# A Web of Expectations: Evolving Relationships in Community Participatory Geoweb Projects.


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**Abstract**

New forms of participatory online geospatial technology have the potential to support citizen engagement in governance and community development. The mechanisms of this contribution have predominantly been cast in the literature as 'citizens as sensors', with individuals acting as a distributed network, feeding academics or government with data. To counter this dominant perspective, we describe our shared experiences with the development of three community-based Geospatial Web 2.0 (Geoweb) projects, where community organizations were engaged as partners, with the general aim to bring about social change in their communities through technology development and implementation. Developing Geoweb tools with community organizations was a process that saw significant evolution of project expectations and relationships. As Geoweb tool development encountered the realities of technological development and implementation in a community context, this served to reduce organizational enthusiasm and support for projects as a whole. We question the power dynamics at play between university researchers and organizations, including project financing, both during development and in the long term. How researchers managed, or perpetuated, many of the popular myths of the Geoweb, namely that it is inexpensive and easy to use (thought not to build, perhaps) impacted the success of each project and the sustainability of relationships between researcher and organization. Ultimately, this research shows the continuing gap between the promise of online geospatial technology, and the realities of its implementation at the community level.

Keywords: Geoweb, community development, technology implementation, social context, stakeholders

## Introduction

The recent promotion of online tools for informing and engaging the public has roots in broader conceptual and pragmatic trends in the study of governments; in trends in environmental decision-making; in critical examinations of science and technology; and in the potential benefits of the application of Participatory Geographic Information Systems (PGIS). For over two decades there has been a slow but significant move away from conceptualizing governments as singular authorities that manage public affairs. Owing to the general absence of government involvement in service provision in some global settings such as cities in the Global South (National Research Council, 2003), questions about the legitimacy of governments (Skogstad, 2003), and the general recognition that governments are in a state of transformation adapting to complex domestic and global affairs, there has been a shift from the study of government to the study of governance (Savan et al., 2004). This shift emphasizes the process of governing in which a range of actors interact to produce outcomes, with the lines between them often being blurred (Stoker, 1998). In reconceptualizing the role of government and with the emergence of dynamic and adaptive on-line decision-making supports and processes, (Elwood, 2010, Goodchild, 2008) formerly accepted distinctions

between expert and lay knowledge have diminished (Keen, 2008). This is not a surprising result: as decision-making processes are opened to or opened by a new set of actors, the potential for new forms of knowledge to also emerge is heightened. This raises questions about the meaning of experts and expertise (Leach et al., 2005; Fischer, 2009) and also the tools and processes that exist to facilitate a greater diversity of knowledge in public affairs, such as the use of Geographic Information Systems (GIS) in participatory processes (Sieber, 2006; Dunn, 2007). It is amidst these conceptual and normative shifts that online, map-based Web 2.0 tools (the Geospatial Web 2.0, or Geoweb) have emerged as promising mechanisms of engagement (Rouse et al., 2007; Johnson and Sieber, 2012a).

The Geoweb builds on the concepts of Web 2.0, including the multi-directional sharing of information between networked users, replacing the traditional Web 1.0 model based on authoritative sources, such as mainstream media channels, producing 'official' content that is then passively consumed by an online readership (O'Reilly, 2005). Web 2.0 is seen to be more 'democratic', with greater emphasis on the importance and value of multiple individual voices (and content) compared to the expert-driven Web 1.0 (Chadwick, 2009; Hall et al., 2010). A social media network provides a common example of Web 2.0 in practice, with users sharing their own information, including daily activities, personal preferences, locational information, and rich web content, such as photos and videos, with other users. The Geoweb is the geospatial variant of Web 2.0, where users interact, typically through the interface of a web-based map that is built on cloud services like application programming interfaces (e.g. Google Maps), to contribute location-related information, often called Volunteered Geographic Information or VGI (Goodchild, 2007).

VGI is contributed by individuals, based on their own personal experience and often without compensation. VGI contribution has been cast as 'citizens as sensors', with individuals collecting data to support citizen science research (Haklay et al., 2008), to fill gaps left behind by government cutbacks, or as data-rich statements highlighting the failures of government (Johnson and Sieber, 2012a). This perspective reduces the role of citizens to that of instruments acting at the command of the Geoweb developer/sponsor. An emerging critique of this perspective draws on PGIS literature to present citizens not as sensors, but as partners in the construction, deployment, and potential benefits/losses involved with Geoweb development (Elwood, 2010; Corbett, 2012). We position the Geoweb as the implementation of technology (a set of specific software products) and process (project development), that may realize the 'citizens as partners' perspective of PGIS (Elwood, 2008), using maps and related social media to support and bring about social change through treating citizens as agents in local governance, planning and decision-making. With this orientation, the Geoweb demonstrates how VGI can be directed towards supporting the social and empowerment objectives of PGIS, though this in turn creates a new series of

challenges for community use and adoption of geospatial technologies, as development and implementation can be a complicated and path dependent process.

