ABSTRACT

BRIDGING THE DIGITAL DIVIDE: INTEGRATING SOCIAL AND TECHNICAL CAPACITY WITHIN PARTICIPATORY GIS

by Jennifer Lynn Prather

Participatory GIS (PPGIS) has been offered as a way to engage local citizens in community problems such as urban decline, however much of the existing literature focuses more on GIS as technical process rather than addressing GIS as a human/social process. This paper explores the potential role of social capital as a bridging agent between GIS as a technological and social process. Using the case study of housing in the declining inner-ring suburb of Elmwood Place, Ohio, this research employs archival, interpretive, and participatory research methods to examine the role of social capital within a PPGIS. Results suggest PPGIS participants are far more than passive recipients of information and the success of such an endeavor relies on the motivation of participants just as much as the accessibility and usability of data collection tools and techniques. In places like Elmwood Place, social capital is not only a necessary precondition for building a PPGIS, but appears to be a positive outcome as well.
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DEDICATION

This work is dedicated to my family:
A journey of a thousand miles begins with a single step.
This journey is for you.
ACKNOWLEDGEMENTS

First and foremost, I would like to thank my family for the support and encouragement they have given me throughout my life. Thank you for teaching me the value of hard work, and helping me find the determination to see things through to the end.

I would also like to thank my close circle of friends for the smiles, for the laughs, for the chats, the encouragement and for simply blessing me with their presence.

To the Geography Department Faculty and Staff: thank you for loving what you do, and inspiring me to find the same kind of passion. I consider it a great honor to have had the opportunity to learn from each of you.

To Debbi White: thank you for being you, for hunting me down to make sure my forms are filled out, for helping me register for classes, and for the wonderful peanut butter pie you bring to department functions. You have made a lasting impression on me and I will never forget you.

To those from the St. Bernard-Elmwood Place Community, especially those who participated in this study: thank you for the time and effort you have put into making our neighborhoods better places to live.

Lastly, and most certainly not least, Dr. Prytherch and Robbyn Abbitt: I would like to express my heartfelt thanks to the both of you, I most certainly would not be here if it weren’t for your advice, guidance, and support over the years. I appreciate your patience and the countless hours you spent with me editing and making changes as I worked to finish this thesis. Your encouragement has stimulated my passion for Geography and GIS and inspired me to put forth the best effort possible. Thank you for being such great role models.
PUBLIC INVESTIGATION

Public involvement has become an important topic in planning theory and practice over the last quarter century, and Public Participation GIS (PPGIS) has emerged at the intersection of an increased desire for participatory democracy and the availability of technology based spatial analysis. PPGIS, in theory, aims to create a sense of community empowerment while improving the level of citizen participation in the planning process through geo-spatial technology (WJ Craig & SA Elwood, 1998; WJ Craig, TM Harris, & D Weiner, 2002; S Elwood & H Leitner, 1998; Ghose, 2001; NJ Obermeyer, n.d.). Because PPGIS strives to democratize research through the study of complex issues and phenomenon with the full engagement of individuals that are directly affected by it (Breitbart, 2003), it has the potential to become a valuable tool in engaging local citizens in combating community problems such as urban decline. However the existing body of literature which focuses primarily on GIS as a technical process of mapping and data collection does not offer much discussion on GIS as a human/social process.

Many studies have been conducted on grassroots organizations and their use of GIS technology, (W.J. Craig & S.A. Elwood, 1998; S. Elwood & H. Leitner, 1998; H. Leitner, R.B. McMaster, S. Elwood, S. McMaster, & E. Sheppard, 2002), as well as studies of the empowerment generated in of local organizations as a result of better access to geographic information technologies (Ghose, 2001; N.J. Obermeyer, 1998). There have also been studies conducted to develop models that can be used to evaluate participatory GIS (Barndt, 2002). These studies and others like them have led to disputes about the epistemological and the theoretical supposition of PPGIS and have created a dialogue centering on access to geographic information technology and the identification of individuals who can utilize and benefit from participatory GIS. Concerns over cost, accessibility, and nature of PPGIS, voiced by many researchers are valid. But even these concerns, and the subsequent case studies they produced, are focused on the technological side of the discipline.

In this paper I will explore the social aspect of participatory GIS through the lens of social capital, a sociological concept used in business, economics, organizational behavior, political science, public health and the social sciences in general, to refer to connections within and between social networks (Arrow, 2000; Gittell & Vidal, 1998a; RD Putnam, 1995a). I explore the potential role of social capital as both necessary precondition for and productive result of
participatory GIS, through the use of archival, interpretive, and participatory methods. Although this paper focuses on PPGIS as a social process, I argue the social and technical aspects of PPGIS cannot exist apart from one another; both add value to the field and are mutually dependent on the other for the success of a PPGIS endeavor.

This paper documents the process of using participatory GIS to build a GIS database which depicts the housing conditions in the Village of Elmwood Place, an inner-ring suburb of Cincinnati Ohio, through the use of a modified version of the university/community partnership suggested by Leitner and Elwood et al. (H Leitner, RB McMaster, S Elwood, S McMaster, & E Sheppard, 2002). Elmwood Place exemplifies the challenges of planning in struggling urban neighborhoods, which have both major urban problems and limited governmental resources, and could thus benefit from PPGIS. The lessons learned here could very well be applicable in other struggling communities. To understand the role of social capital in relation to PPGIS, I first assess the pre-existing levels of social capital in Elmwood Place before engaging the community in PPGIS. To better understand the social challenges and complexities in building a participatory GIS program, I draw from writings on the best practices found in other PPGIS studies completed in struggling urban areas (Al-Kodmany, 2000a; Ghose, 2001) to implement a participatory GIS program -- in this case an urban housing inventory and mapping process -- in an urban community with little resources. Finally, I surveyed the participants after the PPGIS to assess what, if any, changes occurred in levels of social capital.

The work done by contemporary PPGIS practitioners has made great strides in making GIS technology available to a wider audience, but participatory GIS has yet to reach its full potential (S Elwood, 2006). The results of this study suggest that generating and maintaining social capital amongst project participants is of vital importance to the success of a PPGIS project. Social capital is as valuable a resource as the data collection tools and techniques used in the process, and should be treated as such when planning for the future of PPGIS. Participatory GIS should not only be viewed as a technology; but as a social process as well, as the two cannot function without the consideration of the other. Further exploration into societal aspects of participatory GIS can benefit the discipline as practitioners look for ways to make it available in the future.
LITERATURE REVIEW

Participatory GIS

Participatory GIS evolved as a response to a claim that marginalized individuals were often left out of policy debates (SC Aitken & SM Michel, 1995; WJ Craig et al., 2002; SA Elwood, 2002; Ghose, 2001) and it has become an effort to make GIS a less techno-centric, elitist, and exclusive science. PPGIS is geared toward empowering every day, non-technical users such as community groups, and grassroots organizations.

