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GIS use in community planning: a multidimensional analysis of empowerment

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Abstract. A growing body of research examining the social and political implications of geographic information systems (GIS) considers the extent to which the use of this technology may empower or disempower different actors and institutions. However, these studies have tended not to articulate a clear conceptualization of empowerment. Thus, in this paper, I develop a multidimensional conceptual framework for assessing empowerment (and disempowerment), and employ it in examining the impacts of GIS use by community-based organizations engaged in urban planning and neighborhood revitalization. Drawing on a case study conducted with a Minneapolis, Minnesota, neighborhood organization, I show how this multidimensional framework fosters a more complete analysis of empowerment, and therefore, development of a more detailed explanation of the impacts of this new technology.

In cities across the United States, community organizations ranging from small resident groups active in single neighborhoods to large nonprofit organizations engaged in complicated tasks such as affordable-housing development are becoming increasingly involved in urban planning and problem solving. This growing involvement is part of a shift in the roles and responsibilities of community organizations and, by extension, of the citizens who participate in them. Municipal government still plays a central role in planning, but community organizations are being charged with direct responsibility for planning and problem solving in their local communities. Minneapolis and Milwaukee, for instance, have developed neighborhood revitalization programs in which community organizations have been creating and implementing comprehensive community plans for improving housing, economic development, transportation, and environmental conditions (http://www.nrp.org; http://www.ci.mil.wi.us/citygov/doa/admin/plan.htm). In assuming responsibility for a greater range of urban planning and revitalization tasks, community organizations are incorporating new tools and practices. No longer, for instance, are information technologies such as geographic information systems (GIS) tools used solely by local state planners—they are increasingly being used by community organizations as part of their planning and revitalization efforts. The adoption of this technology by community organizations is particularly significant in light of ongoing debates in critical GIS research about the ways in which this technology may alter social and political relationships structuring participation and power of various actors in decisionmaking processes.

Critical GIS research in a wide array of contexts—ranging from rural land use, to natural-resource management, to urban planning—has illustrated the contradictory and complex nature of this technology (compare Aitken and Michel, 1995; Pickles, 1995; Sheppard, 1995). A central point of debate has been whether use of GIS technology might empower organizations and social groups that have been marginalized from decisionmaking, or whether it will tend to consolidate the power of existing dominant actors—furthering the marginalization of others (compare Harris and Weiner, 1998; Harris et al 1995; Ramasubramanian, 1998; Sieber, 1997). However, there remain only a few studies exploring these debates in the context of community-based GIS use in

urban politics and planning (compare Barndt and Craig, 1994; Ghose 2001; Leitner et al, 2000; Ramasubramanian, 1998), as well as a dearth of studies that explicitly conceptualize empowerment in their examination of the impacts of GIS. Thus, in this paper, I begin with a more detailed examination of the propositions developed in critical GIS research as to the mechanisms through which GIS use alters power relations, followed by an explanation of a conceptualization of empowerment intended to foster a detailed assessment of the changing power relations of these complex interactions, as they are being altered through adoption of GIS by community organizations. I employ this conceptualization in assessing the multifaceted impacts of community-based GIS use, drawing on research carried out with an organization in Minneapolis, Minnesota, that uses GIS in its neighborhood-revitalization efforts. This case study examined the ways in which GIS use alters the language, practices, and priorities of community-level planning and revitalization efforts, as well as the impacts of GIS on participation and power of the organization vis-à-vis local state institutions, planning practices, and revitalization efforts (Elwood, 2000).[1]

Critical GIS research

The critical GIS research agenda began with heated debates about the implications of this technology for the discipline of geography (compare Openshaw, 1991; Taylor and Overton, 1991), but the focus soon shifted to include an examination of the broader social and political impacts of this technology. Several propositions have been developed in the literature about ways that GIS may alter social and political processes and the power of individuals, institutions, and knowledge claims. These different arguments about the mechanisms mediating the impacts of GIS focus on different ways in which power is negotiated through GIS and the broader processes in which it is embedded.

A number of scholars have focused on the design of GIS to privilege information that can be displayed visually and quantitative techniques for spatial analysis, further arguing that these data storage and processing techniques are part of an empiricist and positivist logic (Lake, 1993; Pickles, 1995; Rundstrom, 1995; Sheppard, 1995). The empiricism and positivism of GIS are not inherently problematic, they contend, but become so because of the possibility that other forms of knowledge and logic (and by extension, the people and communities they represent) may be excluded from processes in which GIS is used. Other researchers have focused on the closely related role GIS may play in constituting expertise in decisionmaking. Specifically, they argue that GIS advances an instrumental rationalist approach to decision-making that is already dominant in decisionmaking processes where GIS is used, such as land-use planning. The validation by the state of this approach and of GIS as an acceptable tool for information analysis and decisionmaking thus mutually reinforces the hegemony of instrumental rationalism, at the expense of other approaches and knowledge systems (Aitken and Michel, 1995; Harris et al, 1995; Lupton and Mather, 1997; Yapa, 1991). Both kinds of perspectives are rooted in a concern with the construction of power through the privileging of some knowledge claims or forms of logic over others. In particular, there is an attempt to understand how GIS may reinforce an existing hierarchy in which some forms of knowledge and decisionmaking logic are given

[1] Given the analysis of shifting social and political relationships in this project, the study employed ethnographic data-collection techniques and interpretive analysis. From 1999 to 2000, I conducted intensive interviews with approximately twenty-five organization staff and neighborhood residents, analyzed documents and maps produced by the organization over a period of twelve years (1987 – 99), and conducted participant observation while working as an intern at the neighborhood organization for ten months and attending approximately fifty meetings of the organization and its committees.

greater legitimacy, thereby excluding alternative forms of logic and information, marginalizing the knowledge and needs of communities represented by them.