An increasing number of Geoweb applications now focus on community civic engagement, planning, and local governance (Corbett, 2012; Johnson and Sieber, 2012b). This has led to the development of participatory components of these tools; they are now being designed as frameworks for individuals or groups to contribute opinions, landmarks, sightings, and other forms of local and hyperlocal information (Tulloch, 2008; Miller, 2007). Despite the more inclusive design, these new maps continue to evoke power relations, involving authoritative agents to produce them, digital inequities in the people that contribute geographic content (Crutcher and Zook 2009) and are found to draw and reconstitute their power within and through these relations (Parker, 2006). In this sense, the Geoweb can be considered a process of creating and formalizing knowledge of specific stakeholders. This mirrors statements that mapping is not an objective practice, but rather one that is a function and product of the character of social relations in those contexts and the associated power and authority in those contexts (Harley, 1989; Kitchin and Dodge, 2007; Wood, 2009). The Geoweb, as considered in this research, largely replicates this procedural focus, where community members, stakeholders, and academic developers contribute to the way the tools are built and the information is mapped.

Developing and implementing a Geoweb tool in partnership with a community or government organization involves constant negotiation between all parties in terms of project goals, approach, design, and technology choices. The relationship between the Geoweb developer and the partner organization may evolve dramatically over the course of project development, with potential for moving the project (and relationships) in unanticipated directions. Research has focused on the large actors and the end users--the volunteers (Dalton 2012). A focus on the practice of civic platform/applications developers--that is, how these applications come to be--is largely under-represented in the theoretical discussions that dominate the Geoweb and VGI literatures (Elwood, 2010; Elwood, 2008; Elwood and Leszczynski 2012; Crampton 2013).

This research investigates the frictions that emerge through the co-development of these applications and how these tensions and deliberations influence the outcome of Geoweb projects. Using a comparison of Geoweb tools developed with three separate community partners, we illustrate that technology development does not occur within a vacuum; it must also be understood as a process strongly directed by the evolving social relationships of two or more unique organizations with very different levels of expertise, resources, and capacity. The impacts of this process on the product, relationships, and on the process of development itself, are examined. We base our discussion of the social evolution of community-based participatory Geoweb projects on our experiences

developing Geoweb applications with three separate community organizations throughout Canada.

## Methodology

The findings of this paper are the result of a critical self-assessment of the participatory action research (PAR) processes used to develop the three Geoweb projects. Our approach responds to ongoing questions raised in the broader literature about what "...practices, and politics emerge from the geoweb" (Elwood, 2010, 402). In developing the findings presented here, the authors engaged in a group reflection of Geoweb projects, from which key common themes were identified. In each case described below, the overarching tenets of PAR were central: a collective commitment to investigate an issue of social importance; a desire by all partners to engage in self-reflection to gain greater understanding of the issue or problem; a joint decision by partners to work together to try to meet individual and collective goals; and the building of an alliance or partnership between researchers and practitioners in the planning and implementation of the process (McIntyre, 2008). Given the normative goals embedded in the application of Geoweb tools (i.e., enhance, improve or alter the means by which 'the public' can share knowledge with the potential to influence policy and planning choices or outcomes), these projects were also similar because they were driven by a desire to produce 'actionable knowledge' for both the community group and the academic partners: knowledge that could be used to help guide next steps in both practice and research (Dewulf et al., 2005). Hence, the process entailed refining and tailoring Geoweb software to suit the knowledge collection goals of the community groups, while at the same time assessing the challenges in this process and in the deployment of the software. Ultimately, the data collection goals of the community groups drove the end product - the Geoweb tool deployed. These goals, however, were altered when implementation, capacity, technological or resource constraints arose and when discussion between partners led to an agreed upon change in goals. We believe that this self-assessment and reflection process is unique and responds to a simple yet overarching need to engage in more critical analysis of multiple cases of geoweb application (Sieber, 2006).

The projects discussed below evolved in very different geographic and political contexts, focused on distinct issues, tried to engage with dissimilar 'publics', and, applied different Geoweb tools. As a result of this, individual experiences are not generalizable and they do not represent 'unique' or 'critical' cases that are more often the hallmark of theory-testing case study research. Instead, these cases, considered individually and collectively, are presented and analyzed in the spirit of theory-building case study research, which starts with and is built on the collective assessment of knowledge generated from deep understandings of individual cases. Comparatively, the cases are held together by the fact that they were all developed in collaboration with academics working under the same collective research project who were driven by the same overarching team research goals. For the purposes of this paper, the central goal

was to advance knowledge about the critical processes involved in geoweb development and implementation and to assist in theory-building. Hence, what validates the inclusion of each of the cases discussed and analyzed here is the shared research goal and method of self-reflection and assessment of the process of geoweb tool development.

At a time when research suggests that the proliferation of new Internet mapping technology has not seen a commensurate increase in PPGIS participation rates (Brown, 2012), the collective assessment of individual cases of geoweb tool development and application offers lessons that are important for better understanding how social and power dynamics in geoweb tool development influence broader questions about factors influencing participation when Geoweb tools are used.

**Case study descriptions**

Web-based programming, particularly related to user-interactivity, has rapidly developed over the past five years, with the range of potential Geoweb functionality now largely limited by the imagination. There remains a clear disconnect between the persuasive simplicity of social networking application interfaces, of which the Geoweb is one, and the brutal reality of designing, coding and testing of their usability and robustness. Numerous 'out of the box' solutions promise to deliver participatory Geoweb applications (e.g., Google My Maps, Geocommons.org, and ArcGIS Online), however, each solution has significant constraints. Existing applications are often too expensive, too simplistic, limited by the requirement to be built using proprietary software, or cannot guarantee the privacy and integrity of the data shared (Elwood and Leszczynski, 2011).