GIS technology has been evolving since its creation in the 1960s, but it wasn’t until the cost of computer hardware and software started to decline in the last twenty-five years that a discussion regarding the nature of GIS and its role in society started to take place. Participatory GIS was featured in Cartography and GIS in 1998, laying the foundation for this new sub-discipline. The discourse that has followed has touched on issues of data availability and cost, empowerment, and theory. From a theoretical standpoint, PPGIS differs from that of traditional GIS in the fact that it aims to democratize research through the study of complex issues with the full engagement of individuals that are directly affected by it (Breitbart, 2003). It is clear however, that fundamentally different approaches to the interpretation of participation, and what it is supposed to achieve exist amongst PPGIS practitioners. (Abbot et al., 1998; S.C. Aitken & S.M. Michel, 1995; Pickles, 1995)

In general, it is argued that participatory GIS should always strive to encourage lifelong learning in a manner that bridges the gap between race, gender, religion, or socioeconomic status (WJ Craig et al., 2002), yet there are many challenges to achieving this idea. The first major challenge to PPGIS is the prohibitively high starting costs for hardware, GIS software, and data (for example the leading manufacturer in GIS software, ESRI, sells a single license of ArcInfo for nearly $1000). Helga Leitner and Sarah Elwood et.al (2002), have confronted these issues by identifying five models through which PPGIS can be accomplished. These models range from in house GIS programs and university-community partnerships to the use of internet map servers such as Google Earth and Live Local. Participatory GIS is generally conducted in partnerships developed between individuals, communities, grassroots organizations, academic institutions, religious or faith-based institutions, and the private sector (H Leitner, S Elwood, E Sheppard, S McMaster, & R McMaster, 2000).
The second challenge to implementing a PPGIS is the identification of individuals who can utilize and benefit from it. Scholars have often written about public participation as a hierarchical scale (Craig et al., 2002) with the bottom exemplifying the least amount of participation and the top representing full public engagement, as seen in figure 1. In many distressed communities citizen participation often falls at the bottom of the hierarchical scale. Participatory GIS is a helpful tool in aiding individuals and communities in climbing the participation ladder, by building upon the existing levels of social capital. These issues are particularly important in those places where GIS is needed the most, like impoverished inner-city or inner-ring suburban neighborhoods. An increasing number of professionals have thus explored how GIS can be integrated with community participation in the context of urban revitalization (SC Aitken & SM Michel, 1995; WJ Craig & SA Elwood, 1998; H Leitner et al., 2000; D.S. Sawicki & Peterman, 2002; E Talen, 2000; E. Talen, 1999). The ideas put forth by these professionals are deeply rooted in theory and provide an excellent foundation for creating a social and institutional framework for participatory GIS, especially in the context of community revitalization in neighborhoods with scant financial resources.

Very few scholars have attempted to create a participatory GIS program from the bottom-up as suggested by Talen (1999, 2000). Most of these studies have skipped the bottom and head straight for the center: the established community based organizations (Al-Kodmany, 2002; S Elwood, 2002a). These case studies are completed in a linear fashion, with little emphasis on sustainable participatory GIS practices or even guidelines to measure the success or failure of the endeavor outside of the general strengths and weaknesses of the project (Al-Kodmany, 2000b; Casey & Pederson, 2002).

Figure 1: In a community lacking substantial amounts of social capital, citizen participation often falls at the bottom of the hierarchical scale. Participatory GIS is a helpful tool in aiding individuals and communities in climbing the participation ladder, by building upon the existing levels of social capital.
The Potential Role of Social Capital

There remains a need to understand how participatory GIS can be constructed, not just technically, but also from a human/social standpoint. How might one build a participatory GIS project from the ground up in a neighborhood with limited financial and social resources, and how would one go about getting people involved in the process? Recent writings on social capital suggest possible ways to not only understand the social aspects of neighborhood dynamics and participatory GIS, but also measure the effects of the participatory GIS process on creating a sense of community and individual empowerment. If participatory GIS “should always strive to encourage lifelong learning in a manner that bridges the gap between race, gender, religion, or socioeconomic status” (Craig et al., 2002), perhaps social capital is one good way to think about that bridge.

In the last decade, many academics have begun the task of investigating the value that social relationships have in neighborhoods through the concept of social capital. Social capital, as it pertains to the neighborhood, can be loosely defined as networks of trust and reciprocity, their ability to organize citizens around a particular project or issue, and their capacity for creating successful community based organizations (Coleman, 1988; RD Putnam, 2001a). The social networks formed in communities create social ties amongst citizens, creating a sense of unity within a community. If these networks are strong, participatory action can thrive. Participatory action can also be limited by social capital, or the lack thereof.

Based on the existing literature, there are three distinct types of social capital: bonding, bridging, and linking social capital (Coffé & Geys, 2006, 2007a, 2007b; Green & Haines, 2007; Paxton, 2002; M. Woolcock & D. Narayan, 2000) Bonding social capital consists of closed networks of like minded individuals such as families and friends, while bridging social capital consists of individuals with marked differences such as race, gender, religion, or socioeconomic status. The third and lesser known type of social capital is linking social capital which consists of relationships formulated between individuals of differing levels of power such as the relationship between members of a community based organization and elected officials. Each of these types of social capital are valuable, but it is believed that bridging connections between individuals with general differences such as race, gender, religion, or socioeconomic status will have a more positive outcome when building trust and cooperation (Coffé and Geys, 2007a).
Many scholars have made contributions to the existing body of literature pertaining to social capital, but not all of these contributions apply when discussing social capital at the neighborhood level. Perhaps the most noted contribution to the study of social capital at the neighborhood level has come from Temkin and Rohe (1998), who suggest that neighborhoods with elevated levels of social capital are more capable of developing an effective response when affected by adversity than neighborhoods with low social capital. They argue that social capital can be divided into two concepts, sociocultural milieu and institutional infrastructure. The idea of sociocultural milieu is closely related to the idea bonding social capital but moves beyond trust and examines feelings of neighborhood identity amongst residents. Institutional infrastructure can be directly connected to bridging social capital and it examines the level of civic engagement amongst residents of a community. They conclude that the three most important aspects of social capital in regards to neighborhood stability are 1) a strong sense of place within a neighborhood 2) the belief that the neighborhood in question was a good/safe place and 3) a solid institutional infrastructure. Such work has been influential in other studies that seek to measure social capital in such community settings (Gittell & Vidal, 1998b; Green & Haines, 2007; Sahd, 2004).

Research Focus: Integrating Social Capital and Participatory GIS

Theories of both participatory GIS and social capital share a great deal in common. To put it most simply, both are about bringing people together around a common goal. Consequently, exploring the potential role of social capital as both a necessary precondition for, and a productive result of participatory GIS, may provide some insight on how to most effectively build a participatory GIS program from the bottom up. GIS practitioners have come up with practical solutions for data availability concerns, providing technical capacity to build community level participatory GIS programs. A considerable amount of research has also gone into identifying individuals who can utilize and benefit from PPGIS. The participatory GIS literature suggests that communities that fall at the bottom of the participation ladder are the communities that can most benefit from a PPGIS program.

At the same time, theories of social capital suggests that a participatory GIS should build open lines of trust and communication amongst participants and practitioners so that anyone interested in being involved in a project can do so in an environment where their presence and
contribution are valued. Building social capacity is paramount to a PPGIS program built on social capital, as it is the mechanism that allows groups of people from diverse backgrounds to work together, and only after a solid level of reciprocity is established does the GIS portion of a PPGIS even start. Given these circumstances, the integration of social capital and participatory GIS might be a useful tool in aiding these neighborhoods in solving some of their problems, but how might this be accomplished in practices? And how might social capital play a role as the bridging agent between GIS as a technological and social process?

Many argue that social capital in the United States has been declining over the last half century, (Paxton, 1999; RD Putnam, 1995b, 1995c) and this decline in social capital exacerbates many of the problems facing urban areas in this country, (Forrest & Kearns, 2001; Rahn & Transue, 1998; Subramanian, Lochner, & Kawachi, 2003; Temkin & Rohe, 1998). At the same time many scholars are in agreement that America’s inner-ring suburbs are in particular physical and social disrepair (Bollens, 1988; Davis, 2005; Hanlon, 2008; Puentes & Warren, 2009). The literatures on both PPGIS and social capital suggest that establishing a successful participatory GIS program requires building upon existing (bonded) social capital amongst participants, in order to use the PPGIS process itself to generate the bridged and linked social capital necessary for keeping participants engaged and interested. The literature suggests that social capital is not depleted when drawn upon, but has its own recycling mechanism. Instead, social capital, when drawn upon, only generates more social capital. Documenting these relationships empirically is the purpose of this study.

