Polit Behav (2007) 29:31–67
DOI 10.1007/s11109-006-9016-3

ORIGINAL PAPER

The Importance of Political Context for Understanding Civic Engagement: A Longitudinal Analysis

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Published online: 14 November 2006

Abstract We contend that political context is important to consider when analyzing social capital and that context has an important but neglected impact on understanding the consequences of civic activity. Our focus is on the influence of rural, local leadership in two Minnesota communities and policies that these elites have developed to bring Internet connectivity to their citizens. One city developed a community electronic network and the other opted for an individualistic, entrepreneurial approach to information technology. Using a quasi-experimental research design and four-wave panel data, we find that elite policy approaches interact with civic activity to predict technology use among citizens, even long after the policies' initial implementation. In the city with a community network, residents who are integrated into civic life are

This research was supported in part by grants from the Center for Urban and Regional Affairs at the University of Minnesota, NSF Grant #SBR9619147, funding from the University of Minnesota's College of Liberal Arts to Eugene Borgida and John L. Sullivan, assistance from the Carlson Chair in American Politics to John L. Sullivan and assistance from the Fester-Lampert Chair in Urban and Regional Affairs to Eugene Borgida. Alina Oxendine was supported in part by a 2003–2004 Rural Poverty Research Institute Dissertation Fellowship and a 2004–2005 Doctoral Dissertation Fellowship from the University of Minnesota Graduate School.

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able to harness these political resources to become more technologically sophisticated.

Keywords Civic engagement · Social capital · Technology · Electronic network

Introduction

Social capital is often defined as the norms of social life that enable people to coordinate action to achieve desired results. It is an asset that communities possess to varying degrees, with the key elements being social trust, civic engagement or both. In addition, variation in civic engagement and political participation has been shown to have pervasive political effects on both individuals and collectivities (Coleman, 1988, 1990; Knack, 2002, 2000; Putnam, 1993, 2000).

One prominent criticism of social capital research is that it downplays the importance of governmental institutions, policy-making, government leaders, and socio-economic factors (Jackman & Miller, 1996; Levi, 1996; Skocpol, 1996; Tarrow, 1996). Additionally, in the on-going debate over the relative primacy of political institutions versus political culture, scholars have gathered mounting evidence that governmental institutions can mold civic attitudes and behaviors (Baker, Dalton, & Hildebrandt, 1981; Rohrschneider, 1996, 1994). Consistent with this research, the present work focuses on broader forces a step above the individual level of analysis and concentrates on the extent to which political context is an important yet neglected factor when analyzing the impact of civic involvement. Not only can political context—in the form of governmental institutions, leadership or structural forces—shape the nature of civic activity, but it can also interact with civic activity to modify the latter's effects. In this paper, we examine the interaction between political context and civic engagement to better understand how this dynamic can shape the consequences of civic engagement.

In examining how political context might alter the manner in which civic involvement functions in communities, we explore how the consequences of civic involvement can differ depending on a community's institutions, leaders and policies. This contextual relationship has been underspecified and understudied. Specifically, we analyze these issues in relation to local leadership and policies that elites have developed regarding *information technology* in rural communities. Even more specifically, we explore the consequences of the interaction between leadership context and political engagement in the local community for participation in the ongoing information technology revolution. This is an important area of research, particularly as Internet use and related technologies penetrate society, shaping employment, education, communication, opportunity structures, political processes, general information acquisition and more. Rural citizens, in particular, rely on information technology to connect with other cities, learn about outside opportunities, and to communicate with each other.

The research presented in this paper is based on a unique, quasi-experimental design, in which we analyze two rural Minnesota cities. Though carefully matched in terms of demographic characteristics, the two cities are distinct in the policy approaches their leaders chose for increasing local citizens' Internet access. One community (Grand Rapids) selected a community-oriented, collaborative approach, instigating the development of a "community electronic network" (GrandNet), while the second community (Detroit Lakes) chose a market-oriented approach (LakesNet) to technology access. We conducted surveys of citizens in these towns, including measures of civic attitudes, community involvement, attitudes toward technology and use of technology. We gathered four waves of panel data for each of these communities, collected in 1997, 1999, 2002 and 2003. These data assess whether and how these policy choices (community vs. market-oriented approaches) shape how civic involvement facilitates access and use of an important public good—computer technology.

We explore whether these initial policy choices create enduring differences for Internet use and access to technology. Because of GrandNet, technology access and utilization initially has a strong connection to civic life in Grand Rapids (Sullivan, Borgida, Jackson, Riedel, & Oxendine, 2002b). The larger question is whether, even after 7 years, people in Grand Rapids who are integrated into the political life of the community are still better able to harness political resources to remain technologically engaged and sophisticated. We also explore the interaction between political and economic resources, in that civic involvement has greater potential to affect profoundly poorer citizens than the affluent, most of whom have other resources to exploit. In Detroit Lakes, lacking community-wide access to technology, citizens initially relied almost entirely on economic resources to access new technologies (Sullivan et al., 2002b), but is this an enduring legacy of the community's privatized approach to internet access? Since community electronic networks can provide expanded access to the information technology revolution, and hence to quality of life opportunities, if differential access is merely a function of individuals' economic standing the consequences of the "digital divide" will be far-reaching. On the other hand, if access can be expanded through community-wide civic engagement, the self-sustaining nature of economic differentials can be attenuated. The political consequences are, therefore, enormous.

In sum, we explore the extent to which (1) political context has major effects on the causes and consequences of civic activity, (2) policy approaches interact with civic activity to explain technology use among citizens and (3) with a community-oriented technology policy, civic involvement becomes more effective at igniting technology use among poorer citizens. Below, we discuss our arguments and expectations in relation to relevant literature and theory.

Importance of Context in Studying Civic Activity

Recent studies have explored contextual influences on civic attitudes and behavior in the United States, such as ethnic and racial diversity, income inequality and ideological polarization (Alesina & La Ferrara, 2000a, b; Costa & Kahn, 2002; Rahn, Yoon, Garet, Lipson, & Loflin, 2003; Rahn & Rudolph, 2002). Many of these studies find that societal heterogeneity depresses social capital, as people have difficulty connecting with and trusting people who are dissimilar (Alesina and La Ferrara, 2000a; Costa & Kahn, 2002).

Moreover, scholars have explored the impact of governmental institutions and contexts on social capital in the United States, finding that particular institutional designs and policies can prompt civic activity. For instance, Schneider, Teske, Marschall, Mintrom, and Roch (1997) find that giving parents greater choice over the public schools their children attend seems to enhance their involvement. Alongside institutional structure, leadership can have a profound effect on social capital. Scholars contend that leadership strength and citizens' confidence in leaders is related to social trust and civic engagement (Durlauf and Fafchamps, 2003; Small, 2002). At the national level, scholars contend that leaders' incompetence and dishonesty have contributed to declines in citizens' trust in government (Nye, 1997; Orren, 1997), which in turn influences vote choice (Hetherington, 1999) and trust in one another (Brehm & Rahn, 1997).

In addition to analyzing the impact of context within the United States, scholars have explored social capital cross-nationally in a variety of institutional and cultural settings (Mondak & Gearing, 1998; Schofer & Fourcade-Gourinchas, 2001; Stolle, 1998). It is clear that levels of civic engagement and awareness differ across countries and tend to be higher in well-developed western democracies as compared to newer democracies (Almond, Dalton, & Powell, 1999; Mondak & Gearing, 1998), that institutional context (whether a country is statist vs. non-statist or corporate vs. non-corporate) shapes the nature of associational life in a country (Schofer & Fourcade-Gourinchas, 2001), and that the size and design of a country's welfare state and related public policies can influence social capital (Boli, 1991; Kumlin & Rothstein, 2005).

Not only can political context—in the form of governmental institutions, leadership or structural forces—shape the nature of civic activity, but it also can interact with aspects of civic activity to modify its effects. In her study of social capital in Senegal, Kuenzi (2003) finds that income is *negatively* related to interpersonal trust in some regions, whereas studies of social capital in most developed countries find the opposite relationship. Also, Schofer and Fourcade-Gourinchas (2001) reveal that education is a much weaker predictor of associational memberships in countries with corporate institutions like Sweden, compared to non-corporate countries like the United States. Finally, in their study of African American civic involvement, Brown and Brown (2003) find that attending church has the capacity to bolster political participation, depending on the way in which the church relates to politics. In churches that encourage political discussion, attendance predicts citizens' likelihood to become politically involved. Otherwise, there is no relationship between attending church and becoming politically active.

Civic Engagement Meets Information Technology

Policy approaches can also interact with civic activity to explain *technology use* among citizens. As mentioned previously, we analyze two cities that have made distinct choices concerning technological development—one developed a community electronic network "GrandNet" and the other opted for a market-oriented approach to networking. Much of the research to date applying the concept of civic involvement to community electronic networks has focused on the ways in which community networks, on-line relationships and virtual communities influence the growth of social capital and social connectedness (Calabrese & Borchert, 1996; Kling, 1996; Wellman et al., 1996). Scholars have also speculated that community electronic networks have the potential to fulfill a number of civic goals including community cohesion, informed citizenship, access to education and training, public participation and enhanced quality of life (Anderson, Bikson, Law, & Mitchell, 1995; Kavanaugh & Patterson, 2001; Schuler, 1994).These studies evaluate and/or assume a direct causal relationship between electronic networks and some social outcome. To our knowledge, our research is the first attempt to explore whether electronic networks have the ability to *interact with* civic involvement to produce heightened technology use.

