Public Participatory Geographic Information Systems

Empowerment and Marginalization

It is an odd concept to attribute to a piece of software the potential to enhance or limit public participation in policymaking, empower or marginalize community members to improve their lives, counter or enable agendas of the powerful, and advance or diminish democratic principles. – Renee Sieber

This paper is a critical review of public participatory geographic information systems (PPGISs) as a tool for community groups and grassroots organizations. PPGIS is used for a variety of reasons, often with the goal of democratizing the decision-making process in bureaucratic processes. Like any technology, its misuse can have disastrous consequences. In the case of public policy decisions, PPGIS has the potential to engrain extant power relations. It is this dichotomy between empowerment and marginalization that will be explored. First, this paper will walk through the background of PPGIS to gain a contextual understanding of how PPGIS was developed. It will then walk through how PPGIS can be viewed as an empowerment tool using various examples set within the PPGIS process. The paper will then examine PPGIS as a marginalizing tool using the same framework as for empowerment. It will look into how PPGIS is utilized under these same two contexts, as well as the future direction of PPGIS to safeguard against its marginalizing potential. To conclude, it will summarize the issues of empowerment and marginalization, highlighting why PPGIS is marginalizing and how it should be viewed as a means of empowerment in the context of public decision making.

PPGIS Background

A geographic information system (GIS) is a database utilized for data creation, storage, analysis, and visualization; it is useful for understanding and representing spatial relationships, patterns, and trends. With the rise of technology over the past twenty years, GIS has become an important, and possibly indispensable, aspect of geographic knowledge production. However, GIS has not been fully embraced within all communities. In academic geography, for example, there is an active dichotomy between GIS geography and non-GIS geography "where the first term is valued,

practical, and powerful while the second...is devalued and marginalized" (St. Martin and Wong 236). This echoes a much larger binary that has infiltrated not just the social sciences, but all matter of debate: quantitative versus qualitative knowledge. Or perhaps more representative of the issue, perceived "fact" versus "opinion", where quantitatively-supported knowledge is considered vastly superior to all other forms of knowledge. This is no more apparent than in the field of public policy, where qualitative testimonies – namely the experiences and troubles of low-income communities – are often disregarded when challenged by figures and data backed by established parties. To combat this discrepancy, "the field of public participation geographic information systems (PPGIS) emerged...to empower less privileged groups in society" (Sieber 2006 491-492).

The idea of PPGIS was first conceptualized in 1996 by members of the National Center for Geographic Information and Analysis (Sieber 2006 492) as a means to "introduce a locally informed perspective into development" (Sillitoe 224). To achieve their goal of empowering less privileged groups, the NCGIA focused on "supply-driven and pragmatic approaches to engage the public in applications of GIS with the goals of improving the transparency of and influencing government policy" (Sieber 2006 492). This strategy is evident in Paul Schroeder's early definition of PPGIS as the "variety of approaches to make GIS and other spatial decision-making tools available and accessible to all those with a stake in official decisions" (qtd. in Sieber 2006 492). Jo Abbot defines PPGIS similarly as "an attempt to utilise GIS technology in the context of the needs and capabilities of communities that will be involved with, and affected by, development projects and programmes" (qtd. in Williams and Dunn 397). Craig Williams and Christine Dunn further expand on these definitions, stating that PPGIS "attempts to integrate official, 'expert' sources of spatial data and local, 'unconventional' geographic knowledge" (Williams and Dunn 397). These definitions, while accurate, are quite general. PPGIS may be better conceptualized by examining some of its many benefits: it can be used to reinforce "a respect for minorities, the inarticulate, and the resource- and power-poor" through equity mapping; it "adds to the factor that the efficiency and effectiveness of the governing towards the governed...can be

transparently tested"; and it can highlight the "value and integrity of indigenous local knowledge as an essential element in participatory planning" (McCall 569). The latter is especially important as anthropologist Paul Sillitoe points out: "It is increasingly recognised that development initiatives that pay attention to local perceptions and ways are more likely to be relevant to people's needs and to generate sustainable interventions" (Sillitoe 224). It is this line by Sillitoe that also happens to best encapsulate the goals of PPGIS.