A number of other studies in the critical GIS literature focus more on how access to GIS alters the knowledge production and discursive strategies available to different actors and, by extension, alters their relative power. For example, some suggest that GIS may enable less powerful actors to create alternative representations that contrast or challenge those of the state, potentially giving them a greater voice in policy debates (Barndt and Craig, 1994; Craig, 1994; Ghose and Huxhold, 2001; Ramasubramanian, 1998; Sawicki and Craig, 1996; Sieber, 1997; 2002; Stonich, 1998). A growing literature on 'public participation GIS' implicitly incorporates this understanding of how and why GIS might alter social and political relationships—it is argued that extending GIS access to grassroots groups and other nontraditional users is beneficial because it enables development of alternative knowledge and its inclusion in decisionmaking (Allen, 1999; Alspach, 1999; Ghose, 2001; Ghose and Huxhold, 2001; Jordan, 2002; Kyem, 2002; Obermeyer, 1998). Recognizing concerns raised by other scholars about the exclusion of certain types of knowledge, a number of researchers in this area have sought ways of extending the representational capacities of traditional GIS to include, for instance, narratives or alternative cartographies (Harris and Weiner, 2002; Krygier, 2002).

Like the epistemological arguments about GIS, these explanations are also concerned with the differential power of various kinds of knowledge claims, but focus on the surrounding relationships and interactions through which nontraditional users (or users wishing to promote alternative agendas) might appropriate the technology to construct and promote their own perspectives or to reexamine those produced by others. By extension, these scholars are concerned, for instance, with power differences that affect access to GIS technology and digital data—such as the limited financial or time resources that citizen organizations have to devote to GIS, the unwillingness of many state institutions to share digital data with community actors, or identity-based power differences within communities that affect individuals' access to the technology. Others have focused on power differentials created as marginalized actors develop strategies to overcome these barriers. Masucci (1999) argues that resource-poor organizations tend to gain access to GIS through partnerships with universities and local government agencies in which they continue to occupy a less powerful position. Similarly, Leitner et al (2000) examine the autonomy and limitations community groups experience as they create various collaborative partnerships to facilitate GIS access.

Drawing on these different explanatory frameworks, the critical GIS literature has developed a number of perspectives that detail the contradictory nature of the technology. Clark (1998), for instance, contends that empowerment and marginalization are closely linked within GIS, arguing that any tool fostering information access, management, and analysis can be used in liberatory or repressive ways. Harris and Weiner (1998) and Stonich (1998) illustrate how GIS might be designed and used in ways that grant a wider range of actors a voice in decisionmaking and enable analysis of multiple forms of information. Simultaneously, however, they show that GIS has the potential to exclude and marginalize individuals and communities because of its high cost, technical skill requirements, and reliance on information that lends itself to cartographic and quantitative analysis.

In critical GIS research, it is increasingly clear that the impacts of this technology are contingent on and shaped by complex social and political relationships that constitute the power of different knowledge systems, decisionmaking processes, actors, and institutions. The question is less whether GIS is empowering or disempowering,

but in what ways does it foster empowerment and disempowerment, and for whom? What is the basis of this empowerment or disempowerment for different actors and institutions? In developing answers to these questions, however, much of the literature does not offer an explicit explanation of what may constitute empowerment or disempowerment in these contexts.[2] This leaves a number of problematic questions for researchers attempting to add empirical and conceptual depth to critical GIS research. What kinds of changes can be interpreted as empowering or disempowering in these studies? How do researchers ensure that they have examined multiple facets of the complicated and shifting power relations in which GIS is embedded? In the following section I develop a conceptualization of empowerment to guide an examination of the contradictory impacts of GIS in the context of community-based GIS use in neighborhood planning and revitalization.

Conceptualizing empowerment

A wide array of definitions of empowerment have been developed and employed in social-science research. This theoretical eclecticism complicates the task of developing a framework for assessing the ways in which power relations are altered and negotiated in the context of community-based GIS use. Furthermore, many of the existing definitions have been framed in such a way that they can lead to significant gaps or contradictions when applied in analysis of empowerment. Nonetheless, these existing theories are useful in crafting a conceptualization that fosters more complete analysis of different manifestations of empowerment at multiple spatial and temporal scales.[3]

The majority of definitions of empowerment developed in the social sciences have been singular—conceiving of empowerment (or disempowerment) as constituted by a single type of change. Although these conceptualizations of empowerment have been developed in a wide range of research contexts, it is possible to identify three groups of similar definitions. First, some scholars have defined empowerment as constituted by *distributive change*, such as greater access to goods and services (Jacobs, 1992), or a greater number of opportunities for participation in political processes (McClendon, 1993; Regalado and Martinez, 1991). These definitions tend to be outcome oriented—conceiving of empowerment as a tangible or material change to be achieved. Second, some scholars use definitions that focus on *procedural changes*—arguing that empowerment occurs when social and political *processes* shift such that the contributions of citizens or community groups are granted greater legitimacy, or that their knowledge and needs are incorporated in decisionmaking processes (Allen, 1993; Lake, 1994; Tinker, 1990; Young, 1990). In contrast to distributive definitions that focus on material gain or on increasing opportunities for involvement, definitions focusing on procedural change are based on the premise that empowerment occurs when participation processes are structured not merely to include multiple views or ideas in decisionmaking dialogue, but to do so in a way that gives them authority and legitimacy. Although this distinction between distributive and procedural change is subtle when applied to the issue of citizen participation, it is important in distinguishing between participation as simple inclusion and participation as accompanied by expanded legitimacy for participants and their priorities and arguments.

