Merging Theory with Practice:

Toward an Evaluation Framework for Community Informatics

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Abstract

Community informatics is defined as a strategy or discipline that focuses on the use of information and communication technologies by territorial communities. This paper analyzes the emerging evaluation literature on community informatics to develop an understanding of the indicators used to gauge project impacts in community networks and community technology centers. This study finds that community informatics evaluations fall into five key areas: 1) enhancing strong democracy; 2) increasing social capital; 3) empowering individuals; 4) revitalizing sense of community; and 5) providing economic development opportunities. This paper aims to develop an understanding or model of community informatics research that synthesizes diverse theoretical perspectives in two ways: first, by presenting a taxonomy of more than 30 evaluation studies based on common methodological and explanatory dimensions; and second, by drawing from this taxonomy to construct an evaluation framework of appropriate indicators and methods for community informatics evaluation research.

Introduction to Evaluation of Community Informatics

As use of information and communication technologies (ICTs) such as the Internet permeate the daily lives of many across the globe, few would dispute that these technologies make impacts on the economic, political, and social realms of daily life. A growing base of literature seeks to analyze the use of these new technologies for community development efforts. Gurstein (1999) refers to this new field of study as community informatics—an approach that links community development efforts with the opportunities that ICTs present. Community informatics (CI) research includes areas such as electronic commerce, community and civic networks, community technology centers, electronic democracy, cultural enhancement, and online participation (Lentz et al., 2000). Research in CI brings together theories of information and communication technologies with the pragmatic field of community development (Romm and Taylor, 2000b).

The seemingly growing interest in and funding for public access to ICTs (The White House, 1999) sparks concerns about ways to measure and assess project impacts on the communities they serve. If community informatics is understood broadly, access issues are not new—universal telephone service has been a goal since the 1930s and public access television has been available in the U.S. since at least the early 1970s. Yet the immense public attention on the "digital society"

has spawned a new type of community technology initiative in which community members, government representatives, and information technology corporations stress the possibilities afforded by new ICTs for improving communities—in the social, political, and economic realms.

However, the value of community informatics needs to be understood so that productive projects can be better and more widely implemented. Studies should take into account the contextual factors that affect CI development and use. In this way, CI research can build on social informatics research that considers the social factors influencing ICT utilization. These theoretical tools can assist researchers in understanding and eventually overcoming barriers to appropriate technological diffusion within communities (Kling, 1999, 2000; Webster, 1996). Although researchers accept varying degrees of the bi-directional impacts of ICTs on society and society on ICTs, most agree that assessments in both directions should consider social influences (Bijker, Hughes, and Pinch, 1987; Bijker and Law, 1992; Kubicek, Dutton, and Williams, 1997; MacKenzie and Wajcman, 1985; Agre and Schuler, 1997; Castells, 1996, 1997).

Only recently have researchers begun a concerted effort to assess the impacts and provide some accountability for these investments in a manner that goes beyond anecdotal evidence of their accomplishments. Typically, evaluation research is utilized only when sufficient time has progressed to allow for either formative or summative assessments to be undertaken. Because of the relative newness of the Internet and ICT access programs (beyond plain old telephone service and one-way television networks), little substantive research/theory literature exists on effective ways to measure change brought about by providing access to ICTs (much less use of ICTs) in communities. This may change as funders (including federal, state, philanthropic, and corporate) of ICT-related projects increasingly demand an explicit evaluation plan that addresses change and outcome-related factors. For example, the U.S. Department of Commerce's Technology Opportunity Program (formerly Telecommunications and Information Infrastructure Assistance Program) requires successfully funded projects to devote significant resources to project

evaluation. Similarly, the National Science Foundation's newly established Information Technology Research Program devotes considerable funding to evaluate CI projects. It is likely that the pertinent knowledge base will increase in the coming years as more robust evaluation frameworks are developed as a result of these and other programs.

Evaluation Methodologies for Community Informatics

Lessons from history suggest similar technologies (i.e., radio, television, telephone) were perceived to be saviors of varying societal problems (de Sola Pool, 1983). Effective and objective assessments of the impacts of ICTs on society are imperative to more fully understand what works, when, and why. One reason for the dearth of objective evaluation research on CI projects is that evaluations focus on social factors that may be difficult to measure. In the 1960s evaluation came to be recognized as a distinct research field. It was initially heavily influenced by the hard sciences, in particular the traditional scientific search for quantifiable outcomes. Many community-based projects do not lend themselves to a positivist type of evaluation as they are driven not by science, but by the values, ideologies, and political interests of the major stakeholders and emphasize the intangibles of community building. Evaluation research for community initiatives such as CI has evolved to focus on contextual factors that influence their success or failure such as the economic, political, and other conditions (O'Connor, 1995).

Those charged with evaluating community initiatives face a number of methodological difficulties. First, evaluations should surface embedded theories and lay them out in detail, identifying all assumptions and sub-assumptions built into the evaluation model. Although causal attribution in community initiatives is complex (Granger, 1998), making explicit theories of why the CI project will work strengthens evaluations because 1) it concentrates evaluation attention and resources on key aspects of the program; 2) it facilitates aggregation of evaluation results into a broader base of theoretical and program knowledge; 3) it asks program practitioners to make

their assumptions explicit and to reach consensus with their colleagues about what they are trying to do and why; and 4) evaluations that address the theoretical assumptions embedded in programs may have more influence on both policy and popular opinion. However, theory-based evaluations may be difficult to implement as the effort may be too complex to trace assumptions, participants may not agree about the theory, and there may be problems of interpreting results such as generalizability (Weiss, 1995). Evaluation approaches must also be sensitive to a wide variety of outside influences that may bias the assessment of changes in outcome measures and threaten the internal and external validity of the evaluation (Gruenewald, 1997).

