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Powering Up: Revisiting Participatory GIS and Empowerment

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Since 1996, participatory GIS (PGIS) has facilitated avenues through which public participation can occur. One of the ways practitioners articulate social change associated with PGIS interventions has been to qualify success using the term 'empowerment'. This paper explores the extent to which PGIS academic literature has utilised, defined, measured, and analysed empowerment. This research will demonstrate the degree to which PGIS has, from 1996 to 2014, appropriately and adequately taken into account the causative and direct relationship between a PGIS intervention and empowerment. This article identifies works broadly dealing with PGIS, then searches within that subset of literature for the term 'empowerment.' The findings are both quantitatively and qualitatively assessed to explore the trends within the PGIS literature over time and to contextualise the ways in which empowerment has been identified, understood, and articulated. We conclude with a discussion on the extent to which future PGIS research and practice has the ability to disrupt power inequalities.

Keywords: PGIS; public participation GIS (PPGIS); participatory GIS (PGIS); GIScience; empowerment

INTRODUCTION

The use of the term 'empowerment' in academic literature is common, but rarely explicitly defined. Heckman described its usage as haphazard and without universal meaning (cited in Sieber, 2006). Commonly, empowerment is articulated through a range of proxy measures, such as access to decision-making opportunities or enhanced skills. We analyse the PGIS[1] literature from 1996 to 2014[2] to explore when empowerment is used, and how it is defined and measured when making claims of empowerment outcomes in project practice. In this paper, we argue that researchers should consider reframing their findings to be more focused upon direct outcomes, while refraining from using 'empowerment' unless it is explicitly defined, measured, and causally linked to project activities. In sum, we suggest that researchers should call empowerment what it is, not what it could or might be.

How empowerment is conceptualized is as equally difficult to talk about meaningfully now as it was in 1996. These difficulties are not limited to diverse definitions; they also include variable or incomplete data collection processes that are required to understand the extent, distribution, cause, and duration of change. As a result, there continues to be difficulties in clearly measuring both short- and long-term success. Where PGIS project evaluation occurs, there is often an emphasis on the short term. This does not mean that PGIS activities have not directly resulted in systemic

and long-term social change – because it is clear that they have. Rather, we suggest that practitioners do not sufficiently understand how, when, why, and for whom empowerment occurs. Furthermore, while the term 'empowerment' continues to be commonly and inconsistently employed, defined, and measured, its use in this manner will further erode the meaningfulness of the concept.

CONTEXTUALIZING PGIS

PGIS research and practice encompasses a diverse range of definitions and approaches.[3] For example, within the span of a few years (1999–2002) the terminology of 'Public Participation GIS,' 'PPGIS,' 'Community GIS', and 'Participatory GIS' have all been used in academic literature (Nyerges *et al.*, 2002; Sieber, 2000; Talen, 1999). In 2005, PGIS intersected with 'citizen science' (David and Howard, 2005), followed by crowdsourcing in 2009 (Crampton, 2009) and more recently the participatory geospatial web (Sieber, 2012). What unites these different terms is a use of Geographic Information Technologies in participatory ways to achieve a set of desired goals (Sieber, 2006). Each of these manifestations have respectively engaged with a wide spectrum of participatory contexts with a range of objectives. However, the ways in which these participatory approaches have handled 'empowerment' is equally broad and problematic.

FRAMING AND DECONSTRUCTING EMPOWERMENT

The representation of geographic information through the medium of cartography is not neutral and is in no way separate from prevalent power relations of society (Dunn, 2007; Ganapati, 2011; Livingstone, 1993). Since the inception of Cartesian map-making, colonial and ruling powers have used maps as a tool to exert their claims over land (Wood and Fels, 1992). These claims have often been made to the detriment of societies already living on the newly 'claimed' land (see Chapin *et al.*, 2005; Harris and Weiner, 1998; Peluso, 1995; Weiner and Harris, 2003). As Hall (1993) states, 'with centuries of distance and historical hindsight, we can see that error and bias, exploitation and colonialism, self-serving centrism and ecological harm can so easily be read into the subsoil of old maps that they may as well be listed with symbols and explained in the legend' (in Pickles, 1995, p. 21).