[2] Ramasubramanian (1998) offers one of the only extended discussions of empowerment in this literature, defining it as the process and outcome of 'critical reflective practice'—reflection on community conditions and needs that leads a community toward more informed and politicized action.

[3] I draw particularly on conceptualizations of empowerment developed in research on community development, citizen activism, community-based organizations, and urban politics and planning, since these arenas are prominent areas of inquiry in critical GIS research.

Third, a large number of studies conceive of empowerment as constituted by *capacity building*, generally framed as an expansion in the ability of citizens or communities to take action on their own behalf. Some scholars contend that such a capacity is a critical precursor to altering structures of oppression that have led to disempowerment (compare Fetterman et al, 1996). These definitions outline a variety of avenues through which that capacity building might occur. Some scholars focus on capacity building as the acquisition of new skills that help individuals and communities actively assert control over their circumstances (Barber, 1984; Boyte, 1989; Rappaport, 1984; Zimmerman, 1990). Others have argued that capacity building occurs through community-based knowledge production, in which members are engaged in gathering information about community conditions or existing resources. They contend that such knowledge production can inform action, serving as the basis for strengthening the capacity of a community to change its circumstances (Gaventa, 1993; Heiman, 1997; Perkins and Zimmerman, 1995). Finally, a large number of scholars argue that the capacity of a community for effective action is increased through development of a politicized consciousness—an understanding of structural power inequities and how these effect them (Fals-Borda and Rahman, 1991; Freire, 1970). Much of Alinsky's writing on community organizing is informed by this assumption, as he asserts that a community must be politicized in order to mobilize effective collective action (Alinsky, 1946, 1989).

Employed separately, these singular definitions of empowerment omit other possible shifts in power relations. Assessing empowerment solely on the basis of capacity building, for example, fails to examine the possibility of changes in distribution of material goods or opportunities for participation that could significantly benefit an individual or a community. Accounting for the potential limitations of singular definitions, other scholars have developed conceptualizations that include multiple dimensions of empowerment. Friedmann (1992) has defined empowerment as involving households and communities gaining one of three related types of power that he argues tend to follow one another—social, political, and psychological power. Social empowerment is gained through increased access to resources needed for household production and reproduction, political empowerment through access to decision-making processes, and psychological empowerment through an enhanced sense of efficacy. Rocha (1997) has developed a definition in which several types of empowerment are differentiated with respect to the arena or relationship being targeted for change. With each level of empowerment in this definition, the arena of change broadens, moving from the individual ('individual empowerment'), to the group ('mediated empowerment'), to institutions ('sociopolitical empowerment'), and then to social structures ('political empowerment').

Although they differ in many ways, Rocha's (1997) and Friedmann's (1992) definitions share a common element, in that each differentiates types of empowerment based on scale of interaction and outcome. Rocha's framework begins at the level of individual change and advances to social structural change. Friedmann's concept sequences its types of empowerment in the opposite direction, positing that psychological empowerment (situated at individual or household level) results from successful efforts to achieve social or political empowerment. The contradiction between these two sequences suggests a problematic ambiguity that arises in conceiving of different dimensions of empowerment as necessarily sequential, or as outcomes that occur at predetermined scales. We can certainly conceive of examples in which is quite difficult to discern such sequential development of different types of empowerment (in either direction), or in which a single activity might simultaneously foster empowerment at multiple scales of interaction. For instance, the revitalization activities of a community

organization can be read as fostering a sense of personal efficacy for involved residents or simultaneously understood as fostering political empowerment though a partial shift in control over neighborhood improvement from the local state to the neighborhood. Part of the confusion arises because of the complicated scales of interaction through which power is negotiated in these situations—relationships between citizens and the state, among different social groups in a neighborhood, between an organization and the residents whose diverse needs and opinions it purportedly represents, between different neighborhoods and the state, and a multitude of other configurations. A single event or action may have multiple and contradictory implications for the negotiation of power in these relationships.

One way to reduce this ambiguity is to employ a conceptualization that differentiates types of empowerment through their substantive differences rather than through scalar differences. Here, I return to singular definitions—empowerment as constituted by distributive change, procedural change, or capacity building—and propose a concept that incorporates all of these as potential dimensions of empowerment. Assessing empowerment as potentially constituted through distributive change, procedural change, or capacity building enables a more complete examination of multiple mechanisms, exchanges or interactions through which power is negotiated among involved actors and institutions.

For instance, in the case of community organizations and processes of urban planning and neighborhood revitalization, distributive empowerment of a community organization might take the form of the organization being offered a seat on the neighborhood-revitalization policy board of the local government. Distributive empowerment of community residents might be constituted through increased access to grant and loan funds for improvement of rental and owner-occupied properties in the neighborhood. Procedural empowerment in this context might involve changes in the decisionmaking practices of the policy board that result in community priorities and proposals being considered on equal footing with plans developed by local government for the community, or changes in community decisionmaking practices to review a wider range of resident proposals for disbursement of revitalization funds in the neighborhood. Capacity-building empowerment might occur by way of the representatives for the community organization, through their participation on the policy board, gaining access to new information or learning new skills that foster continued or enhanced advocacy on behalf of their communities. Capacity building might also take the form of newly involved residents gaining an enhanced sense of efficacy that encourages them to take other actions to improve quality of life in their community.