In the process of developing an evaluation framework for community computer networks, several researchers have found that evaluation of these types of projects, if done at all, has been limited and ad hoc (Bannon and Griffin, 2001; Gygi, 1995). For example, the U.S. Department of Commerce has produced several in-depth case studies of its Technology Opportunities Program that provide useful information about the broad impacts on the communities these projects serve (Bartfai et al., 1999; Frechtling et al., 1999; Frechtling et al., 2000). Gygi finds an increasing amount of qualitative data on these types of projects, but little research generating quantitative data. However, concentrating only on empirical data is problematic as it says nothing about behavior or use (Gygi, 1996).

Progress in the Field

Researchers recognize the need for evaluation metrics for CI and discussions among academics and practitioners are underway (Baker and O'Neil, 2000; Bertram, 1999; Ricci, 2000). Mueller (1996) states that current definitions of telecommunications access are antiquated and overly simplistic because they overlook technological alternatives, overlaps, and interdependencies as well as patterns of usage and the integration of usage into daily lives. He calls for ethnographic observation of communication behavior to construct social indicators of

telecommunications access and usage that are based on theories of communication and behavior, rather than on technologies (Mueller, 1996). Others focus on patterns of use, rather than simply measures of access as a means of better understanding digital participation (Neice, 1998). Odasz stresses the need for outcome-based evaluation that focuses on "real benefit for real people" using anecdotal evidence of attitudinal changes, progressive learning, and conceptual growth rather than quantitative measures that miss this richness in CI projects (Odasz, 1994b). Several evaluations of CI have studied communication information needs, services and roles within the community for information provision (Bishop, 1994; Cowan et al., 1998; Doctor and Ankem, 1996; Pettigrew and Wilkinson, 1996; Schneider, 1996a; Vaughan and Schwartz, 1999) while Patterson encourages the use of multidisciplinary approaches to evaluating community networks and suggests four interconnected nodes: design, access, critical mass, and impacts (Patterson, 1997).

Romm and Taylor develop of a model that can explain and predict the success prospects of CI projects. They found that lack of social harmony within communities can and is often associated with less than successful outcomes in CI projects. On the other hand, a high degree of social harmony is associated with support for the project and its leaders by the community which leads to successful outcomes. They develop an autonomy/harmony model based on two dimensions that are seen as determining the success prospects for CI projects. The autonomy dimension focuses on the degree to which the project is funded, managed, or both by the community in which it occurs. Ideally a project would have high autonomy so that the project is both funded and managed by individuals or organizations within the community it serves. The harmony dimension focuses on the degree to which the local community is conflict free, particularly in relation to the CI project. Communities with higher degrees of harmony are associated with higher success prospects for CI projects. A pilot study of the model on four cases finds that the model ignores other exogenous (e.g. technological development, government,

finances) and endogenous (e.g. motivation, politics, culture) variables that can influence the success prospects of a project. They conclude by suggesting the need for longitudinal research because community harmony and autonomy will change over time (Romm and Taylor, 2000b). Using longitudinal, case study research, they suggest researching how projects and the attitudes within the community change over time; how the behavior of community members changes over time; and whether changes in both attitude and behavior are gradual or abrupt (Romm and Taylor, 2000a).

Study Methodology

As a first step towards this goal of clear rubrics for CI projects, this paper presents a literature review of more than 30 evaluations of ICT/community-related projects conducted between 1994 and 2000. The literature review indicates that theories for the outcomes of CI projects fall into five key areas:

1. ***Enhancing strong democracy***: Includes theories of increasing democratic participation with a meaningful association of citizens within a civic community;

2. ***Increasing social capital*****:** Includes features of social organization such as social networks, norms, and trust that facilitate co-ordination and co-operation for mutual benefit;

3. ***Empowering individuals*****:** Includes discussions of information literacy and ICT access for disadvantaged communities so that all people have opportunities for meaningful participation in an increasingly digitized society;

4. ***Revitalizing sense of community*****:** Includes discussions of increasing community involvement and commitment to geographic communities; and

5. ***Providing economic development opportunities***: Includes theories about the use of ICTs to encourage economic activity.

By identifying and analyzing the methods and indicators used to evaluate these projects, we can begin to establish an appropriate evaluation framework for CI in each of these five areas. This paper reviews evaluations of community networks and community technology centers to bridge

theories of outcomes for CI projects with use of appropriate indicators. The goal is to understand how theories of the impacts of these projects merge with the pragmatics of conducting evaluations in this area and to begin a discussion on the use of appropriate indicators for assessing impacts.

Frameworks for Evaluating Community Informatics

Theories about the potential impacts of community informatics fall into five key areas: 1) enhancing strong democracy; 2) increasing social capital; 3) empowering individuals; 4) revitalizing sense of community; and 5) providing economic development opportunities.

1. Enhancing Strong Democracy

A concern of many Americans is the lack of participation by the general public in politics. Explanations for this lack of participation vary including the argument that the lack of participation comes from the belief that any single individual's effort is unlikely to make a difference (Miller, 1997; Olson, 1965; Ostrom, 1998). Since it is difficult to exclude non-participants from enjoying the benefits of political action and since the costs of participation are high, most citizens will choose to free ride on the political activities of others (Downs, 1957). Others have argued that the media overly influences the public (Mattelart, 1991; Schiller, 1989) or that all aspects of political life are in the exclusive domain of elites (Greider, 1993; Phillips, 1990; Putnam, 1976).