Technological exclusivity implies that GIS favours top-down 'expert' knowledge developed by technocrats within hierarchical institutional frameworks (Sieber, 2006; Tsai *et al.*, 2013), however, within the last few decades, maps are no longer exclusively the product of experts (Crampton and Krygier, 2006). In the early 1990s there was much debate about the positivistic imperialism that GIS imposes (Openshaw, 1991, 1992; Taylor and Overton, 1991, 1992). In 1995, the discussion shifted focus onto the potential for GIS as a public participatory tool (Ganapati, 2011). As GIS technology continued to become more affordable and easier to use, research into PGIS applications expanded (Ganapati, 2011; Obermeyer, 1995). However, limited attention has been given to the social, political, and philosophical implications of the technology. It has become clear that even participatory processes do not equally benefit all people within society (Elwood, 2002, 2007; Sheppard, 1995; Young and Gilmore, 2014). As a result of this, after nearly two decades of academic research on PGIS, the extent, causation, duration, and distribution of positive change remains insufficiently understood.

Central to the debate over the role of PGIS in society has been the belief of its ability to disrupt power inequalities – this has been expressed through the theme of empowerment. The term has been used extensively throughout the PGIS literature. However, despite its widespread use, there has been an ongoing difficulty in formalising what empowerment means in relation to GIS (Corbett and Keller, 2005; Dunn, 2007; Young and Gilmore, 2014). For example, in a special session organised by the National Center for Geographic Information and Analysis in 1998, 23 of 31 papers presented claimed that communities were empowered by accessing and using GIS technologies. Despite these claims there was little or no explanation given in those papers as to what was meant by the term empowerment and how empowerment was to be identified. This lack of clarity has persisted throughout the PGIS literature. Elwood concluded in 2002, several years after that special session, that there is 'a dearth of studies that explicitly conceptualise empowerment in the examinations of the impacts of GIS' (2002, p. 906). To date, the PGIS literature has still not arrived at a commonly accepted operational definition of the term empowerment. In addition, there is a paucity of discussion over the mechanisms and frameworks with which it can be identified, observed, and measured.

This lack of theoretical and practical engagement with empowerment in the PGIS literature is not a result of a lack of attempts to evaluate (Corbett and Keller, 2005; Sieber, 2003; Tsai *et al.*, 2013) nor frameworks for its analysis (Elwood, 2002; Friedmann, 1992; Rocha, 1997; Scheyvens, 1999). These frameworks are limited to providing categories of empowerment outcomes, but those categories do not differentiate between empowerment capacity and empowerment, and therefore they do not indicate the relative closeness of each category to actual power shifts, even though some (i.e. increased access to goods and services) appear less related to power than others (i.e. changes in perceived legitimacy).

Empowerment is often referred to as both an outcome and a process (Dubois and Miley, 1992; Tsai *et al.*, 2013). Yet, the outcome of empowerment entails more than simply examining individual development or community solidarity. In order for power structures to be altered and the powerless to gain a level of control over the distribution of power and decision-making processes in society, there must be tangible and measurable impacts in the wider political arena (Ristock and Pennell, 1996; Thomas, 1992) and a visible demonstration of change that the world around is forced to acknowledge, respond to, and accommodate. Critical to an understanding of empowerment is that this process is undertaken by an individual, group or community, it is not something done 'to' or 'for' these social units (Rowlands, 1997). In essence, the process of empowerment involves growth and development leading to deliberate efforts to participate in, share control of and influence social, economic, and political events and institutions. The empowerment that takes place within individuals or communities and brings about increased influence or power can take many forms (Corbett, 2013). For example, for an individual the acquirement of new knowledge and skills may bring about social influence and political power, while for a community it might be the development of a common identity and vision (Fetterman, 1996; Parsons, 1991; Rappaport, 1987; Ristock and Pennell, 1996; Thomas, 1992). Ultimately, in order to evaluate empowerment, one must take into account how power is being disrupted, who is being empowered, and how to empower (Tsai *et al.*, 2013).

In this paper we seek to analyse the PGIS literature to assess the trends, uses, definitions, and metrics of the term empowerment, as well as explore claims of empowerment resulting directly from PGIS practice. In doing so, we do not seek to (re)define 'empowerment' nor to offer a definition that could be universally applied. Rather, we explore the ways in which the divergent conceptualisations of empowerment within the PGIS literature impact how it is measured and linked to outcomes.