In differentiating dimensions of empowerment along lines of distributive, procedural, or capacity-building change, scale remains an essential consideration. Efforts to change distribution of opportunities for involvement or distribution of material goods and services, to alter processes that determine the legitimacy or influence of different actors and institutions, or to expand their capacities for action all have inherently scalar dimensions, because these negotiations occur among actors and institutions positioned at (and working to affect) different spatial scales. Geographers have characterized such struggles for power and control that occur across multiple scales of interaction as a 'politics of scale' (Cox, 1998; Swyngedouw, 1997). Such a 'politics of scale' must be taken into account in assessing empowerment. In the case of community organizations involved in urban planning and problem solving, key actors include citizens, community organizations, and the state. An assessment of empowerment in this context needs to examine distributive, procedural, and capacity-building changes in a way that explores multiscalar implications of these changes for the relationships and interactions of these different actors engaged in urban planning and revitalization.

It is also crucial to consider the temporal scale of changes that might occur. Not only is empowerment a multifaceted process, it is shifting—very rarely constituting a fixed or permanent outcome. Thus, a crucial question to be asked of any kind of empowerment, at any scale of interaction, is the extent to which it is sustainable. Although many scholars writing on empowerment recognize its potential impermanence (Handler, 1996; Hasson and Ley, 1994; McClendon, 1993; Perkins and Zimmerman, 1995), there has been little extensive consideration of what types of empowerment might be most sustainable, or what strategies an organization or institution might pursue in trying to maintain advantages won.

With respect to the conceptualization of empowerment I develop here, its dimensions differ with respect to their long-term implications—with some being easier to sustain than others. Distributive types of empowerment are perhaps the least sustainable because they involve a less powerful actor being granted a benefit (such as increased opportunities for participation) by a more powerful actor. This type of empowerment carries with it the future possibility that the benefit could be removed. Procedural dimensions of empowerment may be more sustainable. For instance, in the context of community-based organizations, Hasson and Ley (1994) argue that once procedures have changed such that the opinions and wishes of community groups are considered legitimate parts of urban policymaking, it becomes difficult for the state to revoke this legitimacy. That is, although the state may retain greater power, if community groups have a legitimate voice, they have a way to contest attempts to scale back their participation and influence. Capacity-building dimensions of empowerment are potentially the most sustainable. New skills and knowledge, if they can be maintained and retained by a community or organization, hold the greatest potential for long-term empowerment. These new capacities and knowledge may be transferable to other struggles or issues as well, contributing to empowerment across a wide range of circumstances.

In the following section, I examine the impacts of GIS use in community-based planning and problem solving using this multidimensional framework to explore empowerment and disempowerment at different spatial and temporal scales. GIS use changes community-based planning and problem-solving practices in multiple ways, with complicated and contradictory implications for power relations among multiple actors engaged in these processes.

Applying the framework: GIS, neighborhood revitalization, and empowerment

Powderhorn Park neighborhood, located in south central Minneapolis, Minnesota, is a community of approximately 10 000 residents, diverse with respect to race and ethnicity, class and income, age, and housing tenure. Like many US inner-city neighborhoods, Powderhorn Park experienced decline during the 1970s and 1980s, through deterioration of its aging housing stock, loss of local employment opportunities and business activity, increasing poverty, and rising crime rates. Throughout its history, the neighborhood has had a high degree of citizen involvement in a number of neighborhood organizations. One of these, the Powderhorn Park Neighborhood Association (PPNA), has become a key actor in neighborhood revitalization efforts since the 1970s. In particular, PPNA's role has been strengthened because of its responsibility for overseeing implementation of a comprehensive plan written by neighborhood residents in the early 1990s as part of the Minneapolis Neighborhood Revitalization Program (NRP).[4]

[4] NRP is a twenty-year program created by the State of Minnesota and City of Minneapolis that began in 1990 and redirects tax-increment funds from downtown development into neighborhood improvement efforts. See Nickel (1995) and Fainstein and Hirst (1996) for further description and discussion.

In its neighborhood revitalization efforts, PPNA has sought to involve anyone who lives, works, owns property, or attends a religious institution in the neighborhood. The organization is directed by an elected board of such members and involves many more in subcommittees focusing on housing, economic development, community building, family and youth services, fundraising, and arts and cultural development. Its activities are funded by public and private sources—grants from the rich network of philanthropic organizations in the local area, community developed block-grant funds, and support from the City of Minneapolis through NRP. In recent years, the organization has employed five to seven full-time staff members, most of whom are neighborhood residents. Like many neighborhood-based organizations, PPNA has struggled with address barriers inhibiting full participation in the organisation of the diverse social groups in the neighborhood. However, concerns about these barriers have been a central focus within PPNA's activities and agenda, and in recent years the organization has developed a number of effective strategies for building involvement of renters, people of color, low-income residents, recent immigrants, and elderly residents.

Table 1. Data attributes of Powderhorn Park Neighborhood Association (PPNA) housing database.

