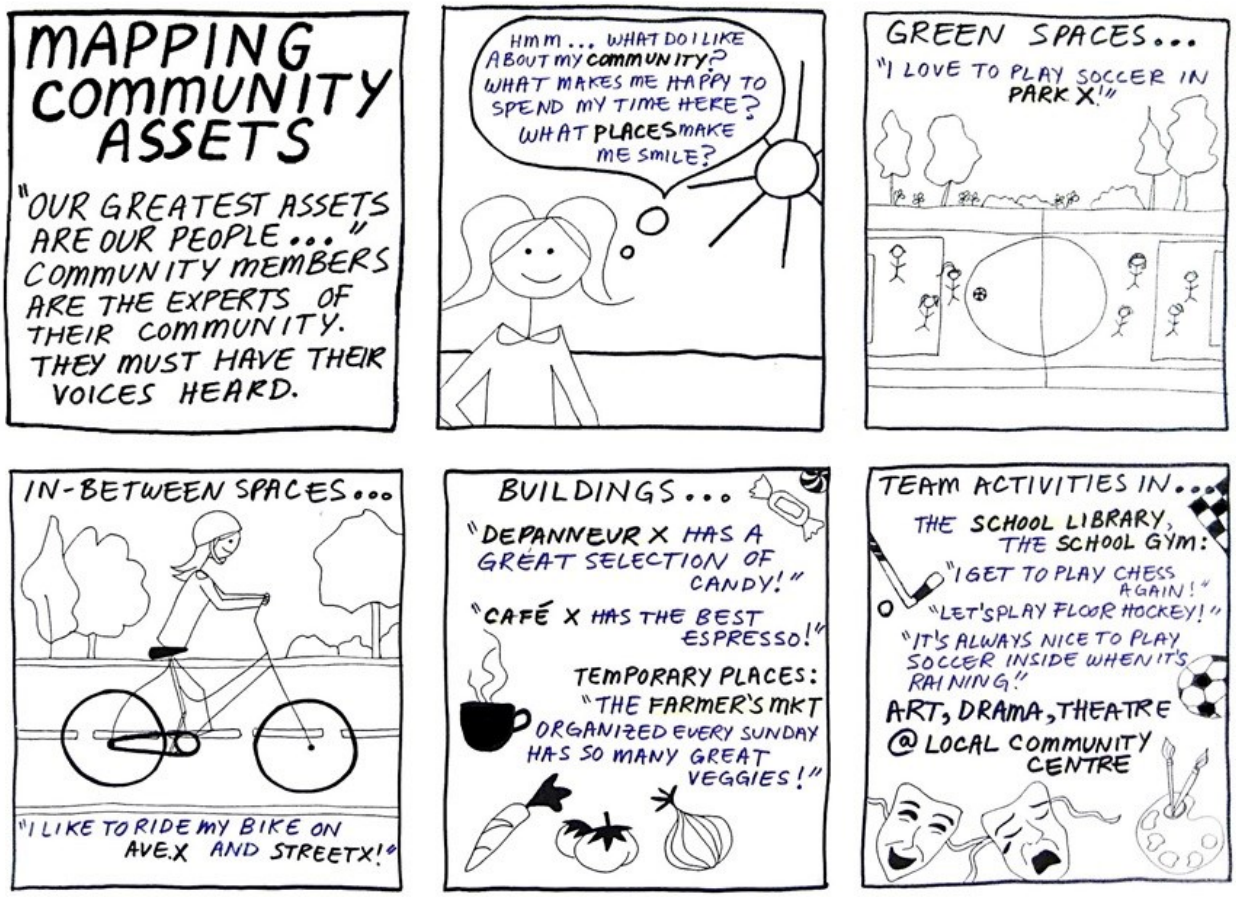
Zikopoulos, P. C., C. Eaton, D. deRoos, T. Deutsch and G. Lapis (2012). *Understanding big data. Analytics for enterprise class hadoop and streaming data.* New York, McGraw-Hill.

Zook, M, Graham, M., Shelton, T., & Gorman, S. (2010). Volunteered geographic information and crowdsourcing disaster relief: A case study of the Haitian earthquake. *World Medical and Health Policy, 2*(2), 7-33.