**CASE STUDY**

The village of Elmwood Place is a prime example of the troubles inner-ring suburbs are facing, both socially and financially. Incorporated in 1889, the Village of Elmwood Place is one of Cincinnati Ohio’s first suburbs. Located nine miles from the Ohio River, Elmwood Place is one of three independent jurisdictions surrounded by the City of Cincinnati as illustrated in figure 2. The village is bisected by rail road lines and is located less than a mile from Procter and Gamble’s National Headquarters (est. 1837) and the former home of the Miami Erie Canal. Once connected to downtown Cincinnati by street car (1920-1950 respectively), Elmwood Place had an abundance of affordable housing, jobs, and businesses. According to lifetime resident
and former mayor Richard Ellison, the Village of Elmwood Place, ‘had an area of six or seven blocks where we had just about any kind of store you could find - or two of them, they used to come from all over to shop in Elmwood Place. The saying was, if you can't find it in Elmwood Place you can't find it—not anymore' (Perry, 2006).
Figure 2: The Village of Elmwood Place, located nine miles from the Ohio River, is one of Cincinnati's oldest suburbs.
Figure 3: Elmwood Place in the 1950's compared to the Elmwood Place of Today
This small municipality now confronts large urban problems. With a land area of 0.3 square miles and a population of 2,495 (as of the 2009), the village is the second smallest political jurisdiction in Hamilton County, yet has the highest level of population density. Seventy-six percent of the residential structures in the village were built prior to 1939, and the median sale price of one of these structures in 2006 was $21,000. A majority of the village’s residents earn a low to moderate income leaving twenty-two percent of the population below the poverty line (“American FactFinder,” 2009; “Hamilton County Auditor Dusty Rhodes,” 2009). A direct comparison of median household income and median home value between Elmwood Places and its nearest neighbors illustrate the plight the village is currently facing financially.

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<td>The Village of Elmwood Place</td>
<td>$29,107</td>
<td>$62,900</td>
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<td>The City of Norwood</td>
<td>$32,223</td>
<td>$86,500</td>
</tr>
<tr>
<td>The City of St. Bernard</td>
<td>$37,536</td>
<td>$91,500</td>
</tr>
<tr>
<td>The City of Cincinnati</td>
<td>$29,493</td>
<td>$93,000</td>
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Figure 4: A comparison of income and home values statistics between Elmwood Place, and its closes neighbors show the plight the village is currently facing.

Socially, the village is also facing rapid decline. At the time of this project, there were few civic engagement opportunities available to residents. There are no parks or recreation facilities available within the village, and the local branch of the Cincinnati Public Library is currently in the process of closing its doors in Elmwood Place. Based on the author’s own experience of growing up in Elmwood Place, there is a limited attitude, spirit, and willingness of citizens here to engage in community issues. It appears that social networks outside of immediate family and close neighbors are scarce, and the good will, sympathy, trust, and reciprocity generally created by social interaction within and between social networks is considerably diminished compared with the past. Social capital is generally referred to as the underpinning and core fabric of social communities, and has potential benefits of safety and security, friendship and community, and a sense of civic identity. It appears that Elmwood Place, already distressed economically, may also exemplify the diminished social capital found in similar urban neighborhoods.

These challenges are most obvious in housing conditions in the village. The age of the residential structures in the village, coupled with resident’s financial inability make necessary
improvements to their property and
the role absentee landlords, means
that many of the residential
structures in Elmwood Place are
health and safety hazards, and a
continuous source of blight, as
seen in figure 5. These conditions
have physical and social
consequences, all of which have
negative impacts on economic
stability, neighborhood image, and
the quality of life the village is able
to afford its residents. The village
is not unique, its scant financial
resources, aging housing stock, empty store fronts, crumbling business district, and lack of social
identity are all characteristics of older declining urban neighborhoods. Many of the village’s
infrastructural problems are inherently spatial, but the $300,000 annual operating budget has no
funds appropriated for solving said problems. Elmwood Place, like many other declining inner-
ing suburbs, could benefit from the use of GIS in evaluating and implementing solutions to the
everyday problems, but the technology and the resources required by a GIS are far too expensive
for any town with a limited budget. Participatory GIS could be viable alternative to traditional
GIS in struggling communities like Elmwood Place, but it is important first to understand the
potential role of social capital in establishing and maintaining a PPGIS.

RESEARCH METHODS

The goal of this research project was to develop a basic understanding of the social
challenges and complexities in building a participatory GIS program in a neighborhood with
limited social and financial resources, while assessing the role of social capital in the process, by
examining how effectively social capital is being developed and utilized before, during, and after
a participatory GIS process. As elsewhere in the literature, this study analyzed social capital –
and potential changes in it—primarily through qualitative data collected by means of participant observation, surveys, and focus groups (Grootaert, D Narayan, Jones, & M Woolcock, 2004; Grootaert & Van Bastelaer, 2002; Harpham, Grant, & Thomas, 2002; D Narayan & Cassidy, 2001). The primary feature of the project was the participatory GIS project itself, whose construction was designed to embody the best practices suggested in the participatory GIS literature (S Aitken, 2002; Al-Kodmany, 2002; S Elwood, 2002b; Ghose & S Elwood, n.d.; Holley, n.d.; NJ Obermeyer, 1998; DS Sawicki & Burke, 2002; Stewart, Jacobson, & Draper, 2008; E. Talen, 1999; Theobald, 2003). Participant observation employed in conjunction with surveys and focus groups were used to examine the practical, methodological, and social concerns associated with building a participatory GIS, and as a tool for evaluating the strengths and weaknesses of this project from a participant standpoint, as well as evaluating the progression of group dynamics such as communication and participation as participants get to know and trust one another. Analyzing the role of social capital before, during, and after a housing quality assessment project might offer a new perspective on the challenges and impacts of participatory GIS in bringing people of diverse backgrounds together (Craig et al., 2002).

Building Social Capacity for Participatory GIS

Recruiting Participants

The first priority in exploring the potential role of social capital on the planning and implementation process of a participatory GIS program in an urban community with little resources is to recruit participants willing to spend the summer collecting and modifying GIS data for the housing quality assessment. To do so, a comprehensive recruiting plan was created in order to maximize the number of participants for the project. The plan included placing paper advertisements in several high profile locations throughout the village, cold calling property owners to let them know of the upcoming project, sending advertisements home with the 285 students attending Elmwood Place Elementary School, as well as advertising via social media outlets such as Facebook (See Appendix A). These advertisements publicized an information session to be held at the local elementary school where the project was discussed, and participants were recruited.
Measuring the Pre-existing Levels of Social Capital in Elmwood Place

Once participants were recruited for this project, it was then necessary to determine what level of social capital was present amongst the participants before they started the project so that any changes over the course of the summer could be documented. The level of social capital present amongst participants at the projects onset, acts as the foundation for building social capacity. Any social capital built as a result of this project will be layered upon this foundation, mimicking the public participation hierarchy discussed by Craig (2002) with the bottom exemplifying the amount of social capital measured and least amount of public participation, and the top, increased social capital and full public engagement as a result of this project.