Property	Involved individuals	Activities/problems
Lot size	*Owner/taxpayer*	Past problems
Zoning	*Name*	PPNA actions
Property ID number	*Address*	Staff/resident observations
Age of structure	*Telephone number*	
Condition code	PPNA involvement	
Legal description	Volunteer skills	
Tenure status	*Rental license holder*	
Tax delinquent status	*Name*	
Sales history	*Address*	
	Telephone number	
	PPNA involvement	
	Volunteer skills	
	Caretaker/manager	
	Name	
	Address	
	Telephone number	
	PPNA involvement	
	Volunteer skills	
	Block leader	
	Name	
	Address	
	Telephone number	
	PPNA involvement	
	Volunteer skills	
	Tenants	
	Name	
	Address	
	Telephone number	
	PPNA involvement	
	Volunteer skills	

Note: Italicized text indicates attributes for which data are obtained from local government sources and are maintained for all neighborhood properties. All other information is locally collected and is known for some, but not all, properties in the neighborhood.

In 1994, PPNA hired a local nonprofit software developer to build a complex database of neighborhood information, and purchased MapInfo GIS software[5] to use in analysis and mapping of these data.[6] Although staff and residents refer to this database as the 'housing database', it contains information on property and land use, as well as information about people and activities in the neighborhood (see table 1). The property and land-use variables include lot sizes, zoning, and age and condition of structures, and these data were obtained from city and county government offices. The 'people and activity' data were gathered by staff and residents and include information concerning past problems or changes in conditions at neighborhood properties, as well as histories of PPNA involvement in resolving problems or improving conditions at a site. Finally, the database includes information about how to contact occupants, owners, or managers of neighborhood properties.

The staff and residents involved in PPNA's acquisition of GIS and construction of its database had initially planned for these technologies to serve as publicly available information and analysis tools for residents. Though all residents are in theory welcome to use the software at the PPNA office, in practice, it has been difficult for the organization to provide adequate instruction for most residents to use the technology themselves. Thus, staff members who have GIS training carry out most of the mapping and analysis being done at PPNA. However, the information and maps they generate from their GIS use are widely used by residents in many activities. The Housing and Land Use committee and the Economic Development committee frequently request information and maps to guide decisions about strategies, target areas for their activities, or changing conditions in the neighborhood. Individuals sometimes make requests for their own use, as in the case of a resident who requested information about unoccupied structures with mixed-use zoning designations, because she was searching for a building in which she could live and operate a small business.

PPNA's use of GIS to map and analyze these data has resulted in development of some important new planning and problem-solving tools and practices. Further, the use of this technology has fostered changes in the language and information used in neighborhood dialogue and some of the fundamental assumptions and priorities that guide the organization's decisions. These changes in the language, practices, and priorities of planning have significantly altered power relations within the neighborhood—among residents and within PPNA's activities—and have also altered PPNA's relationship with the local state in urban planning and neighborhood revitalization. These shifts in many cases also have implications for individuals' capacities to enact change in their circumstances and, at a much broader scale, may influence PPNA's power vis-à-vis other community organizations in the city. I devote the remainder of this paper to explaining and assessing distributive, procedural, and capacity-building dimensions of empowerment (and disempowerment) at these various scales of interaction. In developing this explanation, I draw on illustrative examples of changes in language, practices, and priorities that have occurred at PPNA, rather than including an exhaustive review of all changes.

Distributive dimensions of empowerment

In the context of neighborhood planning and problem-solving efforts, distributive empowerment can be conceived of as individuals or organizations expanding their opportunities for involvement. PPNA's use of the GIS has fostered several changes

[5] MapInfo Corporation, 1 Global View, Troy, NY12180, USA.

[6] PPNA uses other information technologies in its activities, including e-mail, listserv discussion groups, the Internet, and other digital databases. Discussion of the role and impacts of this wider range of technologies can be found in Elwood (2000).

that have distributive implications, both at the neighborhood level and at the city level. One of the most important of these changes in neighborhood-level processes has been a shift in the language and forms of information that dominate PPNA's deliberations about the neighborhood. Most of the information held in their GIS database is quantitative in form, and further, understanding these data requires experience with and knowledge of city land and property policies. Through their growing use of GIS and these data, residents have altered the terms and information they use in describing neighborhood conditions. For example, archival records show that, in the past, discussions of neighborhood housing conditions were couched in a language of visual description and relied heavily on residents' observations. Since the advent of GIS at PPNA, such discussions more commonly use numerical property-condition codes contained in the housing database. For example, using this system residents discussing vacant and boarded houses at PPNA meetings commonly describe the structure as, "on the 249 list"—the code designating this condition. Further illustrating how the GIS has contributed to changes in language and information use at PPNA, a staff member offered this explanation of how residents' observations are incorporated into the database for analysis:

> "one of the roles [staff members] take is to distill that [information] down into quantifiable and measurable pieces" (Oscar, personal interview, 1999).[7]

Though Oscar described this process of quantification as one carried out by staff members, it significantly affects resident participants in PPNA as the information becomes a part of the organization's dialogue and deliberations.

Such changes in the language and forms of information used in PPNA have contrasting implications with respect to distributive dimensions of empowerment. On one hand, they raise the level of expertise and knowledge one must have in order to understand and contribute to dialogue in the organization, in effect restricting opportunities for involvement of some neighborhood residents. In the words of one resident,

> "I've been a member of this committee for years, and with the discussion of tonight's agenda items, I couldn't understand a thing. We've gotten so far into zoning code that the lay person can't figure out what is going on!" (Melissa, personal interview, 1999).