Appendices

Appendix A - Storyboards as a Research Methodology

Storyboards for research project proposal for two audiences: academic storyboards and community storyboards. The academic storyboards are below. Storyboards for research project academic and community proposal in French (for Lachine) and modified storyboards for research project community proposal (Vancouver) are available online. Presentations of all storyboards can be viewed as Prezis at: http://prezi.com/user/anabrandusescu




WHAT WOULD YOU WANT IMPROVED IN YOUR COMMUNITY?
WHAT...
• PLACES
• RESOURCES
Hmm... WHAT WOULD I WANT IMPROVED IN MY COMMUNITY? WHAT MAKES ME UNHAPPY TO SPEND MY TIME HERE? WHAT PLACES MAKE ME SAD?
GREEN SPACES...
"I WOULD LOVE TO PLAY SOCCER IN PARKX!"
IN-BETWEEN SPACES...
"A BIKE PATH WOULD BE SO NICE TO RIDE ON AND SO SAFE!"
"...IT WOULD BE GREAT TO BUILD IT ON AVENUE X AND STREET X."
BUILDINGS...
"DEPANNEUR X SHOULD HAVE MORE CANDIES TO CHOOSE FROM!"
TEMPORARY PLACES:
"I WISH CAFÉX HAD BETTER COFFEE!"
"I WISH WE HAD A FARMER'S MKT IN OUR COMMUNITY TO BUY FRESH VEGGIES!"
TEAM ACTIVITIES IN...
THE SCHOOL LIBRARY,
THE SCHOOL GYM:
"I WISH I COULD PLAY CHESS, FLOOR HOCKEY AND SOCCER AT SCHOOL
"...I WISH WE HAD A PLACE TO PAINT AND HAVE PLAYS IN OUR COMMUNITY!"
ART, DRAMA, THEATRE @ LOCAL COMMUNITY CENTRE
IMPROVEMENT NEEDED IN COMMUNITY SPACES
HMM... AM I THE ONLY ONE WHO FEELS THIS WAY? I WONDER WHAT HOLLIS AND ROSS THINK ABOUT THIS...
AN IDEA...
I KNOW! I'LL SEND THEM A TEXT MESSAGE!
TEXTING AWAY...
MEANWHILE...
HOLLIS
YEAH, I AGREE WITH YOU! YOU CAN TEXT WHAT YOU THINK ABOUT COMMUNITY PLACES AT THIS WEBSITE. IT'S CALLED LACHINE SPACES!
ROSS
LACHINE PLACES
MAP
LACHINE
240
90
40
OF AGGREGATED MESSAGES IN AN AREA
CATEGORIES
• CAFÉ X
• DEPANNEUR
• GREEN SPACES
• SCHOOL X
• PARK X
• ROAD/AVE/STREET X
"COOL! MY THOUGHTS CAN BE MAPPED WITH MY CELL PHONE. I CAN TEXT ABOUT PLACES IN MY COMMUNITY!"

WHY MOBILE PHONES IN COMMUNITIES? WHY THE LACHINE SPACES WEBSITE?

SIMILARITIES + DIFFERENCES

- COMMUNITY MEMBERS CAN SHARE THEIR THOUGHTS BY SENDING A MESSAGE VIA MOBILE PHONES
- YOU CAN FIND OUT WHAT OTHERS ARE TEXTING ABOUT COMMUNITY SPACES

LACHINE SPACES: CREATING A DIALOGUE ABOUT COMMUNITY PLACES

MESSAGE: "I WISH WE HAD A PLACE FOR ART ACTIVITIES IN OUR COMMUNITY."
REPLY #1: "I AGREE! I WOULD LOVE TO HAVE A LOCAL YOUTH CENTRE FOR PLAYS AND PAINTING CLASSES!"
REPLY #2: "GREAT IDEA! MUSIC COURSES TOO"
REPLY #3: "HOW ABOUT DANCE CLASSES?"

NOW WHAT HAPPENS?

THAT'S GREAT THAT OTHERS WANT SIMILAR IMPROVEMENTS IN OUR COMMUNITY, BUT WHAT DO WE DO WITH ALL THE COLLECTED MESSAGES?

LET'S MEET + TALK ABOUT COMMUNITY ASSETS + SPACES THAT NEED IMPROVEMENT

NEXT UP...

CONTACT CITY HALL, A COMMUNITY-BASED ORGANIZATION OR A LOCAL SCHOOL AND PRESENT THE TEXTS ABOUT COMMUNITY SPACES

TEXTING CAN BE USED TO SHOW PROGRESS: AS CHANGES IN THE COMMUNITY ARE MADE, THOUGHTS ON THESE CHANGES CAN FURTHER BE RECORDED + MAPPED!

COMMUNITY DEVELOPMENT

WHAT IS IT?