In this research, we highlight the importance of community-based electronic networks, of which GrandNet is an example, that offer rural citizens opportunities for technological access and improvement, regardless of their socio-economic status. Most community technological projects support public access terminals in public libraries and community centers, as well as community programs that provide low or no cost training in computer and Internet use. These kinds of projects not only provide practical access and training but also spark community interest and discussion, particularly among local leaders and active citizens.

By their nature, community projects are nested in the public realm, typically consist of a partnership between local organizations, and require substantial coordination between local leaders and their respective institutions. The very act of developing and perpetuating a community electronic network demands elite collaboration, communication and extensive discussion of technology. At the same time, citizens who attend public meetings associated with partner organizations (and/or are active in civic organizations closely aligned with them) are more likely to become involved in the project's core dialogue. As the project grows, its programs are implemented, and leaders seek to make citizens aware of its offerings (such as free computer classes or public access terminals). Gradually, an even larger group of citizens learn about the project and become part of the public conversation. Citizens engaged in the public realm, who are involved in civic activities, should have the highest level of project awareness and benefit most from its offerings.

For this reason we believe that, in the context of a community technology project like GrandNet found in Grand Rapids (as opposed to an electronic network without such a public flavor), citizens who are active in public affairs will be the most likely to use and learn about technology. We expect that in Grand Rapids, citizens who have considerable economic *or civic* resources will experience the most gains in information technology use in the years following the network's implementation. In Grand Rapids, technology has had a strong connection to civic life: for example, terminals have been in public buildings throughout the community; community organizations have been involved with GrandNet; new civic programs developed as a result of GrandNet; and local media outlets have covered the project's evolution. We should also note that interviews and focus groups we conducted reinforce the expectation that the connection between community life and technology has been prominent in Grand Rapids (Borgida, Oxendine, Jackson, Riedel, Sullivan, & Gangl, 2002). Those who are tied to the community through civic groups or public organizations linked to the project are particularly likely to know about and have experience with the community electronic network.[1]

This ‘‘community flavor’’ is missing from the electronic network in Detroit Lakes, the comparison community. In Detroit Lakes, individuals with economic resources can purchase access to computers and the Internet, but their levels of community involvement, initially at least, did not influence technology access (Sullivan et al., 2002b). In this paper, we explore whether, over the ensuing 7 years, forces were at work which would mitigate this initial set of findings, or whether the dynamic set in motion several years earlier persisted.

Civic Involvement and its Potential to Bridge the Digital Divide

This project is not only important for examining the interplay of structure and civic involvement, but it also sheds light on issues of social equity that have come to the foreground with the development of new technologies. A pressing concern, particularly in light of growing income inequality in the United States,[2] is the division between the rich and poor in terms of access to information technology. Even though socio-economic divisions have declined

[1] For instance, when the public computer lab opened at the Native American elementary school, the school distributed fliers throughout the community. Focus group meetings with parents of Native American children indicate that the parents learned about the program through their children, through their children's teachers, and through their involvement in the local PTA. Teachers reported hearing about the program at local school board meetings, through the district's technology committee, and in the local newspaper.

[2] Data and analyses from the Congressional Budget Office, as well as major think tanks like the Economic Policy Institute and the Center on Budget and Priorities, have all tracked a rise in income inequality since the 1970s. According to the Congressional Budget Office, over the past 20 years the income of the top 1% has risen by 200%, the income of the middle fifth has risen by 15%, and the income of the bottom fifth has risen by only 9%.

for computer and Internet access since scholars began discussing the "digital divide" over a decade ago, divisions persist along several dimensions, including income. Adults living in households making an income of $30,000 or less are about half as likely as the highest-income Americans making $75,000+ to go on-line at all (49% have access, as opposed to 93%) and are also much less likely (42% as opposed to 71%) to have high speed Internet access at home (Pew Internet and American Life Project, 2005). Similarly, children in affluent homes with the newest technologies and high-speed Internet access at home maintain a strong advantage, even though technology education in public schools is making notable strides improving Internet access for minority and low-income children (Corporation for Public Broadcasting, 2003).

Just as the income gap continues to be strong, divisions by community type (urban, rural and suburban) are also pronounced. Internet use has grown in rural communities, but the gap between them and urban and suburban communities has remained fairly constant over time. In each of the past 4 years, rural Internet use has remained about 10% behind the national average. Moreover, low-income residents of rural areas are less likely to go online than low-income people living in urban or suburban areas, and a larger proportion of residents living in rural areas have household incomes of $30,000 and less. Middle and upper income residents in both rural and non-rural areas are equally likely to be Internet users (Pew Internet and American Life Report, 2004).

Previous research exploring the relationship between socio-economic status and community electronic networks finds that community technology projects enhance opportunities for the poor. Scholars find that electronic networks increase overall access, computer knowledge and skills for the poor—and, in doing so, enhance feelings of empowerment, efficacy, political participation and expression of political rights and responsibilities (Lillie, 2006a, b). In our analysis, we pursue a related line of inquiry, analyzing *whether civic involvement enhances the effectiveness of community technology projects and their ability to help the poor*. To do this, we explore the interaction between civic involvement and socio-economic status when predicting technology use. In other words, we seek to find out whether civic involvement has a greater impact on poorer citizens than the more affluent.

In our previous work (Sullivan et al., 2002b, which we discuss more below), we found some evidence of this interaction, although this study lacked longitudinal data. In the GrandNet community, our research revealed that two sets of factors led to technology usage—one set primarily economic and the other primarily political (or civic). So, individuals with lower levels of economic resources seem to be quite active in the Internet revolution provided they had high levels of political knowledge and community involvement. This makes sense, in that most community technological projects support public access terminals in public libraries and community centers, as well as community programs that provide low or no cost training in computer and Internet use. These kinds of projects not only provide practical access and training but also spark community interest and discussion. Citizens who are engaged in their communities, and who may or may not be economically well off, are able to learn about new technologies and become more familiar with their uses and benefits. In particular, citizens who are active in civic affairs and voluntary associations, who otherwise may not have access to computer use and training through their jobs or by way of socio-economic advantage, have opportunities to become technologically savvy. This may be one of the major ways that citizenship participation and community involvement can spur both community and individual economic development, providing a significant feedback loop between political structures and economic and educational environments.

Analytical Distinctions and Previous Findings

In this paper, we use the term *political* capital instead of *social* capital, mainly to distinguish between private sociability (sometimes considered an indicator of social capital) and public-oriented engagement. We believe that attending a political rally or organized civic group meeting is substantively different than talking to neighbors or going to dinner with close friends; the former encourages engagement within the public realm while the latter does not necessarily facilitate community interest or activity (Sullivan, Borgida, Jackson, Riedel, Oxendine, & Gangl, 2002a; Sullivan et al., 2002b). In this paper, the main form of political capital we evaluate is membership in organized civic associations, such as fraternal groups or service clubs.

We also use different terms when referring to communities as opposed to individual citizens. We use the term ''capital'' when referring to an entire community. So, in our work, communities with higher civic involvement have more political capital, just as those with higher incomes have more economic capital. We use the term ''resources'' when referring to individual citizens–citizens who are members of civic associations and who are politically active have ample political resources, just as those with higher incomes have more economic resources. We distinguish between economic resources and political resources, both of which have the potential for increasing an individual's propensity for technological literacy and use.

In the most recent tests of this framework, we found support for these analytical distinctions (Borgida et al., 2002; Oxendine, Borgida, Sullivan, & Jackson, 2003; Sullivan et al., 2002a, 2002b). In a previous study, for example, we analyzed data collected in our 1997 baseline survey. We tested structural equation models (using AMOS) to compare the factors that led to positive attitudes toward and use of computers, the Internet, and local electronic networks. We found that, in the community with a more vibrant evolving public network, there were two sets of factors that led to positive attitudes and actual usage—one set primarily economic and the other primarily political (or civic). Individuals who had lower levels of economic resources were quite active in the Internet revolution provided they had high levels of political knowledge and community involvement. In the community taking the more individualistic, entrepreneurial approach, only economic factors had these kinds of effects. There was plenty of community involvement by the citizens, but this involvement had no impact on the extent to which individuals opted actively into the electronic revolution of the last decade.

The data analyzed in our structural equation models were cross-sectional and were collected in the early stages of development of these community networks. To be sure, results were strongly suggestive and potentially quite powerful. However, with panel data collected four times over a period of 6 years, we now can examine whether these findings are robust and represent continuing differences between the two communities that could affect the generation of subsequent rounds of community political and economic capital. We can now determine whether it was indeed the case that, over a period of 6 years, Grand Rapids continued to provide two separate paths to participation in the information technology revolution and hence to economic opportunity—while in Detroit Lakes the primary determinant continued to be differences in individual-level wealth and income.