Though the new discourse of decisionmaking at PPNA and exclusions that have occurred because of it can be understood as barriers of expertise and knowledge, it is critical to recognize that they are intricately intertwined with exclusions along lines of race, class, ethnicity, gender, and other axes of difference. The individuals who have most readily incorporated this new discourse into their activities at PPNA have largely been upper-middle-class white homeowners. The emerging discourse has tended to impinge on participation of people of color, senior citizens, low-income individuals, and residents with limited English skills. These patterns of inclusion and exclusion are inscribed in PPNA's particular history and social relations, but of course are simultaneously an expression of broader structural opportunities and constraints.

Although PPNA's use of GIS has resulted in changes that raise barriers to participation of some residents, the organization has simultaneously been trying to use its GIS as part of a strategy to lower these barriers. One of the most common daily uses of PPNA's GIS is providing information to neighborhood residents. For instance, residents experiencing problems with a nearby rental property could obtain information from the housing database about past strategies used in trying to resolve the problem, or information about how to contact the owner and manager. In an alternative scenario, a block club seeking to establish a community garden on a vacant lot

[7] In the direct quotations from my interviews, the names of staff and residents are pseudonyms, given the preference of some not to be identified.

could obtain zoning and ownership data needed for their project. Prior to the existence of PPNA's databases, acquisition of these type of data required calling or visiting several city government offices, as well as PPNA's own office. For many residents, this series of steps constituted a barrier to participation. A resident might not know which office to contact, might feel intimidated to do so, or might not have telephone or transportation access. One elderly resident, a frequent recipient of information from the database, offered this explanation,

> "I think a lot of seniors don't know who to call if they're having problems. PPNA gives them information that helps them figure out what to do, it makes such a difference" (Jane, personal interview, 1999).

PPNA's choice to use its GIS to create an information clearinghouse within the neighborhood thus lowers the barriers to involvement experienced by some residents in neighborhood problem solving and revitalization, fostering distributive empowerment for these individuals.

Beyond the scale of neighborhood interactions, PPNA's use of GIS has also fostered changes that constitute distributive empowerment for PPNA in its relationship to local government. PPNA has used GIS to foster greater information access and analysis capabilities, which in turn it has used to leverage greater participation in city-level decisionmaking. One of PPNA's community organizers offered this example,

> "Say there is a dilapidated house and the City Inspector walks by it once on the sidewalk and says it is all cleaned up and there ain't no reason to put more energy into it. Well, we may still be getting a bunch of calls from residents who say the place is trashed again and it's noisy. By keeping this information in the database, we can start to see a pattern emerge. We can then show the City there might be a need for more monitoring, maybe checking in with the rental property owner. We use this information to justify and push for greater means to address a problem" (Anthony, personal interview, 1999).

In this instance, PPNA is using its database to monitor neighborhood conditions, and then using this information to insert its voice into city plans regarding housing improvement. Although the City of Minneapolis does have a history of willingness to involve neighborhood organizations in city-level decisions, this opportunity to make specific recommendations for city actions in the neighborhood constitutes an expansion of previous opportunities for community-organization participation. Such new opportunities for participation constitute a distributive form of empowerment.

In sum, PPNA's GIS use has had mixed implications with respect to distributive dimensions of empowerment. In neighborhood-level processes, the technology has simultaneously expanded and restricted the involvement of residents in planning and problem solving. At the level of city, the implications are largely positive—PPNA has used its GIS to leverage increased opportunities for involvement in decisions that affect Powderhorn Park.

Procedural dimensions of empowerment

PPNA's use of GIS has also fostered changes in its priorities, practices, and discourses that have altered the legitimacy or influence of actors and their knowledge claims. These changes in legitimacy and influence constitute procedural forms of empowerment for some residents and disempowerment for others. The procedural shifts outlined here are occurring largely because the use of digital databases and GIS at PPNA has been accompanied by a change in the type of information considered most important and appropriate for planning and problem-solving, and in the relative authority of different claims to knowledge in these processes. Specifically, within PPNA's planning and problem-solving efforts, decisions and opinions that are grounded in

the language and information of city policy and professional planning expertise are being granted increasing authority.

PPNA's GIS has enabled the organization for the first time to obtain, store, and analyze large volumes of information that directly draws on city policy and professional planning expertise. The shift in the type of information considered to be most important or legitimate is evident in the types of information and justifications given in the organization's decisionmaking. One resident offered this explanation of PPNA reasons for rejecting a variance to add more rental units to a property over ten years ago, prior to PPNA's use of GIS:

> "We said no. It was an ugly property! There was tarps hanging off of it and pigeons making a home there and everything!" (Max, personal interview, 1999).

Explaining the information used in reviewing a variance request made in 1999, well after the advent of information technologies at PPNA, a staff member described the present decisionmaking process as one that relies much on different types of information:

> "As a neighborhood, we want consistent zoning and land-use patterns, and we want to strengthen our commercial nodes. So we wanted to rip down commercial building like this [one which is] away from the nodes. And we didn't want to encourage a land use that wasn't [consistent] with the zoning" (Jeremy, personal interview, 1999).

The past choice, described in the first statement, is justified with site-specific conditions and visual observations of the property. The recent action is justified with the language and information of city policy and professional planning—"consistent zoning", "land use patterns", and "commercial nodes".