Barber (1984) uses the phrase strong democracy to show how the 'thin' (liberal/pluralist) U.S. democracy system needs to be reinvigorated with a strong 'democracy' that combines democratic participation with a meaningful association of citizens within a civic community. To embed democratic participation within the community requires that interest group politics be replaced with the politics of association within and among civic groups, at the neighborhood level

(Barber, 1984).

Enter technology. Many believe that ICTs, through their ability to span distance and time and improve communications, offer the potential for revitalizing American society and democracy, provided its implementation favors democratic institution and practice (Cleveland, 1985; Doheny-Farina, 1996; Hague and Loader, 1999; Laudon, 1977). ICTs offer the potential of revitalizing what Habermas' concept of the public sphere in which we all share in the same information (Habermas, 1987). Some discuss the possibilities afforded for increased political discussion via ICTs (Paletz, 1996; Schneider, 1996b). For instance, voter turnout could potentially be increased via online voting (Slaton, 1992); email could reinvigorate democratic discussions (Groper, 1996); or voters could access an electronic voter guide such as The Democracy Network to encourage voter knowledge of candidates' political stances (Doctor and Dutton, 1999).

Others question whether use of ICTs can actually enhance strong democracy. Bimber dismisses the claim that the Internet will erode the influence of organized groups and political elites, and suggests a model of 'accelerated pluralism' in which the Internet contributes to the on-going fragmentation of the present system of interest-group politics and a shift toward a more fluid, issue-based group politics with less institutional coherence (Bimber, 1998). Wilhelm presents a content analysis of a random sampling of postings to political Usenet newsgroups to find the extent to which the interaction that takes place within them is consistent with the notion of 'democratic deliberation.' Since sustained deliberation is rare within these newsgroups, he finds that they are ineffective sounding boards for signaling and expounding issues and problems to be addressed by government (Wilhelm, 1999). In Hale et al.'s (1999) analysis of the content of 290 Californian government websites, they find that the potential for two-way communication through a web presence is not being fully realized via websites. Current municipal use of webpages does little to foster democratic revitalization (Hale, Musso, and Weare, 1999). Other

studies indicate the importance of face-to-face communications, which are highly difficult to replicate online, even with unlimited bandwidth (Sally, 1995). Others have argued that increased conversations alone will not revitalize democracy (Schudson, 1997).

Although the potential is there, questions still exist as to the effectiveness of ICTs in promoting strong democracy. Empirical research is needed that conducts objective assessments of the impacts CI can have on strong democracy within our current political and societal framework.

2. Increasing Social Capital

Research by Putnam stresses how declining cooperative and communal activity in the U.S. is hurting American communities (Putnam, 1995, 2000). Community quality of life involves 'social capital' and civic engagement (Coleman, 1988; Putnam, 1993a), which some argue ICTs can increase as social capital accumulates through social networks and trust, and the norms of mutual reciprocity that these relationships foster (Putnam, 1993b). ICTs, whose foundation is communication, may help promote civic engagement and interaction between citizens on matters of public concerns and thus enhance community. Issues of community such as solidarity, altruism, loyalty, and reciprocity may be enhanced (Thompson, 1993).

Social capital research demonstrates the importance of social capital to long-term economic well-being, particularly in an increasingly networked society (Halpern, 1998; Temkin and Rohe, 1998). Kavanaugh conducted a study of residents in Blacksburg Electronic Village over a three-year period and found that computer networks are expanding existing social networks with a geographic community. She also found that increased civic engagement and community involvement can be attributed to the Internet among a fifth of Internet users in that community who are predisposed to be engaged in their community (Kavanaugh, 1999). Alkalimat and Williams (2001) present a case study of the use of a community technology center to empower an African American community and find that building social capital is the key to making something

happen in the community (Alkalimat and Williams, 2001).

Inherent within arguments for social capital is a reliance on the importance of social networks within communities (Wilson, 1997). When computer networks link people as well as machines, they become social networks (Garton, Haythornthwaite, and Wellman, 1997; Wellman et al., 1996). While measuring social capital is a relatively new field of study, research on social networks is better established (Barnes, 1972; Berkowitz, 1982; Bourdieu, 1986; Freeman, Romney, and White, 1989; Marsden and Lin, 1982; Wasserman and Faust, 1994). Network analysis offers the prospect of tackling the problem of boundary definition within a community by considering communities as networks of individuals connected both locally and remotely (Scott, 1991; Wellman and Berkowitz, 1988). Social network analysis appears to be a promising new area for research on CI.

3. Empowering Individuals

Empowering individuals to take control of their own destiny has long been the study of social scientists. Israel, et al. defines empowerment as the "ability of people to gain understanding and control over personal, social, economic, and political factors in order to take action to improve their life situations" (Israel et al., 1992). Empowerment is usually described as a process in the social science literature. But it can also be considered as an outcome variable in community projects if capacity building is a major activity of the project. Active strategies must be used to clarify project values and intentions because evaluators can be misled by words such as 'community involvement,' 'community development,' or 'community participation' as these words mean different things to different groups (Hawe, 1994).