Surveys were employed to determine the existing level of social capital, asking respondents to answer simple questions surrounding commonly accepted measures of social capital generally, and more specifically, community engagement and citizen’s feelings about their neighborhood, as briefly illustrated in figure 6. The questions were designed so that each corresponding answer correlated to a number, one-five (one being the lowest and five the highest) (See Appendix C). To calculate the survey results, I translated the responses given by the respondents to their corresponding number and calculated the median response for every question. Low averages were indicative of a low level of social capital while

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<td>Overall, how much impact do you think people like yourself can have in making EP a better place to live?</td>
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<td>How would you rate this community as a place to live?</td>
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<tr>
<td>Do you believe the people running this community care about you?</td>
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<tr>
<td>I trust the people of Elmwood Place:</td>
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<tr>
<td>My place of residence gives me a sense of who I am:</td>
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<td>How many of your neighbors do you know personally?</td>
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<td>In five years time do you see yourself affiliated with the village in some capacity?</td>
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<td>How long has your affiliation with the Village of Elmwood Place existed?</td>
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<tr>
<td>What is your opinion of the existing housing units in Elmwood Place?</td>
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<tr>
<td>What is your affiliation with the Village of Elmwood Place? (Please check all that apply)</td>
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<th>Survey Specific Questions:</th>
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<tr>
<td>1) Do you think your participation in this research project will affect the way you think and (or) feel about the village?</td>
</tr>
<tr>
<td>2) Has your participation in this research project changed the way you think and (or) feel about the village?</td>
</tr>
<tr>
<td>3) Do you plan on being active in community improvement efforts in the future?</td>
</tr>
</tbody>
</table>

Figure 6: Survey questions used to measure social capital throughout the project.
high averages would clearly indicate the opposite. A focus group was used to supplement the survey assessment of social capital, giving participants an opportunity to expand on questions asked in the survey. The feelings expressed in these surveys and focus groups in conjunction with participant observation taken during the first research meeting will paint an overall picture of the current level of social capital in the village.

In order promote bridged social capital, and to create a work environment where participants felt at ease contributing; I organized a series of social events separate from the GIS project which served as a platform for building enough social capital that participants might work better together in the participatory GIS setting, despite coming from diverse backgrounds. I took a rather unorthodox approach in interpreting the social capital theory (Bain & Hicks, 1998; Green & Haines, 2007; R Putnam, 1997; RD Putnam, 1993, 2001b; Saegert, 2006; WANN, 1998; Wilson, 1997) when organizing several social functions with the hope that these events would allow participants to get to know one another on a more personal level over the course of the summer, thus building a social network based on trust, that could be used for general problem solving in regards to the village and its housing issues.

**Building Technical Capacity for Participatory GIS**

Building the technical capacity for PPGIS consisted of training participants in field survey techniques, assigning their field survey locations, and securing the technology required to do GIS in a group setting. This project was built and executed by way of a modified version of the University-Community Partnership model described by Helga Leitner and Sarah Elwood et.al (2002). I chose this model because it allowed me to complete this project given the constraints of a limited research budget. No money was spent on the technical aspects of this GIS project, as it was completed with software resources provided by Miami University, hardware resources provided by the St. Bernard-Elmwood Place School District, and my own personal computer. These three elements combined, were used to create a data infrastructure that allowed participants to use the student addition of ESRI’s ArcGIS software to creating a housing quality assessment.
Creating a Data Infrastructure for a PPGIS Experience

Participant Training

Those who signed up to participate in this project were asked to attend one of two, three hour training sessions intended for assigning field survey locations, teaching participants how to conduct field surveys, and detailing the field survey time frame. These training sessions were also where the first round surveys were issued, and the first focus group took place.

On this day, participants were divided into teams and asked to collect field surveys on residential structures within the village (similar to the work conducted by Sarah Elwood, 2002). These field surveys aimed to collect information which allowed us to examine and rate the physical structure of housing units found within the village, as well as their aesthetic value. Each individual received packets including appropriate survey forms, a clip board, two pens, a quick reference guide containing information from the field survey class, and a card with my phone number should they need to reach me. The two hour training session was held to educate participants on how to safely and appropriately conduct a field survey of property conditions such as foundation, roof, windows, paint, and yard, so that the data they collected could be utilized to create usable GIS data. All participants were encouraged to engage citizens they encounter while conducting their surveys in a positive manner, as a way of building social capital within the community.

Participants conducted field surveys on properties which fell into the land use categories described in figure 7. I personally conducted field surveys in the remaining land use categories (not mentioned below), so that I could have data available to produce GIS tutorials for participants to learn from.
Three examples of each type of property were displayed in a power point presentation, three of poor quality, three of medium quality, and three of good quality. The examples were taken from properties in the neighboring city of St. Bernard to eliminate the possibility that any examples were properties participants owned or lived in.

Each participant was given a practice survey form (See Appendix G) and taken through the steps necessary to assess the properties on a scale from 1-5 (1 being the worst and 5 being the best). Participants were notified that some properties may not require the use of all of the survey form. For example, vacant property or public space may not require a score in the structural categories of the form i.e. foundation, doors/windows, exterior walls, or paint/siding. In this situation participants were instructed to place zeros in these categories.

Participants were given forty-four days to complete their assigned field surveys. In the forty-four days between meetings I began the task of creating the data infrastructure which would be utilized during the GIS portion of the project. I started this process by creating a computer network that would allow project participants to run GIS software on Macintosh computers in the computer lab at Elmwood Place Elementary School, as well as building an excel workbook to house the field survey data participants would be collecting about properties in Elmwood Place.

Creating a Computer Network

To create a computer network, I used my personal desktop computer, Windows Server 2008 (licensed through the Miami University Computer Science Department), and a 120 day free trial version of terminal services; a program that allows multiple users to log onto a virtual network simultaneously. ArcGIS (student edition) and Microsoft Office were then installed on

<table>
<thead>
<tr>
<th>Commercial</th>
<th>Multi-Use</th>
<th>104 individual parcels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(apartments more than three family)</td>
<td>31 group parcels</td>
</tr>
<tr>
<td></td>
<td>Any business (non-industrial)</td>
<td>(89 individual parcels)</td>
</tr>
<tr>
<td></td>
<td>Parking garages/lots</td>
<td>193 parcels total</td>
</tr>
<tr>
<td></td>
<td>Lodges (i.e. VFW/Eagles)</td>
<td></td>
</tr>
<tr>
<td>Public Property</td>
<td>Municipally Owned</td>
<td>34 individual parcels</td>
</tr>
<tr>
<td></td>
<td>(Parks and buildings)</td>
<td>8 group parcels</td>
</tr>
<tr>
<td></td>
<td>Places of Worship</td>
<td>(52 individual parcels)</td>
</tr>
<tr>
<td>Residential</td>
<td>Single family</td>
<td>86 parcels total</td>
</tr>
<tr>
<td></td>
<td>Two Family</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Three Family</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>907 parcels total</td>
</tr>
</tbody>
</table>

Figure 7: Land use categories in which participants conducted field surveys.
the Windows server. I downloaded and used a free remote desktop connection client for Mac on each of the computers in the computer lab. This allowed the computers to access my PC and run its programs.

Once the server was built, I was able to create user accounts, and personal work folders on the server for each of the project participants. These personal folders were designed, so that each participant could access the GIS data specific to the parcels they were assigned to survey. The objective here was to make the exercise in GIS as simple for participants as possible, and by setting up the computer network and creating an Excel workbook to house their data prior to their GIS training days; I was able to iron out many potential sources of confusion and frustration ahead of time.