It is not the case that the first type of decisionmaking is no longer present at PPNA, just that the second has become increasingly common and is now actively defended by many participants as the best and most appropriate way of making decisions. This development has significant implications for the procedural empowerment of different groups of residents. Specifically, those residents who have the education, expertise, or experiences to be able to frame their contributions to neighborhood dialogue using the newly dominant forms of information can make a greater claim to authority. This shift has meant the empowerment of a particular social group in the neighborhood vis-à-vis all other residents—white, upper-middle-class homeowners with specialized education or experience in law, local government, or business.

The statements above also illustrate the way in which PPNA's revitalization efforts increasingly prioritize goals and plans framed in geographically comprehensive ways, referencing conditions or patterns across the neighborhood. This scalar shift contrasts with earlier decisionmaking priorities and practices that were more site-specific. The effect of this shift in terms of procedural empowerment has been roughly the same as the schism described above. It empowers individuals who have access to such comprehensive information, either through experience with PPNA's GIS and database or through other experiences such as professional experience in planning or local government. The contributions of individuals whose experiences or knowledge enable them to express their ideas and preferences with respect to only site-specific information are less influential. A resident serving as the chair of the Housing and Land Use committee clearly identified this shift in decisionmaking priorities at PPNA,

> "It is really difficult to say 'No, we can't approve that for you' if it is something that an individual feels will improve livability for them. But we have to take into account what is good for the overall neighborhood and area affected" (Max, personal interview, 1999).

PPNA's shift toward comprehensive analysis and information informed by technical expertise has not gone unnoticed or unchallenged by residents' who feel marginalized by it. As one resident argued,

> "I don't want us to be locked in by these technologies. I know, and the people on my block know, what is good for our little corner of the world!" (Melissa, personal interview, 1999).

The growing importance of 'expert qualifications' is evident in the way participants introduce themselves at PPNA meetings. Given the ever-changing array of people who attend these meetings, participants usually introduce themselves and say where they live in the neighborhood. An increasing number accompany this information with a statement of 'credentials' relevant to the activities of a particular subcommittee. So in the Family and Youth Committee, one frequently hears, "I am a social worker for the County", and in the Housing Committee, "I've worked as a Realtor on the south side for twenty years" or "I work in the City Inspector's Office". These statements especially stand out as a way of claiming authority when considered in contrast to the introductions given by residents without such credentials. In one memorable instance, a resident attending an Economic Development committee meeting gave her name and address, faltered for a moment, and said, "I don't have a by-line. I'm just a resident".

Alongside these changes that foster procedural empowerment for some residents while disempowering others, PPNA's use of GIS is also altering the community's interactions with local-government actors in ways that constitute procedural empowerment. PPNA has used its GIS to generate information that these officials need, but do not have access to. This is particularly true because PPNA's database incorporates both local knowledge and government-collected information. Analysis of this information has afforded PPNA greater legitimacy and influence as an informed and knowledgeable actor in local state processes—a procedural dimension of empowerment. As an example, in 1998 the Minnesota legislature was challenging the effectiveness of the Minneapolis NRP and threatening to remove funding for its continuation. At the time, City officials did not have data and maps demonstrating significant tangible improvements in neighborhood conditions. Knowing about PPNA's database and GIS, City officials asked PPNA staff members to present their own maps and analysis showing improvements in housing conditions generated through NRP-funded assistance programs in Powderhorn Park. At first glance, this situation might be interpreted as distributive empowerment—simply an additional opportunity for PPNA's voice to be heard in a decision affecting the neighborhood. However, I argue that it constitutes a much more important procedural shift. In urban planning, state actors are almost always considered to be more powerful and knowledgeable than neighborhood organizations. In contrast, in this situation, city officials consulted PPNA as an informed collaborative partner.

This greater legitimacy and image as an informed and competent participant has been fostered because of the actual analysis PPNA conducts, but also simply because the organization uses GIS. Throughout my interviews with them, residents made countless statements like this one:

> "[Using information technologies] gets the City to take you more seriously. They know that you as a group can actually track down information. It shows that while you may not have the dollars, you have capable people who will work very hard to make a difference" (Joshua, personal interview, 1999).

Although this approach to gaining greater legitimacy has been successful for PPNA, it is important to also recognize its potentially problematic implications for other organizations in the City of Minneapolis. The state validation of GIS-based information and analysis may advantage groups that have access to it at the expense of those groups

that do not, as well as serve to create an expectation on the part of local government actors that community organizations should engage in GIS use, whether or not they wish to do so. My evidence does not suggest that this is occurring in Minneapolis at this point, but it is certainly conceivable that such increased competition between community organizations may emerge over a longer period.

Capacity-building dimensions of empowerment

Capacity-building dimensions of empowerment may take several forms in the context of community organizations and their activities. Expansion of the capacity of individuals and communities to take action on their own behalf could occur through development of new skills, production of new knowledge to inform or guide their action, or development of a new understanding of community conditions that motivates further action. As with both the procedural and distributive dimensions of empowerment, PPNA's use of GIS has had varying impacts with respect to capacity building.

In terms of development of new skills, empowerment of the organization as a whole is clear. The use of GIS has given PPNA access to new data-storage and analysis capabilities—a significant new skill informing planning and problem-solving efforts. However, capacity building through expansion of the skills of individuals is unevenly distributed. Although a large number of involved residents use data and analysis generated from the GIS, PPNA staff members do most of the data acquisition, coding, and analysis. Thus, although development of new skills is occurring, this element of empowerment is restricted to the staff members. This uneven distribution in dimensions of capacity-building empowerment has important potential consequences in the context of community groups. These organizations tend to have high staff turnover (Fisher, 1994), and so GIS skills are unlikely to be retained as community resources if they are not also fostered in residents.