METHODOLOGY

The PGIS literature is broad and in this research we did not seek to locate and evaluate every article written on PGIS. Rather, we aimed to identify the trends in the literature as it relates to the use, understanding, measurement, and

assessment of empowerment. In order to locate PGIS litera-ture, we used multiple keyword[4] searches within the Web of Science citation index from 1996 to 2014.[5] We began with 1996, starting with the Project Varenius period, and contin-ued up until 2014 – the most recent complete academic year at the time of writing this article. All literature search plat-forms have limitations and advantages. While Web of Science is not as inclusive as Google Scholar,[6] its use resulted in a greater ability to access the literature and also enabled enhanced refinements in the searches in order to better focus our search. It also allows for replication of our research and findings.

We then downloaded all of the literature identified by the Web of Science searches, allowing for a quantitative analysis of this PGIS literature and its use of the term 'empowerment' over time. We then used NVivo to analyse these articles quali-tatively, posing the following questions to each article: (1) Does the article define empowerment? If so, how? (2) Does the article measure empowerment? If so, how? (3) Does the article make a direct causal relationship between PGIS activities and empowerment? If so, on what basis? However, not all academic articles are equally read and nor do they equally influence the field. As a proxy measure of their influence, we analysed the PGIS literature that included engagement with 'empowerment' by the number of times those works were cited by others. While this enabled an analysis of influential articles, it does not identify those that critically engage and deconstruct the term. We also conducted an in-depth analysis of articles that included large numbers of in-text references to 'empowerment.' This was determined using keyword word searching with NVivo.

FINDINGS

The Web of Science searches identified 350 articles matching one more of the keywords.[7] Of the 350 matching articles, 90 were duplicates, matching multiple keywords, resulting in 260 unique articles. Of these, 97 (35%) included the word 'empowerment' within them. However, 23 of the articles mentioning 'empowerment' (24%) were limited to biblio-graphic references or out-of-text uses.[8] These articles were not included in either the quantitative or qualitative analyses. Five additional articles were removed through the course of evaluation due to the in-text references referring to titles of papers or organisations, resulting in a total of 69 articles being evaluated. Based upon those results, it is evident that from 1996 until 2014 the use of 'empowerment' in the PGIS literature has significantly increased (see Figure 1).

Of the 69 PGIS articles engaging in a 'substantial' way with 'empowerment,' 17 defined, or used an existing defi-nition of, empowerment (25%). Ten of those 17 articles were published between 2013 and 2014, suggesting that as empowerment is increasingly used within the literature, more researchers have sought to explicitly define it. However, only 12 articles mentioned how empowerment was measured (17%), and only five (7%) provided a specific measure. The specific measures utilised were the public par-ticipation scale developed by the International Association of Public Participation (Brown and Weber, 2013; Nyerges et al., 2006), ownership (McCall, 2003) as well as participant
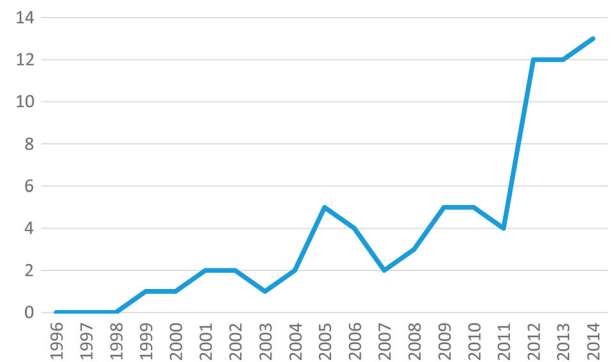

Figure 1. Number of PGIS articles using the term 'Empowerment' 1996–2014

and user feedback (Atzmanstorfer et al., 2014). Non-specific measures included: empowerment through participation; empowerment in relation to how many people could access GIS data; and empowerment through increased access and use of information. Tsai et al. (2013) state that empowerment can only be measured on a case-by-case basis that relies on answering how power is being disrupted, who is empowered, and how to empower.

The findings demonstrate that 25 of the articles (36%) provided a discussion on the linkage between PGIS and empowerment, but only five (7%) discussed this linkage beyond the fact the PGIS is associated with empowerment, or that PGIS methods could lead to empowerment. Only one of these five (McCall, 2003) was the same as those five that provided specific measures. For example, Young and Gilmore (2013) note that PGIS projects are effective at achieving three main forms of empowerment: distributive change (material change, i.e. land tenure and property rights), procedural change (altering processes to increase legitimacy in decision making), and capacity change (increased ability to take action on their own behalf). They also suggest that PGIS activities allow for the transmission of indigenous voices around the world, and that GIS 'encodes traditional knowledge within a scientific medium' that in turn legitimises that knowledge (Young and Gilmore, 2013, p. 814). These same authors would go on question the coexistence of exploitation as a result of PGIS activities (Young and Gilmore, 2014). The remaining two (Dunn, 2007; McCall and Minang, 2005) linked empower-ment with participation and the role of indigenous knowl-edge within PGIS processes.