Community research on participation, combined with theories of empowerment, indicate that individual and community perceptions, elements of the physical and social climate, and organizational characteristics are areas for study that broaden and connect the ideas of

participation and empowerment (Price, 1990). A significant RAND study in the mid-1990s emphasizes the need for universal access to e-mail so that citizens can participate in the growing networked society and thus be empowered (Anderson et al., 1995). A growing reliance on technology in society shows how technologies should be used to empower individuals (Branscomb, 1994).

Within the notion of empowerment, research focuses on information literacy—the skills and knowledge necessary to be able to effectively use today's information and communication technologies (Adler, 1999). Much of the literature advocating information literacy focuses on the economic benefits of having these types of skills and the possible negative macroeconomic consequences of denying these skills to any subset of the population (Council, 1999; Meares and John F. Sargent, 1999; Slowinski, 2000; U.S. Department of Commerce, 1999a). Others have taken a more proactive stance by focusing on ways to improve information literacy skills such as focusing on generic skills (Anderson and Bikson, 1998) or generating appropriate content to encourage use by traditionally underserved communities (Children's Partnership, 2000; Horrigan, 1999)

Reports from a variety of organizations have chronicled the division between the "haves" and "have-nots" of technology access in the U.S. The U.S. Department of Commerce has tracked data on the digital divide since 1995 (U.S. Department of Commerce, 1995, 1998, 1999b, 2000); others have focused on racial differences (Hoffman and Novak, 1998; Wilhelm, 1996); while other studies focus on issues related to location (Alles, Esparza, and Lucas, 1994; Goslee, 1998; Kahin and Keller, 1995; Krieg, 1995; Resnick and Rusk, 1996; Schon, Sanyal, and Mitchell, 1997; Serron and Horrigan, 1997; Speight, 1999). Others have focused on ethical issues related to fairness (Doctor, 1991, 1994; Hochschild, 1981; Holderness, 1998; Murdock and Golding, 1989; O'Neil, 1999; O'Neil and Evans, 2000; Schiller, 1996).

To address issues related to the digital divide, social informatics research asks how, why,

when, and other contextual questions regarding ICT use (Kling, 2000). Researchers focus on use of the Internet in libraries (Kaczor and Jacobson, 1996) and motivations for ICT use ranging from socioeconomic status (Dutton, Sweet, and Rogers, 1989) and demographics (Katz and Aspden, 1997); to measures of self-efficacy and self-disparagement using a social cognitive approach (Eastin and LaRose, 2000; Mastro, LaRose, and Eastin, 2000); to self-selection (Hughes, 2000); to issues of cultural capital (Bourdieu, 1984); and to early adoption and diffusion research (Busselle et al., 1999; Rogers, 1995).

Community informatics projects that seek to empower individuals generally focus on delivering the skills and necessary access to technology to be able to fully participate in the digital revolution. A combination of quantitative measures such as access statistics among various demographic groups and anecdotal evidence of project impacts provide a rich base of literature from which to make generalizations about the impacts of CI on individuals. However, more research is needed that compares programs across contextual factors such as culture, political environments, and implementation models.

4. Revitalizing Sense of Community

Inherent in community informatics research is the concept of *community*. Discussion of community arose out of concern about the transition from agrarian to urbanized industrial societies (Durkheim, 1964; Tonnies, 1955). Researchers continue questioning how to define *community* in social science research, as few can agree to its exact specifications (Chaskin, 1997; MacIver, 1970; Suttles, 1972; Wellman, 1979, 1988; Habermas, 1984, 1987), yet few would disagree with a territorial definition as “we all live someplace” (Morris and Hess, 1975). One difficulty with concepts of community is that they tend to focus on internal relationships within a defined locality without reference to ties and links outside the geographical domain. Traditional studies have overemphasized local cohesion and solidarity and as a result, they failed to recognize

or address properly the difference and varied levels of commitment and exchange most people sustain within their networks (Crow and Allan, 1994).

Yet some argue that "the great good places" (Oldenberg, 1991) and cohesion among community members (Blakely and Snyder, 1997; Etzioni, 1994; Gallagher and Padfield, 1980) are on the decline and seek ways to rebuild community (Schwartz, 1991). Many believe that traits of ICTs—facilitation of information sharing and communication among community members—possess the potential of revitalizing disconnected communities—from citizen to citizen and citizen to government—so that the collective good can be realized. Evaluations of CI should consider these competing arguments about the impacts of ICTs on revitalizing a sense of community.

5. Providing Economic Development Opportunities

Closely related to information literacy and the digital divide, CI research frequently discusses the potential of ICTs to encourage economic development in communities (Allen and Dillman, 1994; Allen, Johnson, and Leistritz, 1993; Clark, Ilbery, and Berkeley, 1995; Dholakia and Harlam, 1994; Freeman, 1996; Gillespie and Cornfold, 1996; Grimes, 1992; KoracKakabadse, Kouzmin, and KoracKakabadse, 2000; Odasz, 1994a; Schmandt, Williams, and Wilson, 1989). The relationships between the use of ICTs and the economic significance of information and communication have long been the subjects of social science investigations (Compaine and Read, 1999; Innis, 1951; Innis, 1950; Jonscher, 1983; Porter and Millar, 1985; Rogers, 1976; Stigler, 1961). However, some argue that rather than undermining the importance of space and place as previously claimed, ICTs can make geography matter more (Goddard and Richardson, 1996).