Capacity building through knowledge production is closely related to capacity building through new understanding of community conditions or needs, and in both areas PPNA's use of GIS fosters community-level empowerment. GIS enables PPNA to store community-collected observations (and local state data) for a much larger number of neighborhood properties, and to maintain these data over a longer period of time. Prior to the creation of its GIS, PPNA's local knowledge resources consisted of notes taken by a frequently changing array of staff members, and the memories of an equally shifting group of active residents. Their use of GIS to create a greatly expanded data resource for the community is a form of capacity building through knowledge production. As well, some residents who use data and maps from the database suggest that they experience capacity building through knowledge production and an enhanced personal sense of efficacy in creating change in the neighborhood. One resident who has frequently used information from the housing database argued:

> "As you gain expertise in knowing what you can do, it makes you so much more powerful. And the reward is knowing you're getting something done, that you're making a difference to the place where you live!" (Jane, personal interview, 1999).

Further, by bringing analytical capabilities of their GIS to bear on this expanded community data resource, PPNA has developed new understandings of neighborhood conditions and needs. For example, PPNA's housing organizer explained that, prior to the creation of the housing database, the Housing and Land Use committee felt that the area of the neighborhood in greatest need of revitalization was the northern portion, both rental and owner-occupied structures. However, after using the GIS to create a series of maps of condition, value, and tenure status, the committee changed its long-standing assessment of the pattern. They found a strong need for revitalization of rental properties on the three largest transportation arteries that cross through the neighborhood. This new

interpretation of neighborhood conditions resulted in a significant change in the geographical pattern of their revitalization strategy, and a move toward assistance programs in those locations to target rental properties. These community-based analyses can be an important element of capacity building in terms of expanded political consciousness. GIS analysis may engage the community in critical reexamination of data and representations of their community being produced by local-government actors, potentially mobilizing and informing community efforts to present alternative views.

In understanding how GIS might foster capacity-building empowerment at the community level, existing patterns of participation and exclusion in an organization are crucial, because these determine which individual residents are directly involved in these dimensions of empowerment. The capacity building that is occurring at PPNA through its use of GIS is most immediately relevant for the organization as a whole, and for those individuals who are actively participating in the organization. Residents who are not involved in the organization are not directly experiencing this form of capacity-building empowerment through PPNA's use of GIS. Such differences illustrate the importance of assessing empowerment at multiple scales of interaction. Solely focusing at the level of the organization would overlook the uneven development of this capacity-building empowerment among Powderhorn Park residents.

Conclusion

From this assessment of distributive, procedural, and capacity-building dimensions of empowerment, it is clear that there can be no singular conclusion regarding the impacts of community-based GIS use. This analysis has shown that such use of GIS tends to foster changes that are simultaneously empowering and disempowering at different scales of interaction, and for different social groups participating in community planning and problem solving. Some neighborhood actors have experienced distributive, procedural, or capacity-building forms of empowerment, whereas other actors in the neighborhood have experienced disempowerment along some of these three axes. Impacts have been more uniformly positive at the scale of PPNA's relationship with the local state, in that the technology has fostered changes that are generally empowering along the three different dimensions. These positive implications for PPNA may be problematic for organizations that do not have access to this technology, given the competitive urban political environment in which community organizations try to garner resources and political favor. A multidimensional and multiscalar examination of empowerment (and disempowerment) enables development of this more complicated account of the impacts of GIS use by community organizations. Use of a singular conceptualization would have obscured, for instance, the emergence of different types of empowerment and disempowerment being experienced by residents of Powderhorn Park. A single-scale analysis in this case study might have overlooked the difference between community-level impacts and changes in the relationship of the neighborhood to the state.

In examining the explanation developed in this case study, it is essential to recognize that the particular impacts of GIS use are highly contingent—strongly shaped by the context in which community organizations are embedded. For instance, a community organization without PPNA's existing concern about involving a diverse group of residents might not choose to use its GIS to foster distributive empowerment of residents by lowering barriers to participation. A community organization without PPNA's history of collaboration with the local government, or that is embedded in a local-government context that has no commitment to including community-level actors, might not be able to leverage the same degree of procedural empowerment through its GIS use. These possible variations highlight a need for comparative study assessing how community

organizations using GIS within different social, political, and economic contexts might experience different configurations of distributive, procedural, and capacity-building forms of empowerment and disempowerment. Such comparative study is an important step in advancing the critical GIS agenda, as much of the empirical research to date has been based on single-case studies like the one profiled here.

As countless other scholars studying participatory democratic practice have observed, organizations engaged in community-based planning or neighborhood revitalization occupy a complicated position. They are simultaneously striving for involvement and influence within the state-level processes in which they are embedded, while at the same time working at the community level to include and represent the needs and priorities of a diverse range of social groups. This study illustrates the growing complexity of these tasks, in the face of new tools and practices that may alter participation and power relations differently in these multiple spheres of interaction. Further, I have developed and highlighted the importance of a multiscalar analysis of empowerment in assessing the implications of such new tools and practices. Analysis at a single scale may obscure the potential complexity of these impacts, whereas examination of multiple spheres of interaction may highlight the presence of trends toward both empowerment and disempowerment. A challenge for community-based organizations, and for those of us trying to understand their role and impact in urban neighborhoods, lies in further exploration of how these organizations might balance the oppositional tendencies of such changes—working to enhance empowering changes while ameliorating disempowering developments.

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