It is not entirely obvious that the initial effects of the community electronic network that we discovered early in its history should endure over time. There are countervailing forces at work and, of course, it may be that these larger societal factors ensure that while a community with a project such as GrandNet would reduce the digital divide earlier than those without such projects, over time the differences would erode. For example, we noticed that the community electronic network in Grand Rapids seemed to lose momentum as leadership shifted and the problem of Internet connectivity was addressed. At the same time, the city of Detroit Lakes inched slightly away from their market-oriented approach, offering some public Internet access in their local library and instituting additional terminals and training in their new community center. In short, one test we face in conducting a longitudinal study is that these countervailing forces could erode the foundation for the effects we observed in our earlier analyses. It is an open question whether the initial differential effects of political participation on participation in the revolution in information technology would persist.

Second, differences in the two cities could also dissipate because of competition between public and private sectors within the communities. Even though Grand Rapids began with a community-based approach, public projects must eventually face marketplace competition. As public and private sectors interact and compete in both towns, it is possible that the two approaches will eventually converge at a similar end point, despite their distinctive beginnings.

Another final challenge associated with a longitudinal data set like ours is that, even with relatively great stability in citizens' attitudes over time, measurement error can cause fluctuations between time points in operational measures. Therefore, in our project we analyze several different scales in order to determine if they are indeed reliable over time and if their relationships with other variables remain consistent.

In sum, the principal aim of our analysis is to see whether different leadership strategies and ensuing policy approaches change the way that civic involvement functions in these communities. Is civic activity more likely to spur technology use in Grand Rapids versus Detroit Lakes? Also, several years after the implementation of these electronic networks, do the communities' initial approaches to technological development continue to have a differential impact on citizens? Does the community-oriented approach in Grand Rapids continue to provide an alternate civic path toward technology use and ownership, particularly for poorer citizens? In essence, we wish to discover whether these alternative policy approaches appear to have longer lasting and consequential implications for the way social, economic, and political capital operate in the two communities.

Method

Political scientists have been developing and supporting the use of field experimentation in research, venturing outside of universities and controlled experimental settings and into more natural environments (Doherty, Green, & Gerber, 2005; Green & Gerber, 2002; Gerber & Green, 2000). This approach helps researchers to strike a balance between internal and external validity, between experimental control and ''real world'' authenticity. In this vein, our project consists of a creative quasi-experimental design, which pairs two communities that differ in terms of technology policy but are quite similar in terms of demographic makeup and character. This section explains our quasi-experimental approach in more detail, highlighting major differences between the two electronic networks. It also discusses surveys we conducted in Grand Rapids and Detroit Lakes, detailing measures and how we collected and analyzed the data.

Brief Background of the Two Networks

We have traced distinct policy approaches in Grand Rapids and Detroit Lakes for over 6 years, using elite interviews, focus groups, mass surveys and observing media coverage and materials made available by community leaders (Borgida et al., 2002; Oxendine et al., 2003; Sullivan et al., 2002a, 2002b). Leaders in Grand Rapids, a small town located in North-central Minnesota, began developing a community electronic network in 1995. These leaders represented various local organizations, including the local school district, the public library, Itasca County's Development Corporation, Itasca Community College, and Itasca County Health and Human Services.

Implementation of the project began in 1997 with funding from the Blandin Foundation, a local philanthropic organization, and the Telecommunications and Information Infrastructure Assistance Program (TIIAP) of the U.S.

Department of Commerce. The community electronic network called GrandNet[3] facilitated technological development in a variety of ways. For instance, the project developed a website that helped to connect the partner organizations and facilitated the sharing of computer hardware and expertise among them. GrandNet also provided public access to computers and the Internet through computer labs housed by four of the five partners and sponsored free or low-cost computer classes to the general public. According to a 1999 GrandNet report, 82 training classes were offered between July 1, 1998 and February 28, 1999. More than 220 employees of the local school district and over 160 community members participated in these classes.

A prominent goal of GrandNet was to make computer technology accessible to everyone in the community (Oxendine et al., 2003).[4] The GrandNet program was focused on spreading technology to disadvantaged sections of the county, including the Native American community. The program (in conjunction with the Minnesota Department of Children, Families, and Learning) trained knowledgeable young people to teach community members, students and their parents about computer programs and the Internet on terminals available at an elementary school. In addition to having all of its rooms wired for the Internet, the school received a data line and a lab with more than ten computers. The electronic network in Grand Rapids had a clear community orientation and explicit goals to spread Internet access, use and knowledge throughout the community, particularly to disadvantaged areas.

Using a hierarchical cluster analysis of demographic and social variables of Minnesota counties, we identified a comparison community to juxtapose against Grand Rapids. The dataset used for this purpose came from 1990 Census data and DATANET[5] (maintained by Minnesota Planning's Land Management Information Center). It included more than 50 variables, including population size, per capita income, percentage employed in different industries and occupations, and level and nature of racial diversity, to name a few.[6] The closest statistical match for Itasca County and its county seat, Grand Rapids, was provided by Becker County and its county seat, Detroit Lakes. Similarities between Grand Rapids and Detroit Lakes persist when comparing data from the more recent 2000 Census.[7] Also, the two communities are similar when comparing measures included in our survey at Time 1. When comparing descriptive statistics on income, civic membership, and a variety of

[3] The project was later renamed ItascaNet (after Itasca County) as the project began providing Internet access to the surrounding county.

[4] Project organizers specify this goal in their literature. For instance, GrandNet's 1998 website featured the following quotation from the Report of the Commission on Freedom and Equality of Access to Information: "Knowledge is power. How freely and how equally citizens have access to knowledge determines how freely and how equally they can share in the governing of our nation and in the work and rewards of our society."

[5] DATANET is an online information system maintained by the State of Minnesota's Land Management Information Center. Its website is www.lmic.state.mn.us.

[6] See Appendix 1.

[7] See Appendix 2, Table 8.

items measuring technology use, differences in means and/or percentages are not statistically significant.[8]

When faced with the issue of technological development in their community, leaders in Detroit Lakes did not work collectively to devise solutions and opted instead for an entrepreneurial, market-based approach. Government and business leaders worked independently to provide Internet access to citizens. Moreover, the city initiated an electronic network called LakesNet through its municipal utility in 1997. This city-managed network supplied moderately priced Internet access to the local schools and public library, and offered Internet service to citizens for a monthly fee. Alongside LakesNet, private communications companies also provided Internet access to citizens at competitive rates. In interviews with the leaders of LakesNet, as well as representatives from a [competing] Internet service provider, they cited ''personality conflicts'' and ''turf issues'' as main reasons for their inability to collaborate.

Survey Data

In conjunction with the Minnesota Center for Survey Research (MCSR)[9], we collected four rounds of surveys (1997, 1999, 2002, and 2003) studying citizens' feelings and behaviors toward information technology and community life in the two towns. The second and third surveys included a ''fresh'' cross-sectional sample of community members from both cities and their surrounding counties, along with a panel component of previous respondents. The fourth survey included only panel respondents. For the first round, we selected random samples of 1,000 residents in each city. We drew these samples half from voter registration records and half from telephone book listings, because some residents tend to have unlisted phone numbers but still register to vote. We mailed these surveys in September of 1997 and received a response rate of about 40% in each city.[10]

The survey, about ten pages in length, covered attitudes toward technology, levels of computer use, and technology ownership. It also included items measuring attitudes toward the community, various facets of political engagement, civic group memberships, social attitudes (like alienation and interpersonal trust), informal sociability, and various demographic indicators.

[8] See Appendix 2, Table 9.

[9] MCSR did not conduct the first data collection in 1997 but did conduct all subsequent collections.

[10] In order to evaluate how well our sample represents populations of Grand Rapids and Detroit Lakes, we compared our respondents' demographic characteristics to the 1990 U.S. Census. In both communities, our respondents were better educated and had higher incomes: 39.5% of Grand Rapids respondents and 37.4% of Detroit Lakes respondents held a college degree (or higher), compared to 14.4% of Grand Rapids residents and 15.9% of Detroit Lakes residents. Moreover, 60.5% of Grand Rapids respondents and 50.8% of Detroit Lakes respondents had household incomes of $35,000 or higher, compared to 29.8% of Grand Rapids residents and 21.9% of Detroit Lakes residents. There is certainly a socio-economic bias in our samples, but the level of bias is similar in both cities and should not affect our ability to draw valid comparisons.

We re-surveyed these original 1997 respondents at three subsequent time points, in 1999,[11] 2002 and 2003. At the conclusion of our four-wave panel, we had 139 respondents in Grand Rapids and 133 respondents in Detroit Lakes who completed surveys at *all four* time points. The final overall panel retention rate was 33.8% for both cities combined (the response rate was 33.2% in Grand Rapids and 34.4% in Detroit Lakes, ns). We found that individuals who responded to all four waves did not differ from non-panel respondents with regard to 1997 household income, education, proportion reporting ownership of a modem or Internet access, or gender. The panel respondents were older ($t = 4.234$, $P < .001$) than non-panel respondents with panel respondents having a mean age of 57 and non-panel respondents having a mean age of 52.