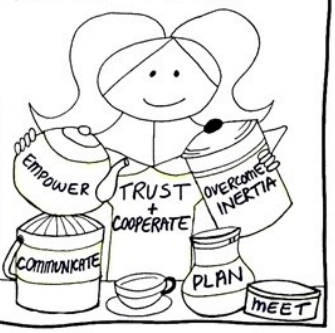
"A STRUCTURED INTERVENTION THAT GIVES COMMUNITIES GREATER CONTROL OVER THE CONDITIONS THAT AFFECT THEIR LIVES." (LYNDON, 2011)

A COMBINATION OF...

* COMMUNITY ORGANIZING + COMMUNITY ECONOMIC DEVELOPMENT *

WHICH AIM FOR:
- COMMUNITY INVOLVEMENT
- ALTERNATIVE VALUES OF ECONOMIC + SOCIAL DEVELOPMENT
- REFORM + SUSTAINABLE GROWTH (ALINSKY, 1971)

A NEED TO...



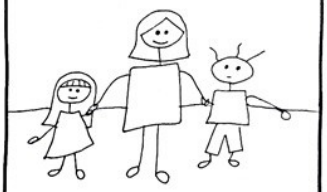
COMMUNITY SELF-HELP (BURNS ET AL, 2004)

- SURVIVE
- THRIVE
- EVOLVE

IT REQUIRES CLOSE COMMUNITY KNOWLEDGE..

THE FOCUS WILL BE ON:
- SPATIAL DISTRIBUTION
- URBAN PLANNING

BECAUSE...



"SOMETIMES THE SPARK COMES FROM WITHIN." (SHRAGGE, 1997, p.23)

COMMUNITY DEVELOPMENT FROM WITHIN

COMMUNITY MEMBERS KNOW WHAT IS BEST FOR THEIR COMMUNITY, BECAUSE GOVERNMENT THINKS THEY KNOW BEST.

"WHAT ABOUT THE OUTSIDER? THE ONE OUTSIDE OUR NEIGHBOURHOOD?"

"WHY SHOULD WE EXPAND THE LIMITS OF OUR HOSPITALITY BEYOND COMMUNITY ORGANIZATIONS?" (NOTE EXISTING TENSIONS BETWEEN UNIVERSITY-COMMUNITY PARTNERSHIPS).

(BURNS ET AL., 2004, P. 16)

COMMUNITY ORGANIZING + COMMUNITY ECONOMIC DEVELOPMENT ADVOCATES DO NOT ALWAYS AGREE WITH THIS EXPANSION...

TRUST WITHIN THE COMMUNITY IS KEY.

(ALINSKY, 1971)

THE OUTSIDER CAN:

- POSE A THREAT TO THE COMMUNITY BY IMPOSING CERTAIN AGENDAS
- PROMOTE GLOBALIZATION, ENCOURAGING FOREIGN INFLUENCE + CONTROL
- WEAKEN COMMUNITY TIES

(BURNS ET AL., 2004)

HOWEVER...

INTERACTING WITH THE OUTSIDER CAN BE USEFUL FOR THE COMMUNITY.

"OUR WELCOME IS THE SIGN OF A COMMUNITY CONFIDENT IN ITSELF."

(MCKNIGHT + BLOCK, 2010, P. 135)

THIS NEW CONNECTION IS ABOUT SHARING INFORMATION

HOW DOES SHARING INFORMATION WORK?

A STORY ABOUT COMMUNITY INFORMATICS

WHAT IS COMMUNITY INFORMATICS (CI)?

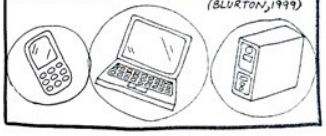
THE INTERACTION BETWEEN LOCAL COMMUNITIES AND INFORMATION TECHNOLOGIES, WITH A FOCUS ON SOCIAL INFORMATICS. (MCIVER, 2003)

IT SUPPORTS TECHNOLOGY DRIVEN INITIATIVES, INFORMATION SHARING, AND BOTTOM-UP APPROACHES TO COMMUNITY DEVELOPMENT

CI SUPPORTS INFORMATION COMMUNICATION TECHNOLOGIES (ICTs)

"A DIVERSE SET OF TECHNOLOGICAL TOOLS AND RESOURCES USED TO COMMUNICATE, CREATE, DISSEMINATE, STORE, AND MANAGE INFORMATION."