To overcome these drawbacks in the projects described in this paper, we set about building our own set of tools to support online Geoweb participation. In hindsight, there were significant risks in doing this, not least because most academics remain untrained in software development, design, marketing, long-term application management and updating, legal related issues, terms of service and the many other realities that have emerged. Each case study involves a small community and associated governmental or non-governmental organization partnering with a university to develop and deploy a Geoweb project. Further uniting these cases, we sought to develop and then evaluate Geoweb tools with the normative goals of allowing participation from non-experts. Each partnership was launched with emphasis on the potential of the Geoweb as a tool for communication, engagement, and dialogue, and as a way for community partners to participate in a rapidly emerging, and potentially exciting, area of technology. We briefly describe each case study context.

In the first case study, the Geoweb was used in a participatory fashion in the rural area of Acton, Quebec, to create a business promotion website as one component of a larger regional economic development strategy (Johnson & Sieber, 2012b; Beaudreau, Johnson, & Sieber, 2012). Acton is a rural area (approximate

population of 16,000) located one hour's drive east of the major Canadian city of Montreal. The economy in Acton largely depends on agriculture and a small light manufacturing sector. Recent economic development initiatives have focused on diversifying the local economic base, building tourism, services, and manufacturing capacity. One identified constraint in the region's economic development strategy was a lack of a strong web presence to raise awareness of the region for prospective investors throughout Quebec. Researchers from McGill University in Montreal, Quebec, created a formal partnership with the local economic development agency (centre locale de développement d'Acton, or CLD) to develop GéoActon, an online map where area business owners could contribute and curate VGI that describes their business (Figure 1). In a region where many businesses do not have a web presence, GéoActon was seen to provide a valuable form of marketing for local business owners, both for customers within the Acton region, and as a demonstration of the range of businesses and activities for potential outside investors. GéoActon is embedded within a larger website created by the CLD to showcase the region and provide information on specific opportunities for business development.

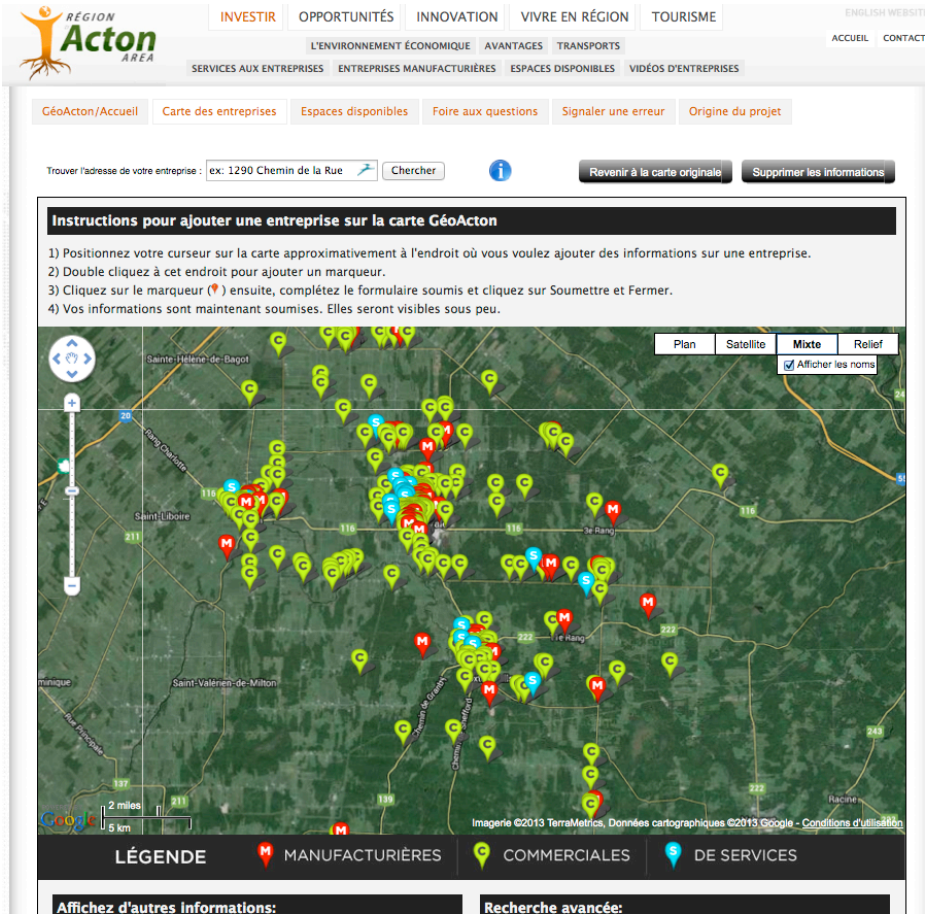


Figure 1: GéoActon interface

The second case study was a partnership between the Kawartha Heritage Conservancy (KHC), Ryerson University (based in Toronto, Ontario) and the University of British Columbia Okanagan campus (UBCO). The Kawartha region is located approximately 90 minutes northeast of Toronto. It is a region rich in lakes, forests, agricultural and recreational opportunities, with the city of Peterborough a central node in the region. The goal of the initiative was to have the map be a repository for cultural heritage in the region. An initial set of cultural heritage data held by KHC (the partnering community organization) was used to create a base layer for the map, along with other geophysical layers contributed by the research team. The goal was to have cultural heritage groups in the region share their knowledge and data with KHC to upload on their behalf or to upload on their own. Once these groups had contributed then the next step was to open up opportunities for the general public to contribute their knowledge (Figure 2). The organization's goals for the project were to examine whether the online tool could serve as a 'living' repository of cultural heritage information that was both accessible to the public and could facilitate the contribution of knowledge from the public. For the researchers, the goal was to understand how and under what conditions different categories of users used the tool and how. A long term goal was to have the data collected to inform future discussions of land use and cultural heritage planning in the region.