Analysing the content of PGIS literature engaging with empowerment demonstrates that only a small number of researchers are attempting to measure empowerment, with an even smaller number outlining the specific measures used. We believe this has identified challenges for PGIS researchers, particularly with regard to justifying the claims being made and being transparent about how such con-clusions are drawn. This is particularly important to address, we believe, because of a continued divide in the GIScience literature between the technical and the social foci, whereby the discourses are not employing the same mechanisms to construct how, when, why, and what constitu-tes 'evidence' (Cochrane et al., 2016). The use of

testimonials, expert reviews or post-process feedback, which are common for those studying the social aspects of PGIS, can be viewed sceptically by those technically inclined seeking quantitative data with supporting baseline assessments. In order for researchers to bridge this divide, it is important for researchers to recognise the limitations of their own 'language' and diversify their methodologies to ensure their findings reflect the complexities of this field and reach a broader audience.

Influential and engaged articles

Of the 260 PGIS matching articles, 17 were cited more than 50 times each. Of these, 12 referenced empowerment, or directly related terms such as empower, empowering, and empowered. Two of those (Brown and Reed, 2009; Crampton, 2009) made only singular, or passing mention to empowerment. Of the remaining nine highly cited articles, three articles (Dunn, 2007; Kwan, 2002; Sieber, 2006) review literature that address empowerment, but do not analyse its use or attempt to define it. The remaining six articles, each of which were cited 50–70 times, made brief mention to empowerment, without any detailed analyses of its meaning, metrics, or causation (Carver *et al.*, 2001; Chapin *et al.*, 2005; Haklay and Tobon, 2002; Jankowski, 2009; Kyem, 2004).

Analysing the most cited articles provides insight into the usage of the term 'empowerment,' but the number of citations do not address the level of substantive, or critical engagement with it. Therefore, in addition to analysing the most cited articles, we also analysed those articles with the most in-text references to 'empowerment.' Since this search was specifically looking for works that critically explored the concept, we did not include verbal variations. The search resulted in only four matches mentioning 'empowerment' 15 or more times.

The article with the most frequent usage of 'empowerment' was Tsai *et al.* (2013), using the term more than 50 times. It is also the only article that has an explicit objective of determining what, for whom, how, and to what extent empowerment occurs. In doing so, the authors examine an array of definitions and offer a framework to evaluate empowerment. However, the broad themes of 'knowledge, capability, and power' (Tsai *et al.*, 2013, p. 210) are not measured, such as the increase of 'capabilities' or how decision-making power was restructured. Instead, the authors present descriptive outcomes that could indicate empowerment, such as the ability to describe experiences, communication between stakeholders, the legitimisation of participation, and consensus making. Beyond generalities of 'stakeholders' and processes, the article does not explore who exactly was empowered, how robust and sustained that change was, or the nature of that empowerment. It is questionable how empowering the exchange of local knowledge about 'abundant resources' for 'administrative information to let the local community and local organisation understand policies and institutions concerned' is, and if that process may have further entrenched some forms of marginalisation (Tsai *et al.*, 2013, p. 210). It is also unclear if that participation resulted in changes to the proposed development or served 'to legitimize policies and projects'

(Harris and Weiner, 1998, p. 75). Nor does the study explore how 'mutual empowerment among stakeholders' is based upon a conceptualisation of power as something in limitless supply that can be given to all, rather than as limited and that activities are 'simultaneously empowering and disempowering at different scales of interaction, and for different social groups' (Elwood, 2002, p. 919). The result is a framing of processes from which everyone benefits, as opposed to a conflictual one that challenges 'hegemonic interpretations of present and future landscapes' (Harris and Weiner, 1998, p. 75).

Young and Gilmore (2014) use empowerment 27 times within the text of their article, and focus upon the potential of participatory geoweb related activities to result in exploitation due to its linkage with publicity. The authors criticise empowerment as a concept and challenge its conceptualisation in the literature, but do not engage with defining, measuring, or correlating activities with outcomes. McCall (2003) was the only article that was both a highly cited article and one that extensively engaged with 'empowerment,' using the term 22 times. Rather than (re)define empowerment, McCall provides specific indicators that typically fall within the category, such as land rights, management, conflict resolution, and building awareness. As explored by McCall (and others, e.g. Sieber, 2006), we argue that a focus upon specific changes and goals is far more valuable than referring to the ill-defined and debated concept of empowerment.