Survey Measures

Even though our overall questionnaire underwent some transformation over these four waves, we retained a set of core questions that remained unchanged. These central questions comprise the measurements analyzed here, which include income and civic memberships (independent variables), as well as Internet use, public computer use, electronic network awareness and community attitudes (dependent variables). With measures of income and civic memberships, we are able to compare their relationships to technology use over time and by community.

Income

We measure respondents' incomes by asking, ''What is your approximate annual household income?'' Respondents' answers correlate strongly over time, ranging from .79 (between 1997 and 2002) to .88 (between 2002 and 2003). In the analysis, we divide respondents into two categories based on their responses in 1997: (1) low income respondents who reported earning less

[11] The survey we conducted in 1999 differs slightly from the other survey rounds. In 1997, our research team sent questionnaires to a random sample of households in Grand Rapids and Detroit Lakes in order to gather baseline data for these two communities. In 1999, we conducted a follow-up survey of households in these two cities, sending questionnaires to those who responded in 1997 and to a new group of residents in each city. Due to a random data collection error regarding identification numbering for the Detroit Lakes panel list, some of the respondents from whom we received questionnaires in 1997 were not sent questionnaires in 1999. To remedy this problem, we sent questionnaires to the 1997 households that had been missed in the 1999 round. This round of data collection we term ''Time 2 $\frac{1}{2}$'' was conducted from September 22 to November 27, 2000 (mailing and data collection for the original round we term ''Time 2'' were conducted from October 28, 1999 to February 7, 2000).Note that the data collection error resulted from a problem with our identification number variable, and it had nothing methodic to do with other variables in our dataset. Because the data collection error was random and only a short span of time elapsed between the two surveys, the groups do not differ systematically. In extensive tests, we find that there are *no statistically significant differences* between respondents surveyed in 1999 and those a bit later in 2000. We tested for differences between the two groups on variables we measure in 1997, as well as those we measure in 1999. Based on our results, we are confident in our ability to pool respondents from Time 2 and Time 2 $\frac{1}{2}$.

than $35,000 and (2) high income respondents who reported earning more than $35,000. These groups account for 46% and 54% of the total respondents, respectively.

Civic Membership Scale

We asked respondents, "For each of the following organizations, please check the space in the column that best represents your relationship to the organization." Associations included fraternal, service, political, and sports group or team, professional or academic society, religious organization, youth organization, school service club, and literary or discussion group. Respondents choose "active member" (score of 1), "inactive member" (score of .5), or "not a member" (score of 0).[12] We summed the ten ratings resulting in alpha = .61. Respondents' scores on this scale correlate highly over time, ranging from .61 (between 1999 and 2003) to .69 (between 1999 and 2002). In our analysis, we divide respondents into two groups—low and high civic memberships—based on their responses from the 1997 survey. Individuals are assigned to the low group if they scored in the bottom third of all respondents and to the high group if they scored in the top third. Although we do not display results for the middle third, it consistently falls between the high and low groups.

Internet Use Scale

We measure Internet use with an additive scale of four questions repeated at all four time periods. These questions ask respondents whether they use an Internet service provider and whether they use their computer for accessing the Internet, e-mail and/or participating in on-line discussion groups. Alpha reliability is equal to .80, .79, .76, and .72 for each of the four time periods.

Public Computer Use Scale

This measure is an additive scale of three questions repeated at three time points (1999, 2002 and 2003). The questions ask respondents whether they use a computer at a public place, whether they use a computer for library research and whether they have used GrandNet or LakesNet. The scale's alpha reliability is equal to .58, .70, and .59 for the three time points.

Electronic Network Awareness

An additive scale of three questions repeated at three time points (1999, 2002, and 2003), asking respondents if they had previously heard of GrandNet or

[12] If the respondent left the item blank, we scored the item 0.

LakesNet, if they had used the network, and how much they have heard people in the community talk about these projects. The alpha reliability was .58, .52, and .46 for the three time periods.

Community Attitudes

This measure is an additive scale of eight questions repeated over all four time periods. The questions ask each respondent to report how nice the community is to raise children, how nice the community is as a place to live, how much they like to be involved in community groups, how satisfied they are with their community, how sorry they would be to leave the community, how much they feel an integral part of their community, and how interested they are to find out who goes on there. The alpha reliabilities are .84, .80, .81, and .82.

Public Information Scale

This measure is an additive scale of three questions included at three time points, 1999, 2002, and 2003. The questions ask respondents whether they have used a computer to find information about local government, local schools or community activities. The alpha reliability is equal to .82, .76, and .74 over the three time points.

Overview of Data Analysis

The aim of our investigation is to explore the impact of community involvement—political capital—on changes in technology use. To what degree do communities' distinct approaches to information technology create or shape an enduring relationship between community involvement and Internet use? Is civic involvement more likely, over time, to encourage technology use in Grand Rapids, compared to Detroit Lakes? To answer this, we compare the impact on technology usage of economic resources (measured by 1997 household income) and of civic resources (measured by 1997 organizational membership). Baseline levels of each measure are used to assure the correct interpretation of causality.

We utilize repeated measures analysis of variance to examine the impact that initial levels of civic and economic resources have on technology use over time. Repeated measures ANOVA models the contribution of the three independent variables (community, 1997 household income, and 1997 civic membership) to the total variance, within subjects variance, and between subjects variance for each dependent variable.[13] Within subjects variance is the change in the dependent variable over time for each individual. Between subjects variance is the difference between individuals' dependent variable scores averaged over all time periods. The total variance is the within and between subjects variance combined. We explore the effects of the independent variables on technology use, including Internet use, use of public access computers, awareness of electronic networks, and use of the Internet to access to public information about schools, local government, and the community. In short, by the technique of repeated measures ANOVA, we can answer the question of whether these outcomes differ in general by community, income, and civic membership as well as whether these outcomes differ *over time* by community, income, and civic membership.

Repeated measures ANOVA offers two main advantages for our study. First, it handles correlated errors when analyzing repeated over-time measures. It does this by separating out and explicitly modeling variance attributable to individual change over time versus variance between individuals. This is important for our purposes, because we expect that some of our dependent variables (especially general Internet use) will display systematic change between 1997 and 2003. This separation allows us to investigate the relationship between an independent and dependent variable by predicting change in the dependent variable as well as explaining differences in overall levels. The second advantage of repeated measures ANOVA is that it allows us to examine interactions between independent variables, even with a relatively low sample size. This is particularly well suited to our study, because our goal is to compare the impact of economic and civic resources on technology use and see if these relationships vary by community.

Results

Results are in Tables 1–6 and Fig. 1–4. Tables 1–5 present ANOVA results examining different dependent variables, beginning with Internet use and

[13] The assumption of sphericity is important to repeated measures ANOVA, and we find that our analyses do not significantly violate this assumption. This assumption states that variances at each time period of the repeated variable are equal and that the covariance (and hence correlations) between each time period of the repeated variable are equal. In addition, these variances and covariances must be the same for each level of the between-subjects variable. In analyses with several time periods, this assumption is difficult to meet. When the sphericity assumption is not met, this method is biased and tends to produce statistically significant results that would disappear if the assumption were met. According to Weinfurt (2000), scholars can measure the degree to which this assumption is violated by calculating the value of "epsilon" (e). A value of $e = 1.0$ indicates the assumption of sphericity is met and a value of $e = 1/(k-1)$ where k equals the number of within subjects levels indicates the worst possible violation of sphericity. In the present study, the worst violation of sphericity would be when epsilon $e = .50$ for three time periods and $e = .33$ for four time periods. In our analysis, epsilon was equal to .73 when analyzing Internet use, .93 when analyzing public computer use, .99 when analyzing electronic network awareness, .91 when analyzing community attitudes, and 1.00 when analyzing public information access. In the following analyses, we use a slightly more conservative estimator of epsilon, the Greenhouse-Geisser estimate. This estimate helps us to adjust the F tests accordingly (Weinfurt, 2000).

ending with community attitudes. Figures 1–4 provide visual interaction effects by community and between economic and political resources. Table 6a–e use tests of Granger causality to examine reciprocal relationships between civic membership and technology.

Internet Use (1997–2003)

Focusing first on Internet use, it increases over time in both communities, as it does nationally. The mean scores on the Internet use scale increase steadily in Grand Rapids from .87 in 1997 to 1.57, 1.81, and 1.94 in the second, third, and fourth waves respectively. The pattern is similar in Detroit Lakes with a mean scale score of .80 in 1997 to 1.35, 1.65, and 1.74 in the second, third, and fourth waves respectively. Note that levels of Internet use are lower in Detroit Lakes at every time point. Examining within-subjects' variance in Internet use over time, the most powerful predictor of usage at any point in time is, of course, usage at the previous point in time. Each subsequent survey, however, showed increases in Internet usage over the previous survey. This means that significant proportions of residents were becoming Internet users at each time point. What types of individuals were joining the revolution as time progressed from 1997 to 1999 to 2002 to 2003, in each of the two communities? How do the roles of income and community involvement differ across the two communities?

The analysis in Table 1 shows a significant within-subjects effect on Internet use by income level, and a significant interaction among income, civic membership, and community. (Growth in Internet use varies by these predictors.) Clearly, income makes a significant difference in determining which additional citizens obtain access to the Internet over these time periods. More important, the interaction effects show that the impact of income and civic membership varies between the two communities.