Figure 2: Kawartha Heritage Conservancy interface

The third case study represents a collaboration between researchers at the UBCO, the Central Okanagan Food Policy Council, the British Columbia Interior Health Authority, as well as a number of local food related organizations, farms, markets and outreach groups (Brennan, 2012; Wright, 2012). The Central Okanagan represents an interface-community, where the rural (producer) and urban (consumer) populations exist side by side. Increasingly people want to better understand how and where their food is grown, processed and sold in order to

improve access to and make informed decisions about local food. This collaborative project sought to support these processes by providing a web-based mapping tool that displays information, discussion and media about local food through a Google Maps mashup 'Experts' in the field do not populate the information provided through the map; rather a framework has been developed to enable community members themselves to share their own knowledge and experiences about local food and its availability (Figure 3). The goal of the project is to stimulate conversation by asking members of the public probing questions related to their food system - Where is our food available? How is it produced? Is our food healthy? Is our food affordable? What influences our choice of foods? Through the map interface, community members can share their own views and begin a dialogue on relevant issues. At the outset of this project, it was envisioned that information gained through this mapping could play a role in supplementing traditional government and corporate sources; and the dialogue between different community members would help them engage in food related social action through obtaining a deeper and more reflective understanding their food system.

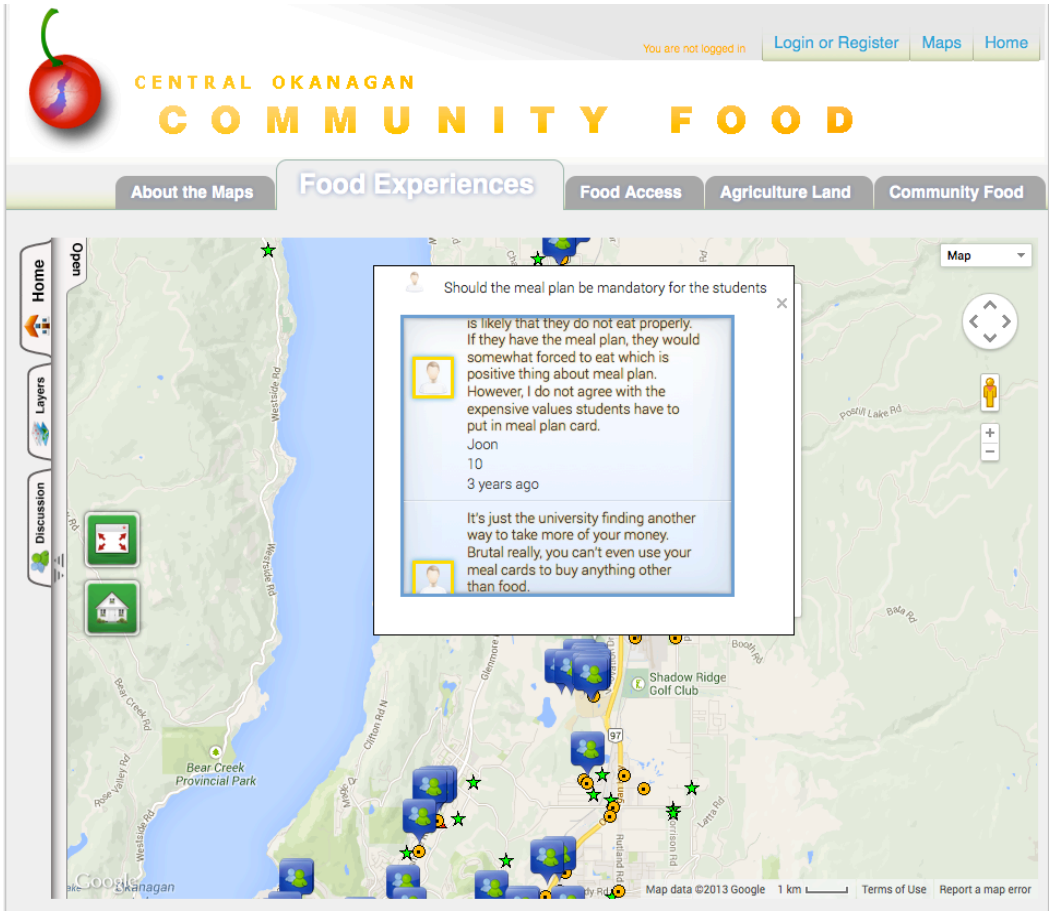


Figure 3: Central Okanagan Community Food Map interface

Though there is variation between these case studies in terms of context, implementation purpose, technology used, and end results, we found common experiences in the relationship between the universities and organizations involved, and in the ways that evolving expectations and relationships were directly influenced by the technology development process. We critically reflect on our experiences, tracing and comparing how technology development and implementation affected the evolution of project participation and relationships over time. These findings shed light on both the Geoweb and its implementation, as well as the tensions that emerge between the praxis of community-university collaborations.