Gurstein (Gurstein, 1999) searches for factors that may hinder the successful diffusion of ICTs within communities and finds that less than successful CI projects are associated with the failure to link the projects with local economic activity and to unite community efforts behind

strong leadership. He sees CI as a double-edged sword in that it can facilitate community development, but it can also be associated with discord in the community. He identifies three strategies for using CI as an enabler of community development: use it as 1) an 'marketing' tool for small business; 2) an enabler for mobilization of a wider range of resources for community economic development; and 3) as a distributed network for the emergence of new networks and economies of disaggregation (Gurstein, 1999).

More research in CI is needed to understand and replicate effective models of economic development through ICT implementation. Potential areas for assessment include the different contextual factors between urban and rural areas; how different organizations can make use of CI for economic benefit; and differences between community networks and community technology centers in spurring economic activity.

Community Networks

Community networking is "a process to serve the local geographic community – to respond to the needs of that community and build solutions to its problems. In the social sense [it] is not a new concept, but using electronic communication to extend and amplify it certainly is" (Morino Institute, 1994). A community network (CNet) has the purpose of fulfilling social functions (Gregson and Ford, 1998; Schuler, 1994, 1996). Much has been written about the goals and implementation of community networks (Carroll and Rosson, 1996; Cohill and Kavanaugh, 1997; Keenan and Trotter, 1999; Shapiro, 1999; Wilcox, 1996), but objective evaluations are relatively new. Significant research efforts include:

- Gregson and Ford (1998) reviewed 14 published evaluations of community networks and the goal and mission statements of 84 web-based community networks and found that no core set of goals applied across all of them, making it difficult to develop general goal-based evaluation measures (Gregson and Ford, 1998).
- Patrick conducted a study of the subjective measures of use and importance from the National Capital FreeNet (NCF) in Canada and found that communications services (email and public discussions) are the main use of the system while information services are secondary services

both in use and importance (Patrick, 1996). Patrick and Black also conducted a survey of FreeNet users to find their demographic characteristics, access methods, and levels of satisfaction with the system. They found NCF users to not be a specialized group in the community; that they were satisfied with the NCF system; and many had purchased new technology to access the system (Patrick and Black, 1997; Patrick, Black, and Whalen, 1995).

- Avis (1995) explores how community networking in Canada impacts the issue of universal access to emerging broadband networks through two case studies. He finds three potential benefits from community networks: 1) increased participation in the democratic system; 2) increased access to education; and 3) community development (Avis, 1995).

- Beamish (1995) stresses how the newness of community networks makes them difficult to evaluate, yet it is appropriate to monitor their progress toward their goals. She differentiates between short-term community network goals (sustainability and growth) and long-term goals (access, public discussions and democratic participation, and community development). She recommends that community networks be measured against the direction and speed of moving toward their goals, rather than the goal itself, using a formative (ongoing) evaluation process. She stresses the need for evaluations to be expressed in terms of actions that implementers can take (Beamish, 1995).

- The Blacksburg Electronic Village (BEV) began in 1993 as a partnership between the Town of Blacksburg, Virginia Tech, and Bell Atlantic (Wiencko, 1993). Researchers at Virginia Tech are evaluating the project, which now has more than half of Blacksburg's population connected to the Internet. The goals of their BEV research are to assess the use of computer networking among a diverse population and to evaluate the impact of computer networking on social relations, community involvement, awareness of local issues, and flows of resources within and across social networks (Kavanaugh, Cohill, and Patterson, 2000). Kavanaugh and Patterson (1998) conducted a random telephone survey in November 1996 of the local calling area in Blacksburg, Virginia (site of the Blacksburg Electronic Village) and found a positive correlation between Internet use and community involvement (Kavanaugh and Patterson, 1998). Other studies include a comparison of users and non-users of the BEV (Patterson, 1996)

- Hampton and Wellman studied Netville, a community of 120 single-family homes in a suburb of Toronto, Canada, which were provided free high-speed Internet connectivity between 1997 and 1999 as part of an industrial trial with networking technologies. Their investigation included a multi-modal model to study how the high-speed connection affects the kinds of interpersonal relations that people have with friends, relatives, and neighbors. Hampton moved into the housing development to conduct ethnographic fieldwork and also conducted surveys and monitored online activity. Results indicate that use of the Internet supports a "variety of social ties, strong and weak, instrumental, emotional, social, and affiliative" (Hampton and Wellman, 1999). See also (Hampton, 2000; Wellman and Hampton, 1999).

- Others have documented the impact on democracy of public computer terminals in the Public Electronic Network (PEN) project in Santa Monica, California. The project is a community-based network designed to bring citizens and city officials closer together in a city with a population of 95,000. The project provided free accounts to women and low-income

individuals (Guthrie et al., 1990; Rogers, Collins-Jarvis, and Schmiz, 1994; Schmitz et al., 1995).

- Rosenbaum (1998) explores the organization of information resources and services provided by 24 web-based community networks in a state-funded project in Indiana and finds that many community networks have not developed local content or services (Rosenbaum, 1998). In a final report to the government sponsor, Rosenbaum and Gregson list four factors that contribute to the success of CI projects: 1) integration into the routine life of the community; 2) local content for local needs; 3) linkages with local government, schools, and social services; and 4) processes that ascertain long-term sustainability. They also find that full ownership of CI projects by the communities they serve is positively associated with success (Rosenbaum and Gregson, 1998).

- Schalken and Tops (1994) present a study into the backgrounds and opinions of a community network in the Netherlands and find that the average user is a well-educated, younger male who uses the system to connect with the outside Internet (Schalken and Tops, 1994).