Figure 1 demonstrates this interaction effect by community. In Grand Rapids, for example, individuals with high income and high civic membership levels showed a big jump in Internet use between 1997 and 1999, while those with low income and high civic membership showed a similar jump a couple of years later, between 1999 and 2002. The data show that the strongest role of civic membership is found in Grand Rapids among those who were making less than $35,000 in 1997. In fact, the greatest increase in Internet use in Grand Rapids over this 6-year time span is among those who have the lowest level of income but the highest level of civic membership.

In Detroit Lakes, however, the greatest increases are among the high-income groups, regardless of level of civic membership. Those with the lowest levels of income coupled with the highest levels of civic membership show no increase between 1997 and 2003. The low income-high civic membership group is the major source of the interaction effects of community, income and civic membership on Internet usage. In Grand Rapids, this group showed a significant increase in Internet use, while in Detroit Lakes, it did not. This suggests that, although the Detroit Lakes Library began to offer limited

Table 1 Repeated measures ANOVA on internet use scale

	Within subjects variance					Between subjects variance			
	SS	df	MS	*F*		SS	df	MS	*F*
DV	133.370	2.182	61.136	68.044**	Intercept	1891.544	1	1891.544	458.343***
DV × Income	6.971	2.182	3.196	3.557**	Income	302.901	1	302.901	73.396***
DV × Membership	6.302	4.363	1.444	1.608	Membership	31.506	2	15.753	3.817*
DV × Community	1.300	2.182	.596	.663	Community	.528	1	.528	.128
DV × Income × Membership	3.484	4.363	.799	.889	Income × Membership	.931	2	.465	.113
DV × Income × Community	3.828	2.182	1.755	1.953	Income × Community	.180	1	.180	.044
DV × Membership × Community	5.366	4.363	1.230	1.369	Membership × Community	13.607	2	6.803	1.649
DV × Income × Membership × Community	13.492	4.363	3.092	3.442**	Income × Membership × Community	4.970	2	2.485	.602
Error	482.173	536.653	.898		Error	1015.223	246	4.127	

*** $P < .001$, ** $P < .01$, * $P < .05$, + $P < .10$

Table 2 Repeated measures ANOVA on public computer use scale

	Within subjects variance					Between subjects variance			
	SS	df	MS	*F*		SS	df	MS	*F*
DV	6.871	1.949	3.526	9.002***	Intercept	363.317	1	363.317	211.850***
DV × Income	1.036	1.949	.532	1.358	Income	44.909	1	44.909	26.187***
DV × Membership	.654	3.898	.168	.429	Membership	13.315	2	6.657	3.882**
DV × Community	1.116	1.949	.572	1.462	Community	4.972	1	4.972	2.899+
DV × Income × Membership	2.132	3.898	.547	1.397	Income × Membership	2.445	2	1.223	.713
DV × Income × Community	.657	1.949	.337	.861	Income × Community	.173	1	.173	.101
DV × Membership × Community	2.541	3.898	.652	1.664	Membership × Community	6.461	2	3.230	1.884
DV × Income × Membership × Community	2.318	3.898	.595	1.518	Income × Membership × Community	10.306	2	5.153	3.005+
Error	187.755	479.397	.392		Error	421.883	246	1.715	

*** $P < .001$, ** $P < .01$, * $P < .05$, + $P < .10$

Table 3 Repeated measures ANOVA on electronic network awareness scale

	Within subjects variance					Between subjects variance			
	SS	df	MS	*F*		SS	df	MS	*F*
DV	17.727	1.935	9.160	23.443***	Intercept	914.667	1	914.667	711.677***
DV × Income	.616	1.935	.318	.814	Income	49.410	1	49.410	38.444***
DV × Membership	2.372	3.870	.613	1.568	Membership	17.479	2	8.740	6.800**
DV × Community	.266	1.935	.138	.352	Community	9.500	1	9.500	7.392**
DV × Income × Membership	1.460	3.870	.377	.965	Income × Membership	1.369	2	.685	.533
DV × Income × Community	.565	1.935	.292	.747	Income × Community	.425	1	.425	.330
DV × Membership × Community	.377	3.870	.097	.249	Membership × Community	1.408	2	.704	.548
DV × Income × Membership × Community	1.850	3.870	.478	1.223	Income × Membership × Community	8.402	2	4.201	3.268*
Error	186.024	476.065	.391		Error	316.166	246	1.285	

*** $P < .001$, ** $P < .01$, * $P < .05$, + $P < .10$

Table 4 Repeated measures ANOVA on accessing public information through the internet scale

	Within subjects variance					Between subjects variance			
	SS	df	MS	F		SS	df	MS	F
DV	44.424	1.989	22.332	10.976***	Intercept	4325.404	1	4325.404	711.106***
DV × Income	1.389	1.989	.698	.343	Income	11.893	1	11.893	1.955
DV × Civic Membership	1.328	3.978	.334	.164	Civic Membership	51.371	2	25.686	4.223*
DV × Community	1.106	1.989	.556	.273	Community	14.106	1	14.106	2.319
DV × Network Use	6.728	5.968	1.127	.554	Network Use	93.146	3	31.049	5.104**
DV × Income × Civic Membership	.737	3.978	.185	.091	Income × Civic Membership	11.220	2	5.610	.922
DV × Income × Community	2.215	1.989	1.113	.547	Income × Community	11.040	1	11.040	1.815
DV × Civic Membership × Community	11.283	3.978	2.836	1.394	Civic Membership × Community	44.225	2	22.113	3.635*
DV × Income × Civic Membership × Community	4.025	3.978	1.012	.497	Income × Civic Membership × Community	7.689	2	3.844	.632
DV × Income × Network Use	8.504	5.968	1.425	.700	Income × Network Use	16.243	3	5.414	.890
DV × Civic Membership × Network Use	20.942	11.935	1.755	.862	Civic Membership × Network Use	32.324	6	5.387	.886
DV × Civic Membership × Income × Network Use	27.438	9.946	2.759	1.356	Income × Civic Membership × Network Use	65.991	5	13.198	2.170+
DV × Network Use × Community	6.253	5.968	1.048	.515	Network Use × Community	20.566	3	6.855	1.127
DV × Income × Network Use × Community	2.783	3.978	.700	.344	Income × Network Use × Community	14.576	2	7.288	1.198
DV × Civic Membership × Network Use* Community	23.029	9.946	2.315	1.138	Civic Membership × Network Use × Community	34.143	5	6.829	1.123
DV × Civic Membership × Income × Network Use × Community	.776	3.978	.195	.096	Income × Civic Membership × Network Use × Community	8.756	2	4.378	.720
Error	392.582	192.955	2.035		Error	590.016	97	6.083	

*** $P < .001$, ** $P < .01$, * $P < .05$, + $P < .10$

Table 5 Repeated measures ANOVA on community attitudes scale

	Within subjects variance					Between subjects variance			
	SS	df	MS	*F*		SS	df	MS	*F*
DV	8.115	2.739	2.962	.494	Intercept	874410.296	1	874410.296	14656.607***
DV × Income	8.728	2.739	3.186	.531	Income	43.617	1	43.617	.731
DV × Membership	1.408	2.739	.514	.086	Membership	1032.392	2	516.196	8.652***
DV × Community	37.715	5.479	6.884	1.147	Community	12.484	1	12.484	.209
DV × Income × Membership	6.328	2.739	2.310	.385	Income × Membership	10.191	2	5.095	.085
DV × Income × Community	11.452	5.479	2.090	.348	Income × Community	44.785	1	44.785	.751
DV × Membership × Community	37.652	5.479	6.873	1.145	Membership × Community	46.734	2	23.367	.392
DV × Income × Membership × Community	15.150	5.479	2.765	.461	Income × Membership × Community	573.785	2	286.893	4.809**
Error	4045.035	673.865	6.003		Error	14676.312	246	59.660	

*** $P < .001$, ** $P < .01$, * $P < .05$, + $P < .10$

Table 6 Does civic membership predict technology use or vice versa?[a]