## The process and technology of Participatory Geoweb collaborations

Existing literature on Web 2.0 and the Geoweb makes claims as to the ability of the technology to act as an intermediary to facilitate participation (Rinner et al., 2008; Nuojua, 2010; Johnson and Sieber, 2012a; Hall et al., 2010). The implications of this are profound, with both levels and the nature of participation being affected by the process through which technology is developed and deployed. The technology development process also affects the relationships between those involved with development, a factor that can greatly influence the path of community-based research partnerships. In all three case studies, we found that the process of technology development had substantial influence on the relationship between university developers and community organization partners. This influence was seen in the initial expectations of community partners, differential in power between researcher and community, sustainability of tools and collaborations, and the change from research collaboration towards 'deal making'. We consider how the collaborative nature and evolution of the relationships between community organization and university developer was manifest in the Geoweb technology development process and the impact that this had on development of the product itself and the sustainability of both tools and relationships. We then consider how in all three cases studied, there was a common finding that the expectations between community organization and university researchers evolved in response to the challenges of the Geoweb development and deployment process.

### *Initial Expectations of Community Partners*

We observed in each case study that community partners were initially enthusiastic and optimistic when establishing a partnership with university researchers. As researchers, we partnered with organizations that actively were contemplating using new web-based tools to support public engagement and information sharing. For each organization, the development of a Geoweb site represented a new form and approach to digital communication and engagement with citizens. Elwood and Leszczynski (2011) speak to the high level of visual interactivity afforded by these new spatial media, which appear far more 'doable'--easier to implement and easier to advocate with--than previous technologies like

GIS. Community organizations were very excited about the possibilities for citizen input as well as citizen activism as a result of contributing online. Prior to this research, each partnering group had only limited investment in technology, with existing web-based tools limited to static, Web 1.0 sites (e.g., with maps as images). In most cases, partner websites were programmed and maintained by third-party web developers or by a token volunteer with web development interests. Considering this low baseline level of experience and familiarity with web development technology and tools, in each case study we saw a reliance on the university researchers for not just the application development, but also initially for fostering the connection between the tool, the organization goals, and project directions. University researchers were invested in the development and deployment of successful Geoweb tools as a precondition of gathering research findings through the testing and evaluation of Geoweb usage at the community level. Because several of us are situated in normative disciplines, we were driven by goals of broadening citizen participation and encouraging co-design of the tools. Community partner expectations were thus heavily influenced by the perspective and motivations of the university researchers.

An additional influence of partners relates to strategies in the promotion of the technology. As university researchers, developers of the technology and project intermediaries, we were "selling" the potential of the Geoweb to support the partnering organizations in their activities and strategies (Warf and Sui, 2010). We might have been perceived as promoting it as we were testing software architecture configurations, user experiences as well as graphical user interfaces. Or we were selling it indirectly where the organizations functioned as a vehicle for the testing of these technologies and processes for engagement, vehicles that sought and welcomed university collaboration. In a sense, universities became participants in neoliberal "solutionism". This is where citizens should assume responsibilities traditionally reserved for government (e.g., in one of the cases, local businesses updating their own information instead of government). Participation is problematized because it is structural; participation has a solution and that is Web 2.0; and that Web 2.0 is presented as 'easy' to develop and exploit (Leszczynski, 2012, Morozov, 2013). Our research teams clearly communicated our uncertainty that the technology would produce the ideal or even intended outcomes that the organization desired, the selling point of the collaboration was that organizational investment in the technology would be minimal for a large participation payout. We functioned as inadvertent techno-optimists in the relationship. Partners expectations that the tool would build their networks raise broad attention to their cause and lead to results - for little to no cost to them, whether financial costs such as a direct licensing fee for technology or advertising, operating costs such as staff time, or opportunity costs when time might be better spent elsewhere. However, there was a clear naivete in both sets of partners regarding the required investments and potential outcomes of the project.

### *Differential Power and the Cost(s) of Development*

The experimental nature of the use of Geoweb tools, our expertise as university researchers with clearly articulated institutional affiliations, and our technical capacity to develop and deploy the technology on the organization's behalf put us in a dominant position of power with the potential to lead the process and further reinforce our position in all decision making processes (Parker, 2006). Although all the project partners carefully negotiated the project goals and functionality, of the application the power still resided in the university teams. If we were slow to develop the promised tool then organizations had little recourse other than to break off the relationship, thus undermining their potential to use this new approach. If the tool could not produce the functionality that the organization desired then they had little technical capacity to modify the tool to make it comply with their desired goals. If the tool did not produce the desired outcomes after being deployed, then the organization had to trust the university partners to adapt the tool to match their goals and desires. In short, organizations entered into a good faith agreement with the universities and researchers that provided formal technical outputs and support, however these agreements were saturated in uncertainty.