- Silver (2000) presents institutional histories of the Blacksburg Electronic Village and the Seattle Community Network and traces the numerous cultural negotiations that took place both off- and on-line throughout their development. He shows how the BEV was built from the top down while the SCN was a grassroots approach and built from the bottom up (Silver, 2000).

- Stallings (1996) examines three community networks to determine to what extent they succeeded in improving the communities they served. He found that all three networks improved their communities and made several recommendations for their maintenance (Stallings, 1996).

- Surak (1998) compares community networks in Australia, Canada, and the United States in an effort to identify and characterize differences in practice and prospects attributable to differences in culture. She draws links between the form of and choices made by community networks and their national context (Surak, 1998).

- Tonn et al. (2000) review 40 community networks to find what types of information each provides and how the network may strengthen the social capital in the community it serves. The study found that most community networks run by non-profits are simply web portals to other websites in the community and exhibit few characteristics associated with building social capital (Tonn, Zambrano, and Moore, 2000).

- Virnoche (1998) examines the development of community networks in relation to communications equity. She looks at four key decision points: interface choice, content, interaction, and outreach to unveil actors, interests, and experiences in shaping a community network (Virnoche, 1998).

- Kurzeme (1996) conducted a longitudinal market survey of the users of Victoria's community network in Australia and found that the demographics of its users were similar to users of the general Internet population (Kurzeme, 1996).

- The Portuguese government sponsors a number of community networks. The Aveiro Digital City is a model community network in Portugal (Firmeza and Fontes, 2000).

- Molz (1994) reports of a study to look at the range of activities sponsored by 24 community networks and the involvement of local libraries. The study finds that community networks strive to improve citizens' lives and libraries play a critical role in this process (Molz, 1994).

- The Library of Michigan Foundation developed an extensive guidebook for developing a community network, which covers many of the technical issues associated with setting up a network (Wiggins, 1999).

These and other evaluations with structured methodologies for evaluation of community networks are included in Table 1 below. The studies are presented with the most recent first, with the authors' stated evaluation purpose, methods, and theories of outcomes from the five key areas.

Table 1
Community Network Evaluations: Purpose, Methods, and Theories of Outcomes

Study	Purpose	Methods	Theories of Outcomes					
			Strong Democracy	Social Capital	Individual Empowerment	Sense of Community	Economic Development	Other
Local nets and social capital in Sweden (Ferlander and Timms, 2001)	To present the first phase of a study to examine the effects of a community network on social capital in Sweden	• Survey • Focus groups • Interviews		✔		✔		
New technology, communities, and networking: problems and prospects for orchestrating change (Bannon and Griffin, 2001)	To examine motivations for community networks and present a case study of eEIAT in Ireland	• Case study						✔
The Soil of Cyberspace. Frameworks and Foundations for a Healthy Online Public Sphere (Silver, 2000)	To present institutional histories of two community networks to trace the cultural negotiations that took place both off- and on-line throughout their development	• Case studies						✔
Grieving for a Lost Network: Collective Action in a Wired Suburb (Hampton, 2000)	To find the effect of living in a neighborhood equipped with a high-speed local network	• Survey • Ethnographic fieldwork		✔		✔		
Community Networks or Networked Communities: State-of-the-Art (Tonn, Zambrano, and Moore, 2000)	To review what information is provided by community networks and how community networks may contribute to strengthening social capital	• Review of 40 community network websites	✔	✔				

The Impact of Computer Networking on Community: A Social Network Analysis Approach (Kavanaugh, 1999)	To explore the relationship between computer networks, social networks, and civic engagement in Blacksburg, Virginia	• Surveys of community members • Interviews with community members	✔	✔				
Web-based Community Networks: A Study of Information Organization and Access (Rosenbaum, 1998)	To explore the organization of information resources and services provided by 24 web-based community networks, examine the core design principles the most useful in their development, and assess strategies to provide access	• Content analysis of web sites • Interviews with board members, technical staff and users • Site visits						✔
The Seamless Web and Communications Equity: The Shaping of a Community Network (Virnoche, 1998)	To study everyday interaction and tensions in network decision making in the Boulder Community Network and LocalNet	• Participant observation • Guided conversations • Private letters • Document review						✔
A Cross-Cultural Comparison of Community Computer Networks (Surak, 1998)	To examine how factors stemming from national context may shape the development of community networks within a country	• Email questionnaire						✔
Who is Going Online? Results from the National Capital FreeNet (Patrick and Black, 1997)	To assess the demographic characteristics, access methods, and levels of satisfaction of the users of the National Capital FreeNet	• Online survey of users			✔			

A Critical Study of Three Free-Net Community Networks (Stallings, 1996)	To study the extent Free-Nets succeed in improving the communities they serve and why	• Review of community network websites • Surveys of users			✔	✔		
VICNET's Users: a Longitudinal Market Survey of the Users of Victoria's Network (Kurzeme, 1996)	To conduct a longitudinal market survey of the users of Victoria's network in Australia	• Online survey			✔			
Public Spaces on the Information Highway: The Role of Community Networks (Avis, 1995)	To analyze three potential benefits of community networks (education, political participation, and community development) using two case studies	• Interviews • Document review • Usage statistics	✔		✔		✔	
Universal Access to Email: Feasibility and Societal Implications (Anderson et al., 1995)	To study the individual, group, and societal benefits of access to ICTs and to learn from the implementation of civic networks at 5 sites	• Site observation • Interviews with key stakeholders	✔	✔	✔		✔	
Civic Networking in the United States (Molz, 1994)	To ascertain the range of activities sponsored by 24 community networks and to determine their level of involvement with local public libraries	• Telephone interviews with community network administrator						✔
The Digital City: A Study into the Backgrounds and Opinions of Its Residents (Schalken and Tops, 1994)	To study the characteristics of the users of the Digital City community network	• Online user survey			✔			