The PPGIS Process

As a collection of many different GIS applications that augment traditional GIS through input and output pathways, PPGIS both crowdsources data and informs equitable and democratic decision-making. The former relies on the "public" while the latter relies on "participation". The domain of the public is theoretically straightforward: it is the "actual people organized in some type of grouping". However, in practice, identifying who is encompassed in the public, or better yet, who is a stakeholder, is much more difficult. Marc Schlossberg and Elliot Shuford attempt to clarify the public by creating three broad subgroups: "Those affected by a decision or program", "Those who can bring important knowledge or information to a decision or program", and "Those who have power to influence and/or affect implementation of a decision or program". The domain of participation, on the other hand, is more abstract. It is not the act of participation or the activities that the public engage in but, rather, "the broader purposes that participation is supposed to achieve" (Schlossberg and Shuford 16-18). In this sense, it is best defined by Sherry Arnstein's framing of public participation as citizen power: "the redistribution of power that enables the have-not citizens, presently excluded from the political and economic processes, to be deliberately included in the future" (Arnstein 216). These explanations will provide a critical context as this paper moves to understand the research process and its implications.

The process of creating a PPGIS is not much different from traditional research methods. First, the process must be designed and navigated. This process includes the "formulation of research questions or conceptualization of problems to be examined; types and sources of information gathered

and means of analyzing that information; and interpretation and dissemination of findings and results" (Elwood 198). The formulation of research methods is an inherently political process; the researcher must be mindful of the fact that their research methods themselves may directly or indirectly skew public participation and bias knowledge production. This paper assumes that the methods are designed properly to limit bias and interference; the alternative would yield illegitimate results that may be used to empower or marginalize, but they would do so without any factual basis. Given this assumption, once designed, the research plan must be executed and data must be collected; this includes the issues of data ownership and access. Third, the collected data must be analyzed before, fourth, being represented. The conclusion of this process is the application of research to real-world problems and decisions. The effective and responsible carrying out of this process is crucial for empowerment as each step builds upon the last. However, even with good research design, each step has pathways that can be exploited purposely or accidentally, resulting in the marginalization of communities. These pathways for empowerment and marginalization in the research process will now be discussed.

Empowerment

The empowering effects of PPGIS are most clear in two stages of its knowledge production process: data collection and representation. These steps are where the researcher has the most amount of room to incorporate indigenous knowledge without interfering with responsible research practices. For instance, while a fine line exists between gathering data to assist communities and interfering with their social and political lives, Williams and Dunn found that "The lengthy and enlightening process of developing a GIS in a fully participatory manner is itself capacity-building and empowering" (McCall 570). In their study on landmine impact in Cambodia, Williams and Dunn discovered that "on-the-fly analysis" with small groups during the data collection process allowed issues to be raised and addressed continuously. Not only did this further the knowledge production process by fostering in depth and provocative discussions, it had the effect of empowering group members, enabling their voices by including their opinions in the official project reports (Williams and Dunn 399).

The data collection process poses a second challenge of spatial accuracy. The mere perception of inaccuracy can, and often will, damage the effectiveness of PPGIS. This is a challenge considering that indigenous knowledge in PPGIS is constantly and continually juxtaposed against technologies that are perceived as highly accurate (Brown 290). However, Sillitoe sees this juxtaposition as a path to "empowerment...through respect for their [poor people] experience and management practices" (Sillitoe 227). On the other hand, Williams and Dunn choose to attack the validity of the juxtaposition, arguing that "high spatial accuracy does not necessarily equate with local realities". They concede that, even if inaccurate, PPGIS relies on indigenous knowledge "being equally as *important* as the more spatially accurate conventional data" (Williams and Dunn 407-408). By validating the local perspective, Williams and Dunn are reinforcing the view that successful policy implementation depends on local agreement, relevance, and good governance. Finally, it is Michael McCall and Peter Minang who find this juxtaposition irrelevant. Their research in Cameroon revealed that "indigenous technical knowledge is normally more reliable, and maybe also more accurate, because it embodies generations of practical essential knowledge, and it operates in interactive, holistic systems" (McCall and Minang 343). While there are many different types of local knowledge, these perspectives should immediately challenge the hegemonic status of quantitative knowledge in decision making. In doing so, they elevate the legitimacy of qualitative knowledge and empower marginalized research contributors.

After (or perhaps simultaneously with) collection, publicly-produced data encounters the issues of ownership and access. The main draw of community data ownership is that it "includes the right to prevent others from using it." Through this mechanism – the right to controlled confidentiality – community or public ownership increases trust between contributors and researchers providing for better data. The bigger debate revolves around data access. Liberal data access can provide communities with more information about their own areas, while controlled access may protect sensitive cultural information and locations. This debate is further explored in the next section.

Likewise, the third step of the PPGIS process, analysis, should not be actively empowering. The next section details how data analysis can be marginalizing. It is assumed that the same processes that allow for analysis to be marginalizing may be used for empowerment as well. However, they should not be viewed as such as this would not be responsible research.