One community organization case study exemplifies how the researcher/community power dynamic and uncertainty impacted project decision-making, as well as addresses some of Elwood's (2010) emergent and unexpected politics from the Geoweb. The organization became frustrated with the time for tool development and decided to test the tool with its constituents prior to its completion. The premature use and application was detrimental to the realization of project goals and academic research. When it was finally ready for use, the organization expressed less interest in using the tool amongst its community and believed that the 'experiment' had run its course. For the researchers, the initial effort produced no measurable research outputs in relation to the effectiveness of the tool as a new form of engagement and data compilation: a disappointing outcome. It did, however, highlight how the process of application development and deployment is as critical as the tool itself. It also emphasizes the often poorly articulated and different objectives of the various partners.

The financial implications of developing Geoweb tools were also surrounded in uncertainty. Both organizations and researchers bore resource (time and money) burdens in their development, though we suggest that the financial burden was higher on the universities than the partnering organizations. For the universities, the material requirements involved paying full-time technology development staff, research co-ordination, grant administration, and constant communication and networking with the community organization. In the case of tool development with one community organization, two full-time faculty were contributing time and financial resources to the project. Two additional staff were actively engaged in the tool development; one staff member worked on the technical application development; while the other focused on project coordination and liaising. As the project extended over two years, the partnering organization also bore a human

resource burden by investing time during each stage of the project to determine needs, compile base data, provide design feedback, and testing the tool. At certain points, university researchers were treated as private sector technical consultants. Researchers also were vulnerable, albeit to a lesser extent, to a co-optation of their agenda and a reduction of their own power where, for example, local governments held the advantage in project development. The monetary portion of these costs were largely covered by the university researchers, with return expectation of being able to conduct research on the partner use and impact, after the tool was launched. This led to important questions about whether the university is a suitable institution in which to incubate new collaborative software applications, as well as the sustainability of the Geoweb tool and the community-university collaboration.

Finally, the Geoweb does not resemble GIS in its development. In traditional GIS, there may have been numerous data sources but there tended to be one software firm, with end users building the applications. The Geoweb is what could be called an 'interlaced developer ecosystem'. This consists, for example, of employees and vendors of large Geoweb platforms (e.g., Google), owners of small-to-medium geoprocessing web services firms (e.g., adressesquebec.gouv.qc.ca for geocoding), user communities (e.g., with open source code used in Kawartha), traditional GIS developers and third party spatial data suppliers, neogeographer hobbyists professionals, and end users, who may be reading, commenting on or tagging, curating, and/or contributing content. If any of these components change, the impact on the application functioning could be severe. This means that though university researchers are filling the role of Geoweb developers, we were equally captive to the vagaries of geoprocessing firms, large platform companies, and third-party data providers.

***Sustainability of Tools and Collaborations***

A third central concern encountered in all case studies was the sustainability of both the Geoweb tool, once developed, and the community-university partnership. The process of tool development and the process of relationship formation, growth, and maintenance can be thought of as occurring along two separate time lines, with different end goals and thus different criteria for sustainability. The development of a Geoweb application typically addresses a discrete problem and thus has a relatively bounded scope and time frame. All three case studies had specific issues that were to be addressed. Although these problems were not necessarily close-ended, they all focused on a time-limited gathering and disseminating information to mobilize the public for some collective action or group benefit. This timeframe matched, at least generally, the time frame of the respective university research team, as dictated by funding and student program cycles. In this shorter context of sustainability, the Geoweb application need only last long enough to contribute to the goals of both the community organization (or any other collaborator) and the university development team - any life beyond this time frame is a bonus. This phase was the period of highest activity between the university and community partners, involving frequent communication and

meetings. After these high-intensity phases passed, the Geoweb tool still needed to be maintained and updated to remain fully-functional and also responsive to changing needs and operational feedback from users. Financial support of the Geoweb tool was not a high priority for community organizations, as ongoing costs, including maintenance, management, or eventual upgrading were not typically budgeted. A sustained maintenance phase is critical because without adequate resources the tool can quickly become broken, forgotten, or otherwise unused.

Differences emerged in the way that case study organizations dealt with the technical issues of tool sustainability. The GéoActon project augmented an existing economic development website with a Geoweb tool. A web developer already contracted to provide support for the parent website was also able to provide a basic level of ongoing support for the Geoweb site, as the two tools were effectively coupled. Aside from this coordination, there was no formal ongoing arrangement for the university researchers to continue to update, maintain, or develop the site after launch. In the Kawartha Heritage Conservancy, system sustainability was an ongoing point of discussion, particularly as delays in project implementation emerged. Justifiably, the organization was concerned with what would happen at the end of project funding regarding the maintenance and revisions to the tool. We proceeded, agreeing that the tool would persist after the end of the formal funded partnership, but, given that the tool was housed on a university server and the technical capacity to alter the tool was held by the university, this placed an undue burden of trust on the organization (Corbett, 2012).

Long-term sustainability was not always a concern. In the Okanagan case study the intent of the partnering organization, which was newly established, was to develop an immediate public awareness of their existence and mandate. Therefore the partner's concern was to get the public to use the site and, through use, promote the organization as a whole. They saw the Geoweb component of their website as being just one part of their overall web presence, which included Facebook, Twitter and weblogs. They used the Geoweb as a mechanism to start online geolocated discussions about discrete issues within the food system. Each active dialogue was only kept open for two weeks, after which it was archived. As a result they were less concerned about the the geolocated discussion component of their site having a long lifespan. The capability to begin new discussions remains but they wanted to avoid having Geoweb maps that were out of date. They also did not want to become overly burdened with the need to moderate the site discussions indefinitely into the future.