Community Technology Centers

A community technology center (CTC) is a generic name given to a computer lab that is open to the public. Some researchers refer to CTCs as community access centers or in Europe, as telecentres. CTCs are the focus of much attention as a means to bridge the digital divide, and most research in this area seems to focus on the demographics of CTC users and impacts of use on their lives. Some noteworthy results of studies are described here:

- CTCs are an international phenomenon. More than 150 community technology centers are in operation in Hungary, with 800 more to be developed within three years. A survey looks at the demographics of their users, the services used, community-related factors of use, and penetration of use according to center type (Molnar, 2000). Fuchs (1998) studies the experiences of community technology center pioneers in Canada, Australia, Wales, Senegal, Sweden, and South Africa to provide lessons learned for those undertaking similar initiatives in Africa. He stresses the importance of the people involved in the project and the way the centers can spur infrastructure investments. He also found that few had policies to guide their development (Fuchs, 1998). Robinson discusses the development of CTCs in Mexico (Robinson, 1998).

- Rose (1997) discusses the role of community technology centers in bridging the digital divide and finds that there are two basic social-service models for the centers: free-standing and embedded in other service agencies. She finds that the embedded model is more sustainable (Rose, 1997).

- CTCNet has conducted a number of studies on the impacts of CTCs on individuals and their communities. A study in 1997 found that CTCs provide ICT access to a majority of people who do not have technology access elsewhere and that may of the participants come to the centers for social interaction (Mark, Cornebise, and Wahl, 1997). In 1998, researchers found that CTCs are a valuable resource for obtaining job skills and learning about employment opportunities and that they fostered a sense of community and personal effectiveness (Chow et al., 1998). A longitudinal study of 12 users at the centers found that computer use and the Internet become a part of life for these users, yet users of CTCs cannot easily be characterized (Chow et al., 2000). Sandor and Scheuerer (2000) provide findings from focus groups on organizing information flows of community technology centers to enable them to extend their reach (Sandor and Scheuerer, 2000).

- Several researchers have looked at the role of libraries in serving as community technology centers (Bishop et al., 1999; Jue et al., 1999). Schuler and McClelland (1999) present an overview of library advocacy in CI initiatives including community technology centers (Schuler and McClelland, 1999). Bertot and McClure provide an evaluation of public access to the Internet through Pennsylvania's public libraries and find raising expectations for the roles of libraries in providing access to digital information services (Bertot and McClure, 1997; McClure and Bertot, 1997). They conduct a similar study on California's libraries with similar results (Bertot, McClure, and Ryan, 1999). In a study of the ways in which public libraries and community centers structure access to the Internet in disadvantaged and

minority communities, results indicate that public libraries may not offer the best setting for CTC placement in the way they are currently configured (Lentz et al., 2000)

- Other studies have focused on improving the workings of community technology centers (Bishop, 2000; Breeden et al., 1998) while others have presented case studies of the activities of these centers (Campbell, 1995; Chapman and Rhodes, 1997; Weiley, 1998).

These and other evaluations with structured methodologies for evaluation of community technology centers are presented in Table 2 below. The studies are presented with the most recent first, with the authors' stated evaluation purpose, methods, and theories of outcomes from the five key areas.

Table 2:
Community Technology Center Evaluations: Purpose, Methods, and Indicators

Study	Purpose	Methods	Theories of Outcomes					
			Strong Democracy	Social Capital	Individual Empowerment	Sense of Community	Economic Development	Other
Social Capital and Cyberpower in the African American Community: A Case Study of a Community Technology Center in the Dual City (Alkalimat and Williams, 2001)	To present a case study of the use of a community technology center to empower an African American community	• Case study		✔				
Structuring Access: The Role of Public Access Centers in the Digital Divide (Lentz et al., 2000)	To assess how access to the Internet for disadvantaged and minority communities is being constructed in one situation	• Interviews with participants • Observations			✔	✔		
Who Goes There? Longitudinal Case Studies of Twelve Users of Community Technology Centers (Chow et al., 2000)	To understand how CTCs affect people's lives over a period of time through case studies of 12 CTC users	• Interviews with 12 CTC participants		✔	✔	✔	✔	
The Importance of California Public Libraries in Increasing Public Access to the Internet (Bertot, McClure, and Ryan, 1999)	To assess the California State Library-sponsored InFoPeople project	• Site visits • Interviews				✔	✔	
Computer and Communications Use in Low-Income Communities (Breeden et al., 1998)	To provide five case studies of community programs that offer low-income people opportunities to learn to use computers and on-line communications	• Site visits • Telephone interview			✔		✔	