DV (Lagged IV)	Grand rapids			Detroit lakes		
	Lagged DV	**Lagged IV**	Adjusted R^2	Lagged DV	Lagged IV	Adjusted R^2
(a) *Internet computer use scale and civic membership scale*						
Internet Use 03 (Civic Membership 02)	.91**	**-.04**	.90	.91**	–.02	.90
Internet Use 02 (Civic Membership 99)	.71**	**.14***	.61	.74**	.06	.58
Internet Use 99 (Civic Membership 97)	.51**	**.17***	.32	.58**	.12	.37
Civic Membership 03 (Internet Use 02)	.63**	**.11**	.46	.68**	.03	.48
Civic Membership 02 (Internet Use 99)	.72**	**-.04**	.49	.68**	.02	.47
Civic Membership 99 (Internet Use 97)	.66**	**.15***	.48	.57**	.18*	.37
(b) *Public computer use scale and civic membership scale*						
Public Computer Use 03 (Civic Membership 02)	.49**	**.17***	.32	.58**	.05	.35
Public Computer Use 02 (Civic Membership 99)	.53**	**.26****	.44	.51**	.18*	.32
Civic Membership 03 (Public Computer Use 02)	.66**	**.04**	.45	.66**	.09	.48
Civic Membership 02 (Public Computer Use 99)	.71**	**-.01**	.49	.68	.02	.46
(c) *Electronic network awareness scale and civic membership scale*						
Network Awareness 03 (Civic Membership 02)	.56**	**.17***	.41	.62**	.05	.40
Network Awareness 02 (Civic Membership 99)	.40**	**.24****	.29	.34	.31	.28
Civic Membership 03 (Network Awareness 02)	.65**	**.05**	.44	.64	.12	.48
Civic Membership 02 (Network Awareness 99)	.70**	**.01**	.49	.67**	.05	.46
(d) *Community attitudes scale and civic membership scale*						
Comm Attitudes 03 (Civic Membership 02)	.81**	**.09**	.70	.84	–.02	.68
Comm Attitudes 02 (Civic Membership 99)	.75**	**.03**	.57	.75**	.07	.59
Comm Attitudes 99 (Civic Membership 97)	.74**	**.08**	.58	.69**	–.06	.45
Civic Membership 03 (Comm Attitudes 02)	.66**	**.04**	.44	.67**	.07	.47
Civic Membership 02 (Comm Attitudes 99)	.69**	**.04**	.49	.67**	.08	.47
Civic Membership 99 (Comm Attitudes 97)	.63**	**.19****	.49	.58**	.04	.34

Table 6 continued

DV (Lagged IV)	Grand rapids			Detroit lakes		
	Lagged DV	**Lagged IV**	Adjusted R^2	Lagged DV	Lagged IV	Adjusted R^2
(e) *Internet access to public information scale and civic membership scale*						
Public Information 03 (Civic Membership 02)	.56**	**.09**	.34	.59**	.11	.37
Public Information 02 (Civic Membership 99)	.48**	**.24***	.36	.44**	.14	.23
Civic Membership 03 (Public Information 02)	.66**	**.05**	.45	.77**	.04	.60
Civic Membership 02 (Public Information 99)	.63**	**.14**	.47	.72**	–.01	.51

*P < .05, **P < .01

[a] In tests of Granger causality, civic involvement variables tend to be more powerful predictors of technology variables, rather than the opposite. Analyzing coefficients for lagged independent variables in Grand Rapids (in bold print below), coefficients for civic membership are more likely to be statistically significant than those for technology variables. Tables 6a through e feature standardized regression coefficients and adjusted R^2

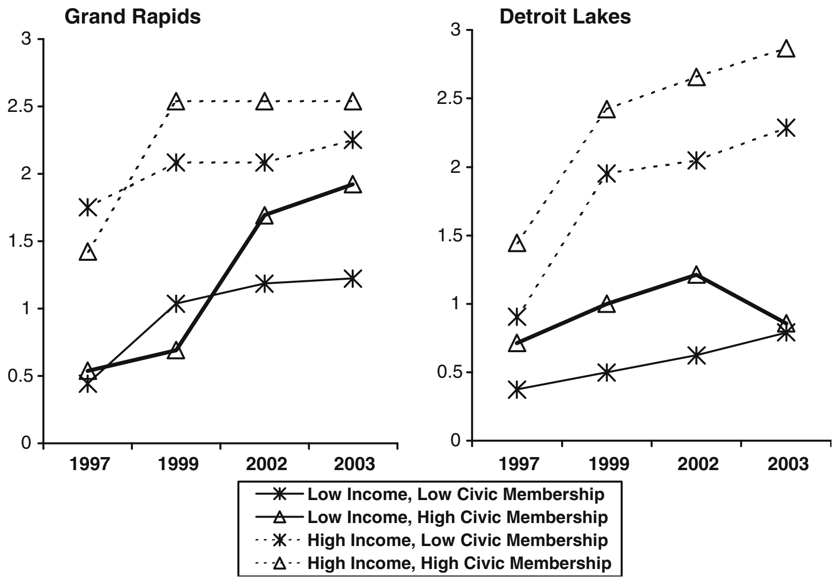

Fig. 1 Internet use scale over time by community, income, and civic membership (within subjects)

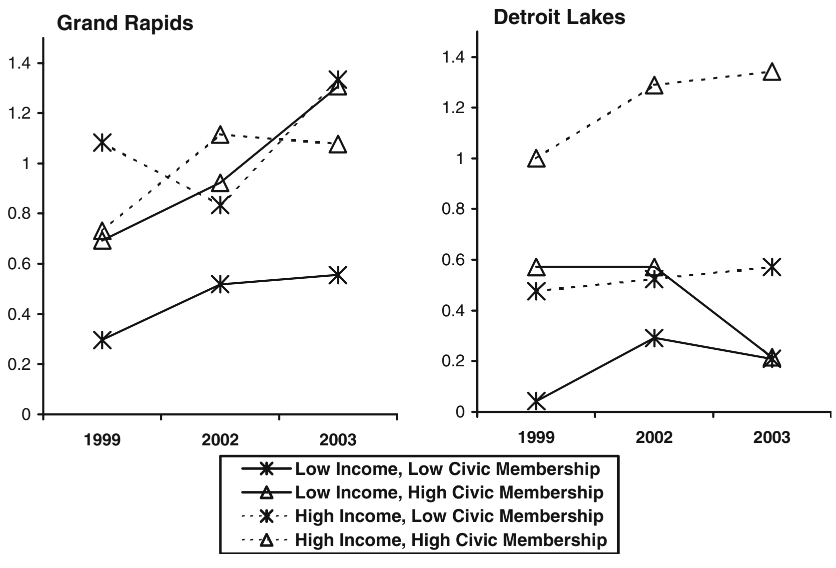

Fig. 2 Public computer use scale over time by community, income and civic membership (between subjects)

Internet access during the time of this study, it was sufficiently limited and had such a low profile that it did not affect lower income groups, even those with high civic awareness and involvement. In Grand Rapids, the GrandNet

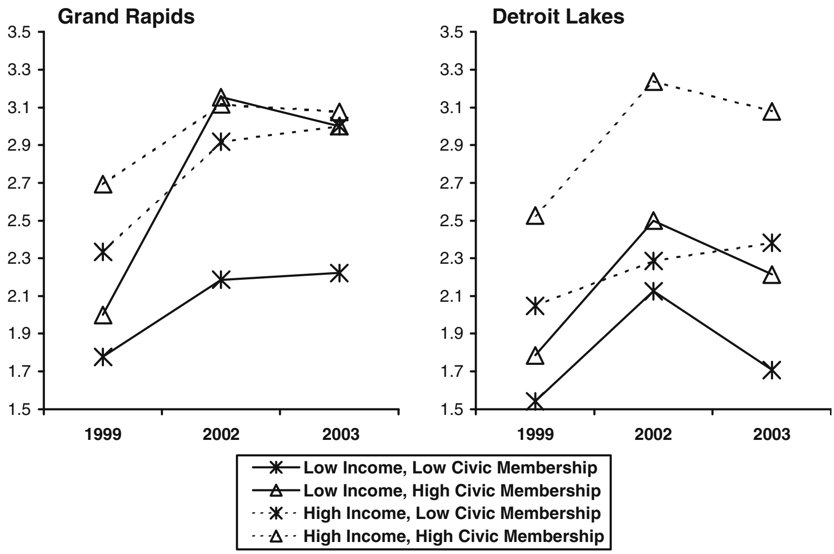

Fig. 3 Electronic network awareness scale by income and civic membership (between subjects)

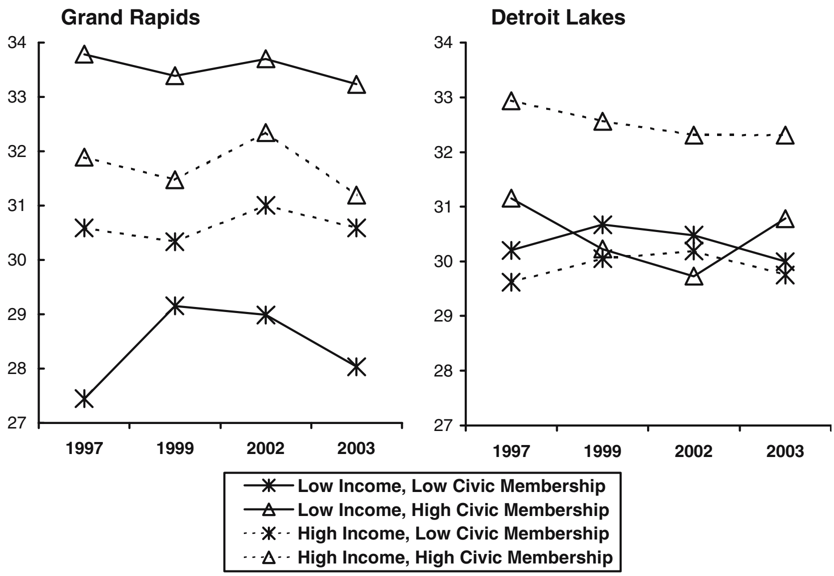

Fig. 4 Overall community attitudes by community, income, and civic membership

Project penetrated community life and exerted a stronger influence on this group of less affluent but active and savvy citizens. Programs targeted at disadvantaged citizens seem to have made a difference among those who are involved in community life.