Partnering organizations' concerns over the sustainability of both the tool and relationship manifest in several ways. First, questions of ownership of both the Geoweb tool and the VGI were raised. Ownership is a critical concern in the co-development of any technology, where we sought to ensure that contributing partners have the right to use, modify, or otherwise exploit the software within the bounds of their specific use-case. Data gathered through each Geoweb tool was

similarly considered the property of the community organization, again, for use within the specific program context, to be shared with the university research team for purposes of academic research. In each organization there was interest in making the Geoweb tool open-source, or otherwise free and accessible not just to the organization, but to any potential user. From the community patrner perspective, making the Geoweb tool open-source could have several benefits. For example, if university developer interest or resources waned, the community organization could still obtain the Geoweb tool source code for further development. An open-source tool could also release the community organization from requiring to work with or maintain a relationship with the university researcher as a condition of using or further developing the Geoweb tool. However, we felt that providing a Geoweb tool as an open-source product does not ensure sustainability of either the tool or the specific sites. The technical skills required to further develop or extend the Geoweb tools used in this research requires substantial web programming knowledge that does not exist in any of the organizations. As a result, further development of a potentially open-source Geoweb tool would require the hiring of an outside consultant or web developer, effectively duplicating the technology development capacity of the existing university research team. Furthermore we felt that it moved away from the intended and negotiated collaborative approach to the construction, deployment, and potential benefits/losses involved with Geoweb development (Elwood, 2010; Corbett, 2012).

Sustainability in this context is more than access to computer code, it is the development of a durable relationship between organization and developer (whether university researchers or other) that ensures tool development and maintenance in support of organizational goals. Implementation challenges created situations where community organization expectations for both project time to completion, and the final product itself, were not met and therefore moved the relationship between community and researchers from one defined by enthusiasm to one of lowered expectations. Given this change in expectations, we as researchers debated which role the university should play in managing these expectations and establishing long term management plans for use and maintenance. This is a typical problem in community informatics (Gurstein, 2003). This is all the more poignant because academics are often driven by short 2-3 year projects that are clearly delineated by granting agencies and graduate student tenures. This created a chronological tension with our partnering community organizations who are pragmatically more focused on the long term outcome of their work. An additional tension also might be that academics are primarily motivated by the 'big picture', as well as theoretical implications of the Geoweb/ICT literature on participation, inclusion, and social change, compared to the gritty realities of actually making a tool to fit the specifications and needs of a poorly defined and/or shifting issue on the ground. Academics may be less inclined to rigour relating to usability testing, community support, long-term sustainability

and control of data - in other words, issues of the utmost importance to partnering organizations (Beaudreau, Johnson, & Sieber, 2012).

### *Research Collaboration as 'Deal Making'*

Given these circumstances, in some ways both university and organization partners have had to strike a 'devil's bargain' with respect to long-term support. Similar to Parker (2006), our research found that partner community organizations struggled with the decision to dedicate their resources toward the production of a mapping tool dependant on researchers to manage the technology, versus towards alternative methods of garnering deeper community involvement. These organizations also needed to trust researchers that they will not quickly terminate or end a collaboration and technology access as a part of the natural wrap-up of a project. Researchers become beholden to the community organizations, having invested substantial amounts of time and resources into supporting the application of the tools with the explicit goal to study how the technology is employed in a 'real world' context, with the aim to determine effectiveness of knowledge generation and engagement. These specific research goals would not be realized if the community organization quickly cut ties with the universities, as this would undermine the potential to track research outcomes and respond to new opportunities, as well as be broadly indicative of failure. As a result, both researchers and organizations have a mutual, though at times uneasy, goal of maintaining, but also simultaneously diluting, the collaboration as projects come to an end or are revised in new directions. Until the capacity of the organizations change or increase significantly, and until one partner chooses to terminate the use of a tool entirely, the sustainability of the tool should be considered dependent on the sustainability of the collaboration.

When discussing sustainability of the collaboration, we must acknowledge the importance of a supportive general public. In each of the case studies, the goal was to engage the public in some way, that is, the organizations were not simply using the tool to post information but to generate some interaction in support of their core mandate. While the success in doing this was mixed and the long term impacts still too early to judge, it is important to recognize that if a community organization had a goal or made an effort to have the public contribute knowledge then they are also asking community members to volunteer their time and efforts. Thus the organizations are also beholden to their constituents and are highly sensitized to both the perceived and actual 'success' of the project. They are also acutely aware that this relationship might be undermined if the time and knowledge the public contributes is lost or erased due to the termination of the tool, or else if the project is considered a failure by others.

## Conclusions

This paper, using case study evaluation, assesses the application of Geoweb tools in three different communities across Canada. Given the new and emergent nature of the Geoweb at a time when our collective expectations about

transparency, the transformative power of internet-based communication, and open-access to data are increasing, this research offers timely critical reflections on the nascent challenges and opportunities that collaborations for the development and implementation of Geoweb tools can produce.