(BLURTON, 1999)

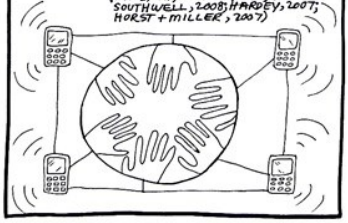


THE ICT WE WILL FOCUS ON IS MOBILE TECHNOLOGY ... IN PARTICULAR

MOBILE PHONES

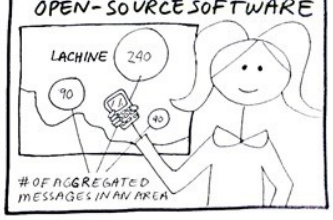
MOBILE TECHNOLOGY FACILITATES COMMUNICATION, PROMOTES NETWORKING, AND SOCIAL STRUCTURES IN COMMUNITIES.

(KATZ, 2011; DONNER, 2008; YEAR+ SOUTHWELL, 2008; HARLEY, 2007; HORST + MILLER, 2007)



USING AN ONLINE APPLICATION, THE LACHINE SPACES WEBSITE IS CREATED, WHERE TEXT MESSAGES ARE MAPPED BASED ON CONTENT LOCATION

HERE WE HAVE A MIX OF MOBILE TECHNOLOGY + OPEN-SOURCE SOFTWARE



COMPLEXITIES OF COMMUNITY INFORMATICS

IMPORTANCE OF FACE-TO-FACE INTERACTION WHEN IMPLEMENTING TECHNOLOGY (GIRARD + Ó SIOCHRÚ, 2003)

"BECAUSE ICTs ARE NOT ALWAYS PARTICIPATORY."

(TOO MUCH FOCUS ON THE TECHNOLOGY + TOO LITTLE FOCUS ON THE COMMUNITY MEMBERS)

CITIZEN SENSING

CITIZENS ARE:

1) BETTER SENSORS FOR THEIR ENVIRONMENT
2) CLOSER TO THE PHENOMENON, THUS CAN APPROACH IT FASTER
3) AND BETTER AT SENSING SUBTLE CHANGES IN THE COMMUNITY (GOODCHILD, 2007)

ICT + PARTICIPATION MUST GO...

BEYOND COMMUNITY-MEMBER INCLUSION

"A PARTICIPATORY APPROACH MUST ALSO RESPOND TO THE DIVERSITY OF USERS AND NEEDS THAT EXIST WITHIN COMMUNITIES. USER COMMUNITIES CANNOT BE VIEWED BE HOMOGENOUS."

COMMUNITIES DIFFER IN THEIR NEEDS + GOALS. (MCIVER, 2003, P.35)

WHAT HAPPENS TO NEGATIVE TEXTS?

HOW DO WE MANAGE REALLY NEGATIVE COMMENTS?

NOT EVERYONE WILL FEEL POSITIVE ABOUT EVERY PLACE + SPACE...

WHAT WILL THE STRATEGY FOR ADDRESSING NEGATIVITY BE?

CONSTRUCTIVE SPACES...

WHAT WOULD YOU LIKE TO IMPROVE?

WHAT HAS TO CHANGE TO ALTER NEGATIVITY?

A CLOSER LOOK AT TECHNOLOGY

WE HAVE COME A LONG WAY...

IN THE ADVANCES WE HAVE MADE.

- RE-DESIGNED INTERFACES THAT ARE BUILT FOR NON-EXPERT USE
- USER FRIENDLINESS
- WEB 1.0 TO WEB 2.0 TRANSITION ENCOURAGES CONVERSATION + PARTICIPATION

HOWEVER, WE MUST RECOGNIZE TECHNOLOGICAL CHALLENGES...

- INTEROPERABILITY
- COST
- INTERFACE + PLATFORM ISSUES: NO AGREEMENT OVER A MAPPING BASE HAS BEEN MADE

IN THIS WEB 2.0 WORLD, WE HAVE MANY CHOICES AND SHOULD STRIVE FOR...

TECHNOLOGICAL SUSTAINABILITY

- BRIDGE THE EXPERT + NON-EXPERT USER GAP
- PRIORITIZE + FACILITATE COMMUNITY GOALS

THE DEMOCRATIZATION OF TECHNOLOGY IS OCCURING RIGHT NOW. SO, HOW WILL THIS PHENOMENON ADDRESS ISSUES SUCH AS...

USER CONTROL

COMMUNITY MEMBERS ARE NOT ALWAYS IN CHARGE OF THE TECHNOLOGY USED. FROM A COMMUNITY PERSPECTIVE, "USERS WANT TO HAVE THEIR OWN SYSTEM, SOMETHING WHICH WORKS WITH THEM TO SOLVE THEIR PROBLEM."