**Using Excel to Store Field Survey Data**

Excel was the platform used to store the housing survey data collected by participants, because the data could easily be joined to an existing parcel shapefile obtained to the Hamilton County Auditor, once participants had finished their surveys. The workbook that I created for this project was designed to allow participants to use zero to represent no data, and still produce accurate averages for the physical and aesthetic value for each property. The completed workbook ultimately consisted of the field survey parameters outlined in figure 8.

| PARCELID | Identifier
|----------|------------------|
| Address  | Identifier
| Foundation (C) | Structural Score
| Doors/Windows (D) | Structural Score
| Roof (E) | Structural Score
| Exterior Walls (F) | Structural Score
| Paint/Siding (G) | Aesthetic Score
| Fencing (H) | Aesthetic Score
| Property (I) | Aesthetic Score

Structure Score = (SUM(C2:F2)/SUM(IF(C2=0,0.5),IF(D2=0,0.5),IF(E2=0,0.5),IF(F2=0,0.5)))*5

Aesthetic Score = (SUM(G2:I2)/SUM(IF(G2=0,0,5),IF(H2=0,0.5),IF(I2=0,0.5)))*5

Average Score = (SUM(C2:I2)/SUM(IF(C2=0,0.5),IF(D2=0,0.5),IF(E2=0,0.5),IF(F2=0,0.5),IF(G2=0,0.5),IF(H2=0,0.5),IF(I2=0,0.5)))*5

Figure 8: The formulas above were used to calculate the structure, aesthetic, and average score, and are written to allow a zero to be used to indicate no data without interfering with the average being calculated.

The social and technical aspects this project existed apart from one another up until this point in the project. Here we are able to take the two and integrate them to complete a housing
quality assessment in Elmwood Place, illustrating that social capacity and technical capacity are mutually dependant on the other for the success of a PPGIS endeavor.

**Integrating Social and Technical Capacity within a Participatory GIS**

**Creating a Housing Quality Assessment with PPGIS**

Once field surveys were completed, the data generated was used to create a GIS decision model for identifying, inventorying and displaying substandard properties based on the information collected during the field surveys. The information the participants collected was archived in the Excel workbook created for the project, imported into ArcMap and joined to an existing parcel data layer (obtained from CAGIS and the Hamilton County Auditor) based on a common identifier (parcelid) (“CAGIS Online,” 2009; “Hamilton County Auditor Dusty Rhodes,” 2009).

I used field surveys I conducted as a tutorial for teaching participants how to create spreadsheets of their survey data, through the use of a computer and a projector. We each input our first ten properties into Excel together, and once participants became acclimated with the process they were free to work on their own and ask questions as needed. I then taught participants how to use different aspects of GIS software as the project progressed, and the need for a particular tool arose. We worked together to join our excel spreadsheets to the Hamilton County parcel layer, and create a master shapefile containing structural and aesthetic information about every property in Elmwood Place. This model was based on the work of Zwick and Schneider (1990) who created a case study of their efforts to find substandard housing in Alachua, Florida.

Participants then met for four additional hours after the initial GIS training days to prepare data to present to the Mayor and council members of the Village of Elmwood Place. At this gathering we merged the data files that were the product of the GIS days into one master shapefile and explored the data. We divided into five groups of four (myself included) to create maps displaying different variations of the data as seen in figure 9, which were decided upon by the participants.

<table>
<thead>
<tr>
<th>Age of properties in the village</th>
<th>Structural score of properties in the village</th>
<th>Aesthetic score of properties in the village</th>
<th>Average score of properties in the village</th>
<th>Property value</th>
</tr>
</thead>
</table>

Figure 9: The maps produced by participants reflect these data variations.
Participants then learned how to prepare a map in the data layout view by creating a title, scale, north arrow, and legend as well as how to export a map as a jpeg. Participants were also taught how to create KML files for Google Earth out of the data they had just created. These KML files were used as a cost effective version of a GIS server, which was delivered to the Mayor along with the paper maps so that village officials can: 1) Improve the image of the village’s homes by encouraging residents and property owners to maintain properties; 2) Enforce the Property Maintenance Code as adopted by the village; 3) Identify sources of funds for rehabilitation of residential dwellings and assist people in obtaining them; 4) Target blighted residential properties and vacant lots for clean-up. The KML files allow village officials to make changes to the housing database as needed, and to see data pertaining to structures within the village in real time.

Measuring Impacts of Participatory GIS on Social Capital in Elmwood Place

As at the beginning of the project, surveys and focus groups were used to determine the level of social capital amongst participants upon conclusion of the project. A second round of surveys was issued on the final day of the project, and a focus group session was held to allow participants an opportunity to expand on their survey questions (See Appendices D and F). Surveys and focus group results were compared against those measuring pre-existing levels social capital, to detect any changes over the course of the project, consequently providing insight on how effectively social capital is being developed and utilized in the participatory GIS process. A third and final round of surveys, and a focus group, nearly identical to the first two were issued five months after completing the housing database. The purpose of this round of inquires was to determine if the social capital generated during the project could be sustained long enough to complete other GIS projects pertaining to the village.

RESULTS

Exploring Measures of Low Social Capital

The results of the surveys, focus group, and participant observation collected at the beginning

![Participant Affiliation](image)

**Figure 10:** Of the twenty-seven active participants of this study, more than half were village residents with a connection to the village of more than one year.
of this project to measure the existing level of social capital amongst participants indicate that the existing level of bridged social capital, the social capital generated by the meshing of individuals with marked differences such as race, gender, religion, or socioeconomic status, was nearly non-existent.

Seventy-six individuals were present for the first meeting, held to discuss the details of the project, and to recruit participants. Of those seventy-six, only twenty-seven volunteered to participate in the project. Of the twenty-seven active participants, fifty percent were village residents, eighty-eight percent had a village affiliation longer than one year, and forty-eight percent had never used a computer.

Participants indicated in their surveys that their place of residence does not provide them with a sense of self worth. An overwhelming majority of participants who live in the village are renters, and many expressed dissatisfaction with their living environment, calling their residences “filthy” and “unfit.” When asked about the level of trust they have for their neighbors and members of the community, ninety-nine percent of the responses were indicative of no trust existing between neighbors and community members. Participants did not feel as if the community leaders cared for their well being, or worked hard enough to make positive changes in the community. Eighty-six percent of survey responses rated the Village of Elmwood Place as a poor place to live, and no single participant believed that they could make a positive impact on the neighborhood. These are all clear indications of a lack of social capital amongst participants.

Initially participants were given the opportunity to expand on their survey responses in semi-structured interviews. Not one single participant was willing to sit down and speak with me one-on-one, citing a lack of personal comfort in doing so. It was evident that participants did not trust me at this point in the project, but they were more comfortable just chatting with one another, and these informal chat sessions turned into focus groups. When given the opportunity to expand in focus groups, participants were still initially reluctant to share their feelings. There was a general feeling of animosity amongst the group, as participants bickered amongst each other and laid blame for the village’s woes on different groups of stereotyped individuals. The overall tone was overwhelmingly negative, and it appeared the project was off to a doubtful start. Participants took turns introducing themselves, and were asked to share some of their positive memories or experiences living in Elmwood Place. As people began to share their experiences, group dynamics started to shift form tense and stressful, to a more relaxed and open dialogue, but
there was still an overwhelming sense of animosity amongst participants. The general consensus amongst the group was that people do not take care of their property. Some argued about the difficulty in doing so, when “the money we make goes to put food on the table, and if there is any left, it’s for gas to get back and forth to work, I just don’t have money for gardening and paint.” Other participants cited a lack of pride as the reason for the lack of property maintenance, saying, “why should I fix my house when the one next to me is a hell hole, why bother?” The discussion was spirited and heated at times, but everyone present was in agreement that something should be done to hold property owners accountable for the maintenance and upkeep of their properties, and that steps should be taken by village officials to work with those who lack the financial ability to make drastic changes to their properties all at one time.

Participants were quick to point out the issues they had with the village and its leaders, and of course these opinions varied, leading to more conflict and confrontation. One participant stated her dissatisfaction with Village leadership, saying, “I recently wrote a letter to the mayor of Elmwood expressing my concerns for my safety and my fellow neighbors. Guess what he had to say? Nothing! He didn’t even reply, he passed the letter on to Elmwood maintenance department and he then laughs in my face…I want to have kids someday but I don’t want to raise them in this neighborhood with all this bullshit!”