Table 1 shows that income and civic membership levels are still predictive when looking at between-subjects variance. (Average Internet use over time is predicted by income and civic membership.) Ignoring individual changes in Internet usage, we still find that over this time period, in the aggregate, participants in the communications revolution were drawn disproportionately from among the higher income groups.

Public Computer Use (1999–2003)

When we examine the use of public computer facilities, there are less systematic growth patterns over time (see Fig. 2). Based on the analysis of within-subjects variance, none of our predictors are systematically related to any growth patterns observed (see Table 2). However, between-subjects variance *is* predicted by the independent variables. Average levels of public computer use (taking all time periods together) are predicted by income and civic membership as evidenced by the between-subjects analysis—higher levels on both variables mean greater frequency of public computer access (see Table 2). There is a marginally significant effect for community ($P < .10$) such that Grand Rapids residents report a higher level of making use of public computer access. More important, there is also a significant interaction between income, civic membership, and community ($p = .05$). Figure 2 shows the nature of this interaction. In both communities, the highest income groups have the highest rates of public access. In Grand Rapids however, those respondents making less than $35,000 in 1997 household income but having high organizational membership appear to have closed the gap with those at higher income levels. In Detroit Lakes, however, those in the higher income levels are set off much more distinctly from those respondents making less income.

Electronic Network Awareness (1999–2003)

The patterns observed for awareness of LakesNet or GrandNet in the two communities are similar to those found for public computer access. As shown in Table 3, there is slightly more systematic variation in this scale and previous levels of network awareness are a statistically significant predictor of within-subjects variance. There is also growth of awareness about each network over time—each level of awareness is predicted by the previous time period. But this growth is not related to the three predictors specified, however. All three independent variables do, however, predict between-subjects variance or the levels of network awareness averaged over time. Overall network awareness is greater among Grand Rapids respondents, those with high levels of civic membership, and those with high levels of income. In addition, there is also an interaction among civic membership, income, and community, illustrated in Fig. 3. In Detroit Lakes, respondents with high income and high civic membership exhibit much greater network awareness than all other respondents in that community. In Grand Rapids, however, those respondents with a high income as well as respondents with a low income but high civic involvement have similarly high levels of network awareness, and the largest increase by far took place among those with low income and high civic awareness. That great leap forward took place between 1999 and 2002. By contrast, in Detroit Lakes, the comparable group of low income-high involvement citizens actually showed a significant decrease between 2002 and 2003.

Public Information through the Internet (1999–2003)

Membership in civic organizations can be a resource for access to information technology, depending on whether it is mobilized for this purpose. It remains to be seen whether the particular approach taken to providing access to technology in turn shapes what kind of information is sought with that technology. In order to examine this question, we used repeated measures ANOVA to explore whether we could predict changes in the public information scale over the time periods. Recall that the public information scale measures the extent to which respondents use the Internet to access information about local governmental and community activities.

In this table, independent variables include civic membership, income, and community. In contrast to previous models, we included an additional independent variable, measuring the number of time periods the respondent indicated accessing GrandNet or LakesNet. This additional independent variable is helpful, because public library Internet access has been an important component of GrandNet's community technology project—and these terminals have existed in part to provide residents greater, easier access to public information.

Table 4 reveals that the frequency of access to public information through the Internet increased over time and is probably related to the more general growth of Internet use over time. None of the independent variables in our within-subjects analysis predicted this growth however. There were, still, statistically significant main effects for civic membership and GrandNet/LakesNet use in predicting between-subjects variance of public information access (public information access levels averaged over the three time periods). The impact of civic membership was somewhat greater for Grand Rapids, where the sharpest increase in accessing the Internet for public information is among those most organizationally involved. There was no interaction between the community and network use.

Community Attitudes (1997–2003)

To explore the possibility that the patterns witnessed with the dependent variables reflected a more general dynamic regarding the interaction of income and civic resources in each community, a dependent measure not focused on technology—the community attitudes scale—was examined. This scale measures how interested, satisfied, and attached respondents were with their particular community at each wave of the study. Mean levels were stable over time and there was no systematic within-subject variance (and hence no growth) to explain (see Table 5). Community was a significant predictor of between-subjects variance (community attitude levels averaged over the four time periods), with Detroit Lakes' respondents reporting slightly more favorable attitudes towards their community than people from Grand Rapids. Income and civic membership by themselves were not significant predictors, however. Only when considered in an interaction with community did these variables have an impact in Detroit Lakes, where those at the highest levels of income and civic membership were far more positive toward the community than all other subgroups. In Grand Rapids, the different subgroups exhibited more distinct community attitudes. Those respondents who had high levels of civic membership reported the most positive attitudes about the community regardless of income level. Positive attitudes then decreased with civic membership levels. This pattern is quite different than what we found for the other dependent variables, all of which were technology-related. This suggests that the specific pattern found earlier is unique to technology-related variables that are most likely to have been affected by the approaches the towns took toward developing community electronic networks.

Establishing Directionality of Effects.[14]

Our models assume that income, civic membership, and the context/type of community electronic network all affect the likelihood that citizens will know about and participate in the Internet revolution. The use of panel data, and the fact that our independent variables were measured years before the various dependent variables were measured, enhances this claim. One can certainly imagine an over-time causal chain where income and community participation influence technology use, and heightened technology use in turn influences levels of social and political capital and individual resources in a reciprocal relationship.

We conducted tests of Granger causality, defined by whether variance in a dependent variable (that remains unexplained after using the lagged dependent variable as a predictor) can be explained by a lagged independent variable (Granger, 1969; Menard, 1991). If so, the independent variable is said to be a ''Granger cause'' of the dependent variable. In the following tests, the Civic Membership Scale and the five outcome variables (Internet Computer Use Scale, Public Computer Use Scale, Electronic Network Awareness Scale, Community Attitudes Scale, and Internet Access to Public Information Scale) are alternated as dependent and independent variables in ordinary least squares regressions using the following form:

$$Y_t = Y_{t-1} + X_{t-1} + e$$

[14] A natural question raised by one reviewer is whether, in these communities, community attitudes impacted Internet use or vice versa? A preliminary analysis showed that community attitudes consistently correlate with civic membership and civic membership correlates with Internet use. There are almost no correlations between community attitudes and Internet use in either community. Hence, if there is a relationship between community attitudes and Internet use, it is likely only an indirect one operating through civic membership.

Only one time period is used as a lag in these tests and simultaneous causality is ruled out by this method. The regression models are run separately for each community.

Table 6a–e report standardized regression coefficients. The key to determining causality is the *significance of the lagged independent variable in each model*. With few exceptions, the pattern appears to be that civic membership causes computer-related behavior and that this occurs much more often in Grand Rapids than in Detroit Lakes. For Grand Rapids, the coefficients illustrating the impact of 1997 and 1999 civic membership on 1999 and 2002 Internet use are statistically significant ($P < .05$), the coefficients illustrating the impact of 1999 and 2002 civic membership on 2002 and 2003 public computer use are statistically significant ($P < .05$), the coefficients illustrating the impact of 1999 and 2002 civic membership on 2002 and 2003 electronic network awareness are statistically significant ($P < .05$), and the coefficient illustrating the impact of 1999 civic membership on 2002 Internet access to public information is statistically significant ($p < .05$). In turn, computer-related behavior does not appear to cause civic membership. One exception involves Internet use and civic membership, which has reciprocal causation in the 1997–1999 time period. Another instance in which civic membership does not drive the causal relationship is with community attitudes; the 1997 community attitudes variable has a causal impact on 1999 civic membership in Grand Rapids. Community attitudes and civic membership are otherwise unrelated.

Discussion and Implications

We find that *context matters greatly*. Not only can political context—in the form of governmental institutions, leadership or structural forces—shape the nature of civic activity, but it can also interact with civic activity to modify its effects. In essence, we find that policy approaches regarding information technology interact with civic activity to predict both general Internet use among citizens, as well as citizens' likelihood to use the Internet to seek out information about local government and community activities.

At the onset of the Internet revolution, leaders in Grand Rapids and Detroit Lakes chose different approaches to technology diffusion, one community-oriented and one based on market forces. These initial policy choices create continuing differences for Internet use and access to technology. Because of GrandNet, technology had a strong relationship to civic life in Grand Rapids. Even after 7 years, people in Grand Rapids who are connected to the community are still able to utilize political resources to remain technologically engaged and sophisticated. There is also an interaction between political and economic resources, in that civic membership is more influential for poorer citizens than the wealthy. In Detroit Lakes, citizens continue to rely mainly on economic resources to access new technologies. We conclude that community electronic networks can provide expanded access to the information technology revolution, and hence to quality of life opportunities.

As with most approaches in the social sciences, our research design encompasses certain drawbacks. By its nature, field experimentation sacrifices a degree of experimental control for "real world" authenticity. In our case, it is difficult to tell *exactly* which components of the community electronic project are causing the link between civic engagement and citizens' Internet use. We observe technology projects in their entirety, and these projects include a variety of plans and programs. Moreover, these projects are nested in different cities, which are quite similar but still distinct in terms of history, culture and character. This unavoidable uniqueness makes it difficult to fully disentangle these factors from the policy approaches city leaders chose.