The fourth step of the PPGIS process, data representation, is crucial for empowerment. The ability to effectually represent spatial data has always been a major strength of GIS, and thus PPGIS also has this strength. PPGIS takes this a step further though, allowing "the non-expert to integrate information from diverse sources and create visual and tabular output" (Dunn 627); this is the "democratization of the knowledge production process" (Couclelis 167).

Marginalization

Collecting data from the "public" may be the single largest challenge facing PPGIS. Two of the issues have already been discussed: the public must be defined which could potentially alienate certain groups and data must be perceived as accurate to avoid damaging the effectiveness and legitimacy of PPGIS. Both issues are compounded by the fact that portions of the public are not familiar with GIS or spatial data. This is a problem because "PPGIS, by definition, succeeds when as many community members as possible can utilize spatial information" (Sieber 2003 54), meaning "participation requires at least a cursory understanding of the importance of spatial concepts, spatial implications, and spatial data" to effectively empower the public (Merrick 35). Even if these problems are avoided, it is disheartening to think that "Participation in the creation of GIS knowledge does not necessarily give any power to those involved in, and affected by, the decision-making" (Aitken and Michel 17). While these issues may not actively marginalize communities, they reinforce extant power relations by relying on inequitable technologies for data collection and potentially ignoring the data that is collected. This is in effect marginalizing and can only be addressed through good governance.

With regards to ownership, the prevailing fear is that data will be privatized and sold once it is collected (McCall 562). The fear derives from the trend of privatization amongst conventional data

producers. Gaining access to geospatial data, like all digital data, is increasingly difficult. It is also incredibly difficult to track how digital personal data (in this case, contributed data) is used by those who aggregate it. How data is accessed can also be marginalizing. Controlled data access is problematic when perceived as protecting engrained power relationships. It may also be viewed as exclusionary; this is especially troublesome if data access is controlled by price, excluding low-budget community groups and grassroots organization while enabling for-profit corporations. However, "Accessibility is not only price-related, there are physical transportation and communication constructs". Publicly produced data often comes from low-income groups with little technological expertise limited mobility. This precludes this "information underclass" from easily and conveniently accessing their data on the web. It can have even more marginalizing implications for those who cannot adopt and comprehend spatial data, as noted earlier on page seven (see quote by Merrick) (McCall 563). Liberal data access controls are also concerning as they may enable surveillance, exploitation, and outside control. For example, access to real estate data enabled the practice of redlining (Harris and Weiner 71).

While the analysis step in creating a PPGIS yielded little information on how to empower the public, there exists an exploitable fault that could lead to marginalization: negotiation. PPGIS research, especially in the context of community development and public policy, involves a wide array of contributors. This raises two issues. First, the sheer amount of data collected is often too much to use and represent effectively. This requires researchers to privilege some knowledge over others, simultaneously empowering the "privileged" knowledge and marginalizing the remaining knowledge (Sillitoe 233). Second, PPGIS data does not come from just the marginalized groups that PPGIS seeks to empower. It also comes from groups with established power like local political and private institutional stakeholders. To effectively combine and draw conclusions from this process, each group's knowledge must be negotiated simultaneously with one another to represent multiple perspectives; this often has "contradictory implications in terms of participation, inclusion, and

representation" (Elwood 200). This contradiction is an inherent challenge to PPGIS knowledge

production; it is unavoidable given the context of the public. However, being cognizant of the

oppositional forces that emerge during PPGIS knowledge production may help to offset the bias they

introduce.

Finally, data representation poses a similar problem to biased data analysis. McCall eloquently

highlights this similarity: "GIS is no more neutral than statistics or bulldozers, it all depends on what it

is being used for, and on who is controlling it" (McCall 568). McCall is echoing Brian Harley's

research that

> The process of mapping consists of creating, rather than simply revealing, knowledge...
>
> [Thus] maps are imbued with the values and judgements of the individuals who
>
> construct them and they are undeniably a reflection of the culture in which those
>
> individuals live. (Kitchin et al 9)

Essentially, this means that PPGIS visual representations can reinforce the status quo, a status quo that

is assumed to be marginalizing, by allowing those with existing power to influence (or create) how data

is represented. This extends extant power relationships into the data representations themselves and is

further compounded by the fact that knowledge is often represented digitally. This is disempowering to

those with limited technological knowledge or access as it prevents democratic critique and control of

said representations.