Another participant interjected citing the blame for the village’s problems on its citizens rather than its leadership, providing us with a colorful list of guidelines for living in Elmwood:

“Get a job, and stop complaining. Try parenting your children. Stop spending every available cent on booze and pills, and stop blaming the police who are overextended, underpaid, and tired of the town you have decided to live in, and probably at least to a degree, helped create. They have their hands tied …you know what, never mind! Come to think of it, this place is doomed, just ignore your kids, skip the whole work-for-a-living-thing, and get drunk again.”

The arguing and fighting that took place at the initial focus group session, was a clear indication that not much social capital existed. The survey results later confirmed these suspicions, with the average of all survey responses falling around 1. My initial observations made me question
the validity of this project, wondering how exactly I was supposed to bring such a diverse and angry group of people together.

Bringing participants together around the idea of making positive changes in the village seemed like an onerous task, especially after our first official meeting. Provided the fact that no bridged social capital existed amongst this group of people, it became necessary to facilitate some sort of social interaction outside of the computer lab that would allow these people to get to know and trust one another. I planned several fun activities that we could all do together. The goal of these activities was to bring us together as a group, a bonding experience of sorts. Over the course of the summer, we had three movie nights/grill outs at one of the vacant parks in town. Participants were encouraged to bring their families and friends to these events. We started the evening grilling food, hamburgers, and hotdogs, and we played games till dusk. After dark, we projected a movie on a large bed sheet attached to a chain link fence in the park. This too appeared to be a failure in the early stages. At the very first movie night, two participants engaged in a rather heated verbal altercation over who was going to eat the last remaining hot dog on the grill.

Because the first social gathering planned to bring this group together didn’t go off as well as planned, I decided to try again. In July we attended a Cincinnati Red’s baseball game together. Some participants had never been to downtown Cincinnati, or a professional baseball game for that matter. Everyone seemed to enjoy themselves, and more importantly, everyone got along. One participant commented, “these aren’t the type of people I would hang out with, but they are pretty cool.” This was the event that started the positive transformations, from this point on, there were no more screaming matches, or temper tantrums.
Integrating Social and Technical Capacity: Completing a Housing Quality Assessment

Teaching participants how to do GIS did not seem to be nearly as difficult as getting them to work together cooperatively, but it did come with its own unique set of challenges. As previously mentioned, forty-eight percent of participants had never used a computer prior to signing up to do this project. With that in mind, I set out to make the GIS portion of this project as simple as possible, for everyone involved. I operated under the assumption that no single participant had a working knowledge of the technology being used, as to not single out any one individual. As a group, we worked at a slow pace, but we worked hard none the less. There were moments throughout the process where some participants grew frustrated with the data input process and wanted to give up. At this point, the social capacity built throughout the summer came into play. Participants assisted and encouraged one another throughout the GIS process, erasing the “us” versus “them” mentality present at the beginning of the project, and replacing it with “we.”

In total, participants devoted nearly three months of their time to this project. The data they collected about properties in the village were ultimately put to good use. The data created for the mayor produced five map documents depicted in figure 13, which were later used to rehab, condemn or tear down several dwellings that did not meet the village’s building code as seen in figure 14.
Figure 13: These five maps illustrating the housing quality assessment were produced by participants of this study and later delivered to village officials.
Figure 14: Changes made to Village properties after the housing quality assessment was delivered to village officials.
Participatory GIS has Positive Impacts on Social Capital

At the end of the mapping project, once the paper maps and KML data had been handed over to village officials, the second round of surveys and focus groups were conducted. Twenty-four of the original twenty-seven participants remained, and the responses they gave to this round of inquiry differed drastically from the first. Participants still indicated in the surveys they completed, that their place of residence does not provide them with a sense of self worth. However, when discussing these feelings in the focus group setting, many suggested they feel a sense of self worth can be achieved over time, where as they previously thought it was hopeless. Those who had previously expressed dissatisfaction with their living environment, calling their residences “filthy” and “unfit,” expressed feelings of empowerment after completing the project, going as far as to say, “I now know how to hold my landlord accountable.” When asked about the level of trust they have for their neighbors and members of the community, only eight percent of the responses were indicative of no trust existing between them, this time around, as opposed to ninety-nine percent in the first survey. Many participants indicated that they did not realize that their community officials were so accessible, and that the preconceived notions they had about village officials were unfounded. Eighty-six percent of survey responses rated the Village of Elmwood Place as a poor place to live. These results are identical to the first round of surveys given; however, the general consensus amongst participants was that they had the ability to make positive change in the community as opposed to the first set of surveys where no single participant believed that they could make a positive impact on the neighborhood.

When given the opportunity to expand on the written surveys, participants who were reluctant to share their feelings at the first meeting had no trouble expressing themselves this time around. The animosity and bickering that once existed was a distant memory. Watching this groups of people interact, one who didn’t know better would think they had been working together for much longer than a single summer. The negativity was replaced with excitement and the anticipation of making positive changes.

The possibility of future GIS projects was the topic of discussion the last time we met, and participants put it to a vote. Mapping sexual offenders and crime hotspots in the village were the most popular choices for future GIS projects that could benefit the village.
Participants left this meeting with one task, to engage members of the community, and to try to get involved whenever time would allow. I left them with data and tutorials for creating a geocoding service, and the promise to check in on their progress in four months time.

When I returned to the Village of Elmwood Place to administer the final round of surveys and the final focus group, in December 2010, I was greeted by a slightly smaller group than we had initially started with. Nineteen of the twenty-seven original participants were in attendance. Two participants had moved out of Elmwood Place, one had been incarcerated, and the remaining two were unaccounted for. Of the nineteen remaining participants, six had worked together to map the addresses of the sexual predators living within the village, and created a 1,000 foot buffer zone around Elmwood Place Elementary to ensure that no sexual predators living in the village were in violation of the Ohio Revised Code, as depicted in figure 15.

![Sexual Offenders Living in the Village of Elmwood Place](image)

**Figure 15:** A map depicting the residences of sexual offenders in Elmwood Place, created by project participants after the housing quality assessment was completed.
Eleven participants have made an effort to get involved in the community since we last met; starting civic organizations such as the Recreation Department and the PTA. Survey results are relatively consistent to those of the second round survey, indicating not much has changed in regard to fluctuations in social capital. The focus group session, differed significantly from the previous two. The nineteen remaining participants decided to meet monthly to continue working for the betterment of the community. Although the social capital level did not rise between the second and final round of inquires, enough remained to keep this group motivated to work toward a better future for their community.

**DISCUSSION**

*Integrating Social and Technical Capacity within a Participatory GIS:* As this project progressed I became increasingly aware of the fact that the social and technical aspects of participatory GIS cannot exist apart from one another, because both are mutually dependant on the other for the success of a PPGIS endeavor. Imagine if you will, having a room full of computers loaded with GIS software, waiting to be used, yet there is no one to use them, or a group of individuals interested in doing GIS, but the technology to do so is unavailable. For these reasons, I argue that future research in the field of participatory GIS should incorporate both the technological and societal aspects of the science. Only then can GIS practitioners have a clear picture of what needs to be done to effectively bring GIS to the people. Social capital is a vital part of this process, as it mostly closely represents the P in PPGIS, and the results of this exercise suggest that generating and maintaining social capital amongst participatory GIS project participants is of vital importance to the outcome of said project.