Another obstacle is that we were unable to gather data prior to the onset of our communities' electronic networks. We gathered baseline data quite early in the projects' development and before the projects were fully implemented in the communities; however, the rapid onset of Internet technology precluded collecting data before any hint of discussion regarding connectivity. However, given how quickly technology develops and penetrates our society, it is virtually impossible to have such a high level of control in any investigation.

Despite these drawbacks, our past qualitative research and intimate knowledge of the communities' projects, however, gives us some reassurance that our findings are due to network differences and not to some other, intervening variable. As we discussed earlier in the paper, interviews and focus groups reveal that citizens tied to the Grand Rapids community through civic organizations are more likely to know about and use the community electronic network. This link between community involvement and new technology is absent in Detroit Lakes.

In analyzing the impact of new technologies on community and social life, researchers believe that community electronic networks have the potential to improve community connectedness, political awareness/activity, access to education and overall quality of life (Anderson et al., 1995; Kavanaugh and Patterson, 2001; Schuler, 1994). Others are concerned that computer technologies may weaken social and community life. Putnam (1995) asks, "What will be the impact, for example, of electronic networks on social capital? My hunch is that meeting in an electronic forum is not the equivalent of meeting in a bowling alley—or even in a saloon—but hard empirical research is needed" (p. 76). In a controversial 1998 study, Kraut et al. found that Internet use seems to erode social connections and enhance loneliness and depression. In a subsequent study, these scholars report that the Internet has much more positive effects, citing evidence that Internet use augments social relationships and individual well-being (Kraut et al., 2002). Our findings suggest that personal technology use may not be particularly influential for community life (and, instead, the relationship is reversed), at least when analyzing civic group membership over the period of time covered by our study.

In our previous work, we found that initial political capital helped to mold the approaches to technology diffusion that these communities originally chose to take. We analyzed interviews, focus groups and surveys and found that Grand Rapids has a more pronounced reservoir of social capital, meaning that people in this community tend to be more trusting, have more cohesive social ties, and are prone toward collaboration. Cooperation and social trust, particularly among community leaders, seem to have played large roles in triggering the development of a community electronic network (Oxendine et al., 2003). In the current analysis, we show that the character of these networks (and likely the civic culture that gave birth to them) continue to have an influence several years after implementation. This is consistent with Fukuyama's (1995) claim that ''societies where computer networking will really take off are the ones in which technology can ride on top of existing social networks'' (p. 80).

These findings have relevance for other issues that communities face, not just technology diffusion. The community-oriented approach implemented in Grand Rapids provides an additional avenue through which citizens can learn about computers and become familiar with new technologies. Community dialogue and discussion gives people who are politically involved an additional channel for such information. This kind of dialogue and community support could serve the same function for other issues like affordable housing, health care, or unemployment. Just as an on-going community dialogue about information technology makes involved citizens better aware of how to utilize computers, an on-going dialogue about health care could make citizens more informed about how to navigate the health care system and to find help from community and governmental organizations. Future research should be conducted, however, to more firmly establish the interplay of community projects and citizens' civic involvement.

Lessons from Grand Rapids and Detroit Lakes are also particularly important in light of growing income inequality and the potential for the digital divide to exacerbate economic stratification. Due to these trends, it is important to investigate *alternatives* for rural and urban citizens to gain access to cutting edge technologies. Our work suggests that community electronic networks may be particularly promising because they allow citizens to tap into civic resources to gain technological experience and know-how. These sorts of technological resources can open doors for citizens interested in learning about their community, local politics and other public institutions. This alternate path toward technological sophistication may be most promising for lower and working class citizens, who are engaged in civic life but financially disadvantaged. In short, we find that community-oriented approaches to information technology can have lasting, beneficial effects.

Acknowledgments The authors would like to thank Greg Belshe, Libby Dresel, Amy Gangl, Monica Schneider and Marc Wagoner for their research assistance. We would also like to thank Jamie Druckman and Chris Federico for helpful comments on earlier drafts of this paper. In addition, we extend our thanks to Frank Allen, Larry Buboltz, Ben Hawkins, Sandy Layman, Milda Hedblom, and the communities of Grand Rapids and Detroit Lakes, Minnesota, for their cooperation.

Appendix 1: Selecting Comparison Communities

The following table illustrates the variables used to select a control community for Itasca County, home of Grand Rapids (Sullivan et al., 2002b). The article's appendix explains, "...[We] performed a cluster analysis of all Minnesota counties using the variables listed in the table below. We standardized the data values using z-score transformations, used squared Euclidean distances as the proximity measure, and used the average linkage between groups as the clustering method. The first time Itasca County was placed in a cluster was when it was added to one that already contained two counties: Becker and Carleton. That cluster later added six more counties, but the core of the cluster was Becker, Carleton and Itasca Counties." The research group finally chose Becker County, home of Detroit Lakes, as the comparison community for Itasca County, home of Grand Rapids.

Table 7

Data obtained from DATANET (maintained by Minnesota Planning's Land Management Information Center)	Data obtained from the 1990 U.S. Census
Population (1995 projection)	Age
Sex—percentage male (1995 projection)	Per capita income
Justice system expenditures (1992)	Number of people
Liquor sales (1992)	...at various education levels
Monthly unemployment rates (1996)	...identified as disabled
Number of	...with interest, dividend, or net rental income
...households (1995 projection)	...with farm self-employment income
...married-couple households (1995 projection)	...with nonfarm self-employment income
...school suspensions (1992–1993)	...with wage income
...runaways (1994)	...with public assistance income
...juvenile apprehensions (1994)	...at each extreme of income scale
...dropouts (1993–1994)	...employed in financial industry
...infant mortalities (1992–1994 total)	...employed in service industry
...low birth-weight babies (1994)	...employed in public industry
...mothers under 18 (1994)	...employed in basic industry
...babies whose mothers had no prenatal care (1994)	...in homes where a Native American language is spoken
...homicides (1993)	...with manual occupation
...criminal offenses–by type of offense (1993)	...with technical occupation
...arrests (1993)	...with service occupation
...drug arrests (1993)	...with laboratory occupation
...DWI arrests (1993)	...below poverty level, by age group
...chemical dependency programs (1994)	...who are Native American
Number of people	...who are non-Native American non-White
...65 and over (1995 projection)	...enrolled in public schools
...19 and under (1995 projection)	...enrolled in private schools
...in labor force (1995 projection)	...living in urban areas

Table 7 continued

Data obtained from DATANET (maintained by Minnesota Planning's Land Management Information Center)	Data obtained from the 1990 U.S. Census
...on probation (1993)	...living in rural areas
...in detox (1992)	
...in chemical dependency programs (1993)	
Number of children	
...in poverty (1989)	
...on AFDC (1995)	
...reporting abuse, neglect (1994)	
...placed out of home (1993)	

Appendix 2

Table 8 Comparing grand rapids and detroit lakes

	Grand rapids	Detroit lakes
Population age 16+	6,224	5,935
Mean Income	38,075	39,085
Percent families in poverty	9.2	9.9
Percent Unemployed	3.3	3.4
Percent White	95.5	92
American Indian	1.9	4.5
Percent High School Grad+	86.7	83.7
Percent Bachelors+	18	24.1
Percent Female	53.5	54.2
Age (median)	40.9	41.5

Data compiled from the 2000 Census

Table 9 Comparing grand rapids and detroit lakes using survey measures

Measure	Time 1	Grand rapids	Detroit lakes	Test statistic
Annual Household Income (Ordinal, 1–5)	1997	< \$5,000 2.3% \$5,000–\$14,999 8.3% \$15,000–\$34,999 28.8% \$35,000–\$74,999 45.5% ≥\$75,000 15.2%	< \$5,000 0% \$5,000–\$14,999 15.9% \$15,000–\$34,999 36.5% \$35,000–\$74,999 31.7% ≥\$75,000 15.9%	Mann–Whitney $Z = -1.596$, $P = .111$ / $t = 1.315$, $P = .190$
Civic Membership Scale (Ordinal, 1–3)	1997	Low 35.3% Medium 25.9% High 38.8%	Low 31.6% Medium 37.6% High 30.8%	$X = 4.466$, $P = .107$
Civic Membership Scale (Interval, 0–10)	1997	Mean = 2.33	Mean = 2.24	$t = .461$, $P = .645$
Internet Use Scale (Interval, 0–4)	1997	Mean = .87	Mean = .80	$t = .481$, $P = .631$

Table 9 continued

Measure	Time 1	Grand rapids	Detroit lakes	Test statistic
Public Computer Use Scale (Interval, 0–3)	1999	Mean = .55	Mean = .59	t = .447, P = .655
Electronic Awareness Scale (Interval, 0–3)	1999	Mean = .85	Mean = 1.00	t = –1.394, P = .165
Community Attitudes Scale (Interval, 13–40)	1997	Mean = 31.19	Mean = 30.60	t = 1.024, P = .307
Public Information Scale (Ordinal, 3–11)	1999	Mean = 4.03	Mean = 3.87	t = .634, P = .527

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