McCall and Minang (2005) use the term 17 times in the text of their work, challenging the assumption that the use of participatory approaches are effective, with empowerment being one of the dimensions analysed. Their findings conclude that empowerment is far more complex than typically presented, with empowerment occurring in different ways for different people and across a spectrum of degrees. However, McCall and Minang do not explicitly define or measure empowerment, evaluating it in relation to levels of participation and the resulting opportunities. While critical, the authors explore activities that resulted in specific positive outcomes, such as rights to land and resources as well as knowledge and skill acquisition. Their generalised measurement as significantly positive, negative or partial, lack the nuance required to analyse what these changes mean, who benefits from these changes, how robust the changes are, and if those changes are sustained.

CONCLUSION

PGIS practice and research has changed significantly since 1996. The platforms have become less costly, easier to access and use. Public engagement continues to rapidly increase with the development of the geospatial web, and is applied to an ever wider growing range of issues and objectives. Due to the enhanced opportunities for public participation, PGIS literature has steadily increased its engagement with the concept of empowerment. Despite its more frequent use, few studies define what empowerment is and how it is measured, and only a small minority are critically engaging with the term. The ambiguous nature of the concept of empowerment cannot be solved by a set of

universally applicable indicators or a generalisable index within PGIS research. Primarily, the challenge is that PGIS is being applied in diverse settings, with diverse objectives and with a range of participants. What is required, we believe, is more specificity about the processes and greater linkage between activities and impacts.

'Empowerment' is a fuzzy concept; imprecise, contested, confusing, widely used, and essentially meaningless unless explicitly defined (Cornwall and Eade, 2010). We argue that it is more valuable to outline and measure a set of indicators, such as land rights, knowledge and skills, or behaviour change. These changes may be framed within the context of empowerment, which is defined by its use of specific indicators and can be assessed accordingly. In addition to clarity and transparency, the future of PGIS practitioners' ability to meaningfully articulate the impacts of their work will be enhanced if readers know what researchers consider important, and what is neglected in their measurement. This will highlight the challenges that have faced little scrutiny to-date, such as the unintended exploitation of online public participation as well as challenges of data ownership. Greater clarity, precision, and robust evaluation will enhance the PGIS literature, provide a more nuanced and critical engagement with empowerment and strengthen our understanding of what PGIS is impacting, how, for whom, and to what extent. After 'empowerment' becomes specified, even in diverse ways, we anticipate that many new questions, challenges, and recommendations will follow, which will strengthen PGIS research, and enhance the broader understanding of what (dis)empowerment is and how it occurs.

BIOGRAPHICAL NOTES

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Notes

1 PGIS is inclusive of public participation GIS and participatory GIS. In our literature review we also included additional terms, as explained below.

2 We use 1996 as the start date because that was when the term public participation GIS (PPGIS) was used for the first time (Schroeder, 1996).

3 Analysing the diverse array of definitions and uses of GIS and participatory processes is beyond the scope of this paper. For an exploration of some of the terms and their unique manifestations see Cochrane *et al.* (2014).

4 The keywords included: Community GIS, Crowdsourcing +GIS, Citizen Science +GIS, Grassroots GIS, P/PGIS, Participatory 3D Mapping, Participatory Cartography, Participatory GIS, Participatory Geoweb, PGIS, PPGIS and Public Participation GIS. Five of these keywords did not result in matches on Web of Science: Grassroots GIS, Participatory 3D Mapping, Participatory Cartography, Participatory Geoweb, PPGIS and PGIS.

5 In addition to the year range, we specified the language as English, "all databases" searched, and used "Topic" as the search category.

6 Using the same keywords, a search on Google Scholar resulted in a total of 20 313 articles. The platform based at the University of British Columbia, Summon, resulted in 5402 matches. An analysis of the differences between these platforms and their results is beyond the scope of the current study.

7 There were 645 matches to these keywords in total. However, some acronyms, such as PGIS, have other uses (e.g. prostaglandin I synthase; personal growth initiative scale; personal grief intensity scale) and were removed (totalling 248), some matches were duplicates or not in English (totalling twenty-nine) and others were not accessible (totalling eighteen).

8 A few works composed most of these bibliographic references because 'empowerment' was in the title of the referred to article, such as Harris and Weiner (1998) and Elwood (2002).

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