Yet despite this time of persistent, rapid change, it is imperative to keep raising and addressing the fundamental questions about the role and potential for online tools and participation in governance (Brewer, 2006; Dovey and Eggers, 2008). As described above, an emerging difference between traditional views of online tools and the participatory world of Web 2.0 is that governments at all scales are less able to steer how online tools can be used or will be used to engage the public in debates and discussion about local issues. For example, the democratization of the Internet and its use as a tool of engagement and advocacy have been poignantly observed in events in Egypt and Tunisia in 2011. Wael Ghonim, the Egyptian Google Executive who fostered the revolution through Facebook, famously stated on CNN: "If you want to liberate a society just give them the Internet" (MacKinnon, 2012, xx). Yet these events also have the potential to exaggerate expectations about how these tools produce change and how and when people choose to engage with the tools (Morozov, 2013). When the point of protest or concern is clear - the enemy or controversy is specific - then an assumption is that online tools have the potential to draw attention to and coalesce citizen engagement around the issue. But local policy concerns are often less urgent and the 'enemy' less clear. This is particularly true for cross-cutting or cross-sectoral social or environmental issues at the local scale, and even more so when the drivers of engagement - the actors leading efforts to reach out to various interests - are not governments, driven by explicit policy goals. "The Internet is a politically contested space, featuring new and unstable power relationships" (MacKinnon, 2012, 5) amongst a host of interests. Therefore, understanding the process of developing online tools for public purposes is significant. As Rebecca MacKinnon explains in Consent of the Networked (2012): "It is time to stop debating whether the Internet is an effective tool for political expression, and to move on to much more urgent question of how digital technology...can be used to maximize the good it can do in the world?..." (MacKinnon, 2012, xx). Hence, understanding what are the social processes that lead to the use of online tools and what are the challenges that emerge in these collaborative processes will remain a very important question in years to come.

Our research experiences have shown that Geoweb tools have the potential to facilitate public engagement and knowledge sharing between different interests and authorities. Through the process of community co-mapping, there is the potential for new knowledge from experts and lay citizens to be shared in the same forums and outside more restrictive or less accessible engagement processes. Despite these benefits, there are many challenges to the development and implementation of Geoweb applications, particularly in a community/university development context. Parker (2006) finds that these mapping technologies lead to intentional exclusion of

populations in the community, limited resources and lack of critical reflection that can impede mapping project from obtaining input from diverse groups. Perkins (2013) found a similar potential for both the creation and reinforcement of community knowledge, but also indicates the reproduction of existing power relationships. As we describe, Geoweb tools do not emerge in a vacuum. They are often an outcome of a social process in which a collection of actors is negotiating to produce a product that has the potential to produce some public good. Even in the absence of a government or a designated governing authority, the norms, interests, capacities, and expectations of the partnering organizations will converge and may conflict over the technological, social and research goals of the participating organizations. Even if the normative basis of tool development are shared amongst organizations, the process of developing the tool can be laden with challenges. The social process around the development of Geoweb tools - the how of technological development - is critical, particularly when partnering organizations bring different goals and capacity. This research demonstrates how Geoweb technology is not neutral, but rather leaves a distinct imprint on the development process, and the character of interaction between collaborators. The goal of Geoweb development is a product (a tool), but the outcome of the co-development process is uncertain and can be considered path dependent, a finding mirrored in process-oriented approaches to mapping (Kitchen and Dodge, 2007; Wood, 2009).

It is also important at this juncture to step back and critically reflect upon whether the aforementioned challenges faced when universities work with community groups on Geoweb tool development and implementation are specific to the new phenomenon that is the Geoweb or are they the same civic engagement challenges faced using Web 1.0, participatory GIS or non-internet based activities? Our analysis suggests that in addition to the common civic engagement challenges faced (e.g. power, inclusion and agency), when Geoweb tools are deployed the potential for more success or greater failure is heightened in part because the expectations are so high. The technological elements of Geoweb provide new opportunities for forging connections that might be thwarted by a digital divide. The Geoweb's grounding of issues for discussion in the geographies of real spaces and places cements abstract discussions in our communities which raises new issues about hierarchies of knowledge and whose expertise counts most. These two examples of the potential of the Geoweb signals that those behind the deployment of these tools must prepared to face the both normal and persistent challenges embedded in broad civic engagement practice, and those unique challenges of the Geoweb.

Finally, as academics, researchers and application developers who engage in these projects from a position of expert power, we must question whether our academic enthusiasm and interest in the theory, technology, and potential of the Geoweb get trapped underneath the reality of what community groups actually need to achieve in terms of time, investments and outcomes. In writing this paper

we have reflected upon the international aid legacy of the 1970s in which large-scale farming technology, such as tractors, were exported as "foreign aid" to farmers whose agricultural practices were smaller scale, and reliant on different technologies. We then asked ourselves "are we doing the same thing?". Our academic fascination with the cutting edge technology is perhaps more appropriate when confined to low-stake sandboxes. But when the issues are real, partners involved are often more risk-averse. As developers we can hide behind the veil of the oft-touted 'perpetual beta' of the Web 2.0, where tools can be works in progress, and improved over time. But among perpetually cash-strapped community organizations that struggle for acceptance and relevance, and especially in situations where they seek to directly engage their communities, this type of flexibility is unacceptable and potentially damaging in the long-term. We feel that this issue of differing motivations and levels of accountability is the same faced by governments in their adoption of Geoweb applications - in other words that there is a fundamental chasm between what researchers and developers propose, and what can be realized in a practical context, a context that is inevitably replete with competing agendas and local dynamics.

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