Application

The final challenge to PPGIS is how it is utilized. The goal of PPGIS in the context of public

policy is to democratize decision making, but this is often out of the control of researchers and

community groups. Williams and Dunn share examples of how their PPGIS both empowered and

marginalized the same groups. In Cambodia, PPGIS allowed researchers to effectively map areas

where landmines existed. Then, through direct surveying, the researchers were able to prioritize what

areas needed to be cleared. The maps created through PPGIS research were more comprehensive and

informative than any expert-produced map. However, once land was cleared of mines, or designated to be cleared, senior military officers confiscated the areas to build their own homes. Lacking government intervention, local people went back to building their homes in dangerous low-priority mined-areas to prevent further land confiscation (Williams and Dunn 399-401). David Tulloch and Tamara Shapiro share similar case studies of the democratic process succeeding due to public participation and GIS, and the same democratic process failing without public participation and GIS. Like Williams and Dunn, they note that PPGIS is not fool-proof; their research revealed "the unfortunate possibility in democratic societies of having high levels of [data] access and participation and still feeling as though the effort was unsuccessful" (Tulloch and Shapiro 57-58).

PPGIS is an amazing and innovative means to incorporate local experience-based knowledge with technocratic policy decisions. However, if it is not clear by now, PPGIS can "be both more enabling to those whom it seeks to serve and... be misused in the 'wrong' hands" (Dunn 621). Ultimately, the ability of PPGIS to empower marginalized communities depends on how it is implemented, this is determined by capacity and good governance. McCall wrote that "Information is a resource whose value is *realised* only in combination with other social/political resources, especially power and access to policy instruments" (McCall 568). This sentiment is echoed by a study on PPGIS implementation in Milwaukee, Wisconsin. In this study, Sarah Elwood and Rina Ghose found that the most successful organizations using PPGIS were:

> Those that possess broad knowledge of available support resources, dense networks of relationship with other organizations and local political actors, levels of stability that enhance organizational knowledge and ability to cultivate available resources, and revitalization priorities and strategies that can be advanced through PPGIS resources available in the locality. (Elwood and Ghose 29)

This reinforces the idea that, at least currently, PPGIS can empower communities which have the existing conditions and infrastructure to facilitate democratic policy making. It is true, then, that

"Participation can be achieved only to the extent that awareness, knowledge, and sociopolitical barriers allow" (Sillitoe 230), and, similarly, "Political integration into local infrastructures is a prerequisite for empowerment" (Dunn 628). PPGIS is just a tool to advance democracy, it will not be successful in areas that lack democracy.

Future PPGIS

Despite all of its problems, Trevor Harris and Daniel Weiner envision a bright future for PPGIS in "community-integrated GIS" (CIGIS). The goal of CIGIS is to increase the "number and diversity of people who are capable of participating in spatial decision-making" given that knowledge production in GIS will also become more inclusive. CIGIS "recognizes GIS as an 'expert' system but tests the capacity of the technology in the context of people and communities normally peripheral to spatial decision-making processes and politics." It expands upon PPGIS by becoming a forum for the discussion of issues, perspectives, and decisions – this is key for good governance. It is the "explicit integration of a community's [experience-based] knowledge and involvement into the system" which allows CIGIS to avoid some faults traditionally associated with PPGIS like data access (Harris and Weiner 74). Williams and Dunn reaffirm this sentiment, writing that successful PPGIS will rely on the democratic distribution of the collected information and outputs (Williams and Dunn 408). As the "GIS equivalent of a New England town meeting", the issue-driven CIGIS will provide a public arena for transparent and informed spatial-decision making and will allow for the incorporation of alternate forms of information; that is, non-spatial knowledge (Harris and Weiner 74). Even so, it cannot overcome non-democratic decision-making. It may, however, be able to challenge existing hegemonic structures embedded in democratic societies.

Conclusion

This paper examined the process of creating a PPGIS, and how that process has both empowering and marginalizing effects. The goal of PPGIS has always been to empower marginalized communities, and when executed well, PPGIS often meets this goal. However, PPGIS is no match for

poor governance and corruption. If a PPGIS operates within an unfair system it will be used to

marginal peripheral communities as was seen in Cambodia. If it can overcome this challenge, there is

no reason why PPGIS cannot achieve its goal since the marginalizing effects of PPGIS are born

entirely out of poor governance. CIGIS attempts to tackle this problem by formally integrating

community into spatial decision making, but even it cannot succeed in a system unwilling to change.

That should be the key takeaway from this paper: PPGIS is a tool for empowerment, but it is not a

system for empowering.