*The Role of Social Capital:* Participants of this project started the summer with some preexisting level of *bonded* social capital, or the social capital that is generated between closed networks of like minded individuals such as families and friends. The social networks that existed between participants at the onset of the project were not strong enough support participatory action of any kind. Participants were unable to sit in the same room without arguing with one another about long standing issues completely unrelated to the project. It was not until barriers created by judgment, preconceived ideas, and the general differences between participants were addressed, that cooperation began to take place. The social networks formed around this project created social ties and a sense of community amongst participants. These strong networks allow
participatory action to thrive, but participatory action can also be limited by social capital, or a lack there of. I argue that social capital must be considered in conjunction with technology when designing a participatory GIS program because the successful bridging or meshing of individuals with marked differences such as race, gender, religion, or socioeconomic status can untimely determine the outcome of any project, and social capital is the mechanism that allows human beings to make those connections.

*The Social Challenges and Complexities of Building a Participatory GIS:* Bridging the gap that sometimes exists between different groups of people is a venture that should not be taken lightly. As much as this project was about social capital and participatory GIS, it also quickly became an exercise in conflict resolution, patience, and flexibility.

Initially, focus group discussions were clouded by long standing family feuds, participants bickering back and forth about decade’s worth of drama: “her daddy ran over our dog,” and “he stole my grandpa’s lawn mower and sold it for cigarettes and beer.” These conversations were common and it seemed impossible at times to get past them. From an outside perspective, these arguments seems rather trivial, but I quickly realized that airing feelings and expressing oneself was a necessary part of the process required for this group of individual to make a connection with one another.

From a methodological perspective, the challenges and complexities that arose were from the more technical side of GIS, making the existing literature a valuable research asset to the process. The idea of the university/community partnership is one that made this project possible. The collaboration between educational institutions and the communities around them is valuable, and should be taken advantage of when available. In the case of this project, we were fortunate enough to have the technical support of both Miami University and the St. Bernard-Elmwood Place School District, thus eliminating the cost of GIS software and computers for participants to work on. In the future, PPGIS practitioners can better serve communities if they incorporate educational institutions at any level, which are able and willing to participate in the project. By doing so, more resources are available to project participants, and local educational institutions such as elementary schools or high schools can facilitate community engagement on a more intimate level, because these institutions have existed in these communities, and a certain level of trust and communication already exists.
The value of a meal: In addition to the social events planned throughout the summer, aimed at bringing participants together, every time the group of us met during the research period, we all brought a food item to share, and spent time snacking and chatting, just getting to know one another. By the end of the summer, many new friendships had been formed, and those in the group who couldn’t even sit in the same room with one another were at least able to work together cooperatively despite their differences in opinion. This sense of community ultimately bled into the GIS project. The goal here was to take the little bit of social capital this group had, and build upon it. It would be completely dishonest to tell you that this was anything more than a shot in the dark. The social capital literature says nothing about cook outs and baseball games. It does however, discuss the importance of trust and communication, and activities like these were the only way I could think to bring these people together.

CONCLUSION

Participatory GIS practitioners have done a considerable amount of research in addressing the prohibitively high cost of GIS software, and identifying individuals who can most benefit from PPGIS, but little emphasis has been placed on how might one build a participatory GIS project from the ground up in a neighborhood with limited financial and social resources, and how would one go about getting people involved in the process?

This study sought to understand the challenges and complexities associated with building a participatory GIS program, what role social capital might have in the process in an urban community with little to know resources, and what practical and methodological concerns are associated with doing so. I explore the potential role of social capital as both necessary precondition for and productive result of participatory GIS, through the use of archival, interpretive, and participatory methods, because the existing body of literature focuses primarily on GIS as a technical process of mapping and data collection and does not offer much discussion on GIS as human/social process.

The results of this study suggest that generating and maintaining social capital amongst project participants in a participatory GIS program is of vital importance to the success of a PPGIS project. However, that social capital can be rather difficult to achieve. Social capital was the mechanism that drove the trust and cooperation between participants of this project. It is important to note, however, the technological aspects of Participatory GIS are just as relevant in this discussion of social capital, as the two are mutually dependant on one another. Both social
capacity, and technical capacity have a significant role to play, and both should be considered, but considered together none the less.

I am a geographer by nature, so addressing these social issues associated with this project was a challenge. I struggled throughout the project, concerned that I perhaps I was not doing an adequate job at bringing such a diverse group of people together around the housing issue in Elmwood Place. The social network that we created was very much based on a certain level of trust and reciprocity that took a significant amount of time to build. It did not happen overnight, and ultimately it was social capital that made this process possible. It kept participants involved, and helped us work together to achieve a specific goal despite the many differences between us. I found that patience and flexibility were key in achieving the desired outcome of this project, not just for myself, as a participatory GIS practitioner, but for the participants as well.

The availability of technology, and creating computer networks that would allow participants to work on GIS software was a significant part of this process, but it would never have been used had we not found a way to come together as a group. This is why I suggest GIS as a social process, and GIS as a technical process should be evaluated together rather than separately in the future.

Future research in the field of participatory GIS should include the GIS server, as it is an up and coming technology. With the availability of GIS server, PPGIS has the potential to reach a wider audience, as the technological resources required to do participatory GIS via web server is greatly reduced from that of traditional GIS. The societal aspects of PPGIS still remain important regardless of the platform being used in the technical process, and should remain a part of the GIS process well into the future. In combining social and technological aspects of participatory GIS in future research, we may be able to harness the power of GIS and bring it to communities who can most benefit from all it has to offer.
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Zwick, P., & Schneider, R. (1990). Searching for substandard housing in Alachua County: A
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Join the Elmwood Place Change for the Better Campaign and help tackle village housing issues.

Information Session:
Thursday, May 20, 2010
Elmwood Place Elementary School Cafeteria
6:30 p.m.

Refreshments will be provided.
APPENDIX B: INFORMED CONSENT

Informed Consent
Title of Research: Housing Suitability Needs Assessment

Investigator: Jennifer Prather
Before agreeing to participate in this research study, it is important that you read the following explanation of this study. This statement describes the purpose, procedures, benefits, risks, discomforts, and precautions of the program. Also described are the alternative procedures available to you, as well as your right to withdraw from the study at any time. No guarantees or assurances can be made as to the results of the study.

Explanation of Procedures
You are being asked to participate in the research project which aims to create a housing suitability needs assessment through participatory GIS, which can be used by citizens and village officials can use to: 1) Improve the image of the Village’s homes by encouraging residents and property owners to maintain properties; 2) Enforce the Property Maintenance Code as adopted by the Village; 3) Identify sources of funds for rehabilitation of residential dwellings and assist people in obtaining them; 4) Target blighted residential properties and vacant lots for clean-up. The housing suitability needs assessment created during this research project will be used to generate maps depicting the condition of the housing structures in the village. These maps and a digital copy of the housing needs assessment itself will be presented to Village officials in August 2010.

Risks and Discomforts
You will not be at physical or psychological risk and should experience no discomfort resulting from the research procedures.

Benefits
There are no direct benefits by participating in this research project. However, this research is expected to yield knowledge about current housing conditions in the Village of Elmwood Place.

**Confidentiality**
All information gathered from the study will remain confidential. Your identity as a participant will not be disclosed to any unauthorized persons; only the researcher and Miami University Institutional Review Board will have access to the research materials, which will be kept in a locked drawer. Any references to your identity that would compromise your anonymity will be removed or disguised prior to the preparation of the research reports and publications. Audiotapes/videotapes will be destroyed or erased at the completion of the study. Your last name will not be used in the transcripts of the recording.

**Withdrawal Without Prejudice**
Participation in this study is voluntary; refusal to participate will involve no penalty. Each participant is free to withdraw consent and discontinue participation in this project at any time without prejudice from this institution. Participant’s initials: _________

**Costs and/or Payments to Subject for Participation in Research**
There will be no costs for participating in the research project. Also, participants will not be paid to participate in this research project. However, complimentary refreshments will be available to you during meeting times.