"START WITH THE PROBLEM, NOT THE TECHNOLOGY." (BANKS, 2009)

TECHNOLOGY + COMMUNITY

ARE COMMUNITY GOALS BEING REPRESENTED WHEN TECHNOLOGY IS USED? IS IT RELEVANT? DOES TECHNOLOGY HELP OR INHIBIT COMMUNICATION?

LET'S FIND OUT!

MAPPING AND TEXTING GO TOGETHER!

VISUALIZING TEXTS USING...

A SIM CARD + GSM MODEM + DESKTOP OR LAPTOP +

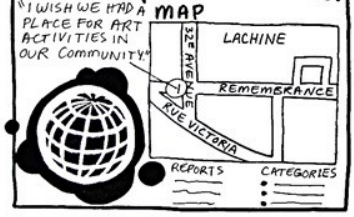
FRONTLINESMS AN OPEN-SOURCE SOFTWARE THAT RECORDS TEXT MESSAGES TO...

VISUALIZE PLACES

BY LINKING PREVIOUS COMPONENTS WITH THE CROWDMAP, OPEN-SOURCE SOFTWARE TO INTEGRATE A MAPPING INTERFACE, LIKE OPENSTREETMAP IN THE WEBSITE TO SHOW THE LOCATION OF THE TEXT CONTENT.

MAPPING COMMUNITY SPACES WITH TEXTS

WHEN ALL TECHNICAL COMPONENTS ARE COMBINED, CONTENT + MAP THE RESULT IS:



A WAY TO SHARE AND ORGANIZE INFORMATION

- FLEXIBLE
- EASY TO USE
- MOBILE
- INTERACTIVE
- TIME EFFICIENT

BUT WILL IT WORK?

WE HAVE TO REMEMBER...

TECHNOLOGY ALONE IS NOT ENOUGH TO IMPROVE COMMUNITIES OR DISPLAY THEIR ASSETS COMMUNITY MEMBER PARTICIPATION IS KEY. DECISIONS MUST BE MADE TO IMPLEMENT APPROPRIATE TECHNOLOGY SUCH AS...

WHICH WEB MAPPING APPLICATION SHOULD YOU CHOOSE?

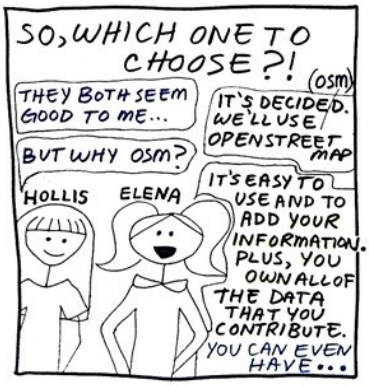
GOOGLE MAPS

PROS	CONS
• EASY TO USE, GOOD NAVIGATION	• QUALITY + ACCURACY OF INFORMATION IS INCONSISTENT
• POPULAR	• DATA IS OWNED + COPYRIGHTED BY MULTIPLE ORGANIZATIONS
• ABILITY TO GET DIRECTIONS BASED ON MODE OF TRAVEL (EG., DRIVING, PUBLIC TRANSPORTATION, BIKING, WALKING)	• BUSINESS NEEDS ARE GREATER THAN COMMUNITY NEEDS
	• COPYRIGHT ISSUES

OPENSTREETMAP

PROS	CONS
• EASY TO USE	• LESS POPULAR + WELL KNOWN
• ENCOURAGES COMMUNITY MAPPING	• DISAGREEMENTS AMONG PROPERTY LINES + PLACE NAMES, FOR EXAMPLE, MAY ARISE
• DETAIL + UTILITY IS UNMATCHED BY COMMERCIAL COMPANIES	• INCONSISTENCY OF DATA; NO GUARANTEE OF ACCURACY OF ANY KIND
• FREE DATA SET WITHOUT THE LIMITATIONS OF A TERMS OF SERVICE	
• 100% OF DATA IS INDEPENDENT	

SO, WHICH ONE TO CHOOSE?!



MAPPING PARTIES!

EXPLORE YOUR COMMUNITY BY FOOT + SEARCH FOR:

- BUILDINGS
- STREETS, AVENUES
- PARKS, FOUNTAINS

THAT ARE NOT MAPPED ON OSM.

TAKE CHARGE OVER HOW YOUR COMMUNITY IS REPRESENTED WITH OPEN STREET MAP!

A VISUAL WAY TO BUILD YOUR COMMUNITY FROM WITHIN.

Appendix B – Acadia Park Spaces Multilingual Posters