**Payment for Research Related Injuries**
Although there are no risks of injury involved with this study, Miami University has made no provision for monetary compensation in the event of injury resulting from the research.

**Questions**
Any questions concerning the research project and/or in the case of injury due to the project, participants can call the Miami University Institutional Review Board at 513-529-3600. Questions regarding rights as a person in this research project should be directed to Dr. Neil Sullivan, Miami University Institutional Review Board Chairman, at 513-529-3600.

**Agreement**
This agreement states that you have received a copy of this informed consent. Your signature below indicates that you agree to participate in this study.

____________________________________  _______________________
Signature of research participant  Date

____________________________________
Research participant name (printed)

____________________________________  _______________________
Signature of researcher  Date
APPENDIX C: OPINION SURVEY 1

Important Directions

1) Please do not write your name on this form.
2) Please try to answer all questions, but keep in mind, filling out this questionnaire is entirely voluntary, and no one will know if you chose to skip some questions.
3) Once you have completed this survey place it in the orange return envelope provided, a volunteer not directly associated with this project will return to pick up the envelope once everyone present has finished.

What is your affiliation with the Village of Elmwood Place? (Please check all that apply)
- I live here
- I work here
- I attend church here
- I own property here

What is your opinion of the existing housing units in Elmwood Place?
- Outstanding
- Good
- Adequate
- Needs improvement
- Poor
- N/A

How long has your affiliation with the Village of Elmwood Place existed?
- Less than 1 year
- 1-5 years
- 6-10 years
- 11-20 years
- 20+ years
- N/A

In five years time do you see yourself affiliated with the village in some capacity?
- Yes
- No

How many of your neighbors do you know personally?
- None
- 1-3
- 4-6
- 6-10
- N/A

My place of residence gives me a sense of who I am:
- Not at all
- Slightly
- Moderately
- Very Much
- N/A

I trust the people of Elmwood Place:
- Not at all
- Slightly
- Moderately
- Very Much
- N/A

Do you believe the people running this community care about you?
- Not at all
- Slightly
- Moderately
- Very
- Much
- N/A

How would you rate this community as a place to live?
- Outstanding
- Good
- Adequate
- Needs improvement
- Poor
- N/A

Overall, how much impact do you think people like yourself can have in making EP a better place to live?
- Significant
- Moderate
- Slight
- None
- Other

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Do you think your participation in this research project will affect the way you think and (or) feel about the village?

- ○ Not at all
- ○ Slightly
- ○ Moderately
- ○ Very
- ○ Much
- ○ N/A

Additional Feedback

Please share any additional comments.

________________________________________________________________________________________
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Thank you for taking the time to fill out our survey. Your input is greatly appreciated.
APPENDIX D: OPINION SURVEY 2

Important Directions

1) Please do not write your name on this form.
2) Please try to answer all questions, but keep in mind, filling out this questionnaire is entirely voluntary, and no one will know if you chose to skip some questions.
3) Once you have completed this survey place it in the orange return envelope provided, a volunteer not directly associated with this project will return to pick up the envelope once everyone present has finished.

**What is your affiliation with the Village of Elmwood Place? (Please check all that apply)**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>I live here</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I work here</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I attend church here</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I own property here</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**What is your opinion of the existing housing units in Elmwood Place?**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outstanding</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Good</td>
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<td>O</td>
</tr>
<tr>
<td>Adequate</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Needs improvement</td>
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<td>O</td>
</tr>
<tr>
<td>Poor</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>N/A</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**How long has your affiliation with the Village of Elmwood Place existed?**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
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<td>Less than 1 year</td>
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</tr>
<tr>
<td>1-5 years</td>
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<td>O</td>
</tr>
<tr>
<td>6-10 years</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>11-20 years</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>20+ years</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>N/A</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**In five years time do you see yourself affiliated with the village in some capacity?**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>No</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**How many of your neighbors do you know personally?**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>1-3</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>4-6</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>6-10</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>N/A</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**My place of residence gives me a sense of who I am:**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Slightly</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Moderately</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Very Much</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>N/A</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**I trust the people of Elmwood Place:**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Slightly</td>
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<td>O</td>
</tr>
<tr>
<td>Moderately</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Very Much</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>N/A</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**Do you believe the people running this community care about you?**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Slightly</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Moderately</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Very Much</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>N/A</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**How would you rate this community as a place to live?**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outstanding</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Good</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Adequate</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Needs improvement</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Poor</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>N/A</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**Overall, how much impact do you think people like yourself can have in making EP a better place to live?**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Moderate</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Slight</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>None</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Other</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
Has your participation in this research project changed the way you think and (or) feel about the village?

- ○ Not at all
- ○ Slightly
- ○ Moderately
- ○ Very Much
- ○ N/A

Additional Feedback

Please share any additional comments.

_________________________________________________________________
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Thank you for taking the time to fill out our survey. Your input is greatly appreciated.
APPENDIX E: OPINION SURVEY 3

Important Directions

1) Please do not write your name on this form.
2) Please try to answer all questions, but keep in mind, filling out this questionnaire is entirely voluntary, and no one will know if you chose to skip some questions.
3) Once you have completed this survey place it in the orange return envelope provided, a volunteer not directly associated with this project will return to pick up the envelope once everyone present has finished.

What is your affiliation with the Village of Elmwood Place? (Please check all that apply)

- I live here
- I work here
- I attend church here
- I own property here

What is your opinion of the existing housing units in Elmwood Place?

- Outstanding
- Good
- Adequate
- Needs improvement
- Poor
- N/A

How long has your affiliation with the Village of Elmwood Place existed?

- Less than 1 year
- 1-5 years
- 6-10 years
- 11-20 years
- 20+ years
- N/A

In five years time do you see yourself affiliated with the village in some capacity?

- Yes
- No

How many of your neighbors do you know personally?

- None
- 1-3
- 4-6
- 6-10
- N/A

My place of residence gives me a sense of who I am:

- Not at all
- Slightly
- Moderately
- Very Much
- N/A

I trust the people of Elmwood Place:

- Not at all
- Slightly
- Moderately
- Very Much
- N/A

Do you believe the people running this community care about you?

- Not all
- Slightly
- Moderately
- Very
- N/A

How would you rate this community as a place to live?

- Outstanding
- Good
- Adequate
- Needs improvement
- Poor
- N/A

Overall, how much impact do you think people like yourself can have in making EP a better place to live?

- Significant
- Moderate
- Slight
- None
- Other
Do you plan on being active in community improvement efforts in the future?

Not at all   Slightly   Moderately   Very Much   N/A

Additional Feedback

Please share any additional comments.

__________________________________________________________________________
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Thank you for taking the time to fill out our survey. Your input is greatly appreciated.
1. What is your affiliation with the Village of Elmwood Place?

2. How long has your affiliation with the Village of Elmwood Place existed?

3. In five years time do you see yourself affiliated with the village in some capacity, why or why not?

4. If you could live elsewhere would you? Why?

5. What is your opinion of the existing housing units in Elmwood Place? What drives you to this conclusion?

6. How many of your neighbors do you know personally?

7. Do you trust the people of Elmwood Place? Why or why not?

8. Do you believe the people running this community care about you?

9. How would you rate this community as a place to live?

10. Overall, how much impact do you think people like yourself can have in making EP a better place to live?
## Appendix F: Field Survey Form

<table>
<thead>
<tr>
<th>Street Name</th>
<th>Address</th>
<th>Foundation</th>
<th>Doors/Windows</th>
<th>Roof</th>
<th>Exterior Walls</th>
<th>Paint/Plastic</th>
<th>Fencing</th>
<th>Property</th>
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</tbody>
</table>

Block: 500