Impact of CTCNet Affiliates: Findings from a National Study of Users of Community Technology Centers (Chow et al., 1998)	To increase understanding of the effect of CTCs, particularly in the domains of employment, learning, personal gains, and sense of community	• Survey of CTC users			✔	✔	✔	
Internet Kafe for Seniors (Weiley, 1998)	To learn how Norway's heritage, culture, and social policies impact the functioning of a community technology center	• Interviews • Participant observation	✔		✔	✔	✔	
"Little Engines that Did": Case Histories from the Global Telecentre Movement (Fuchs, 1998)	To distill the experiences of telecentre pioneers in the developed and developing world in order to provide support for those undertaking similar initiatives in Africa	• 6 case studies (Canada, Australia, Senegal, Sweden, and South Africa)						✔
Community Technology Centers: Impact on Individual Participants and their Communities (Mark, Cornebise, and Wahl, 1997)	To gather information about the impacts of community technology centers on individual participants and the conditions that support these impacts	• Observations • Site visits • Interviews • Document review	✔	✔	✔	✔	✔	
Impacts of Public Access to the Internet through Pennsylvania Public Libraries (Bertot and McClure, 1997)	To study the impacts of providing Internet connectivity to local communities and to assist in the development of valid and reliable network performance measures and evaluation techniques	• Focus groups • Help desk logs • Interviews • Surveys • Site visits			✔		✔	

The Role of Community Access Centers in Bridging the Technology Gap (Rose, 1997)	To assess how community access centers serve as a new type of social-service program and the ways in which they provide computer access to the have-nots	• Interviews with key informants at 5 CTCs						✔
Community Technology Centers: Exploring a Tool for Rural Community Development (Campbell, 1995)	To explore rural CTCs and describe some of the factors that could influence the development of those centers in rural Massachusetts through two case studies	• Interview with CTC administrator • Document review					✔	

Merging Theory and Indicator Use

The five key goals for engendering change in communities though ICTs do not lend themselves easily to positivistic metrics. Evaluation of social programs is difficult for evaluators as hard numbers about program impacts are difficult to obtain—yet hard numbers are often exactly what policymakers want (Weiss, 1977, 1979, 1993). For evaluations of social action programs such as community technology centers and community networks, evaluators emphasize the need for flexibility as there is a mismatch between theory and program reality and program goals are often difficult to measure (Rossi and Williams, 1972; Strickland, 1996; Weiss, 1972). The practice of evaluation itself is a profoundly political and value-laden process, involving judgements about the validity of program objectives and choices about how progress can be measured.

Evaluators of any program must first determine the purpose of the evaluation they are undertaking (Rutman, 1984) so it may be useful to decide whether the purpose of a CI evaluation is to answer questions about one of these five areas. As a first step toward an evaluation framework for CI, potential indicators used in previous studies are presented in Table 3, categorized by each of the five areas. They are also categorized according to whether they are measures of community involvement; access facilities; usage information; attitudes and awareness; information content and structure; economic activity; community characteristics; or operation and management.

Table 3:
Potential Indicators for Evaluating Community Informatics

Indicator	Strong Democracy	Social Capital	Individual Empowerment	Sense of Community	Economic Development
Community Involvement					
Voter turnout	✔	✔		✔	
Level of online interactions among individuals	✔	✔	✔	✔	
Participation rates in community organizations (civic, faith, recreation, etc.)	✔	✔	✔	✔	
Number of face-to-face interactions		✔	✔	✔	
Density of neighborhood acquaintances		✔	✔	✔	
Changes in communications capacities of community	✔	✔	✔	✔	✔
Capacity for collective action	✔	✔	✔	✔	
Community traditions (events, etc.)		✔		✔	
Access Facilities					
ICT penetration rates (residential, business, schools)			✔		✔
ICT access facilities			✔		✔
Available networking infrastructure					✔
Number of ISPs					✔
Usage Information					
Traffic usage logs	✔			✔	
User listserv and bulletin board postings	✔	✔	✔	✔	
Level of two-way information flow	✔	✔	✔	✔	
Average connection/usage time	✔		✔		
User characteristics	✔	✔	✔		
Most popular topics	✔	✔		✔	✔
User satisfaction	✔	✔	✔	✔	
How participant learned of project	✔	✔	✔		
Attitudes and Awareness					
Sense of place	✔	✔		✔	
Perceived helpfulness of neighbors		✔	✔	✔	
Self efficacy	✔	✔	✔		
Awareness of community resources		✔	✔	✔	✔
Perceptions of neighborhood characteristics		✔	✔	✔	
Sense of ability to mobilize politically	✔	✔	✔	✔	
Goals for educational attainment		✔	✔		
Use of personal time	✔	✔	✔	✔	
Motivating factors for participation	✔	✔	✔	✔	
Personal gains from participation		✔	✔		
How long participate in project	✔	✔	✔	✔	
Information Content and Structure					
Depth of online community information	✔			✔	✔
Diversity of content	✔			✔	
Public online service delivery	✔		✔	✔	✔
Public opportunities to post content	✔	✔	✔		
Directories of community resources	✔	✔	✔	✔	✔

Original content production vs. portal	✔	✔		✔	✔
Economic Activity					
Job skills development			✔		✔
Employment status		✔	✔		✔
Business development			✔		✔
Job accessibility		✔	✔		✔
Community Characteristics					
Demographics	✔		✔		✔
Information and technical literacy		✔	✔		✔
Mobility rates	✔	✔		✔	
Political environment	✔			✔	✔
Level of harmony	✔	✔		✔	
Operation and Management					
Implementation (top-down or bottom-up)	✔	✔		✔	✔
Stakeholder identification	✔	✔	✔	✔	✔
Level of autonomy		✔		✔	
Goals	✔	✔	✔	✔	✔
Funding sources	✔			✔	✔
Costs					✔
Organization structure	✔	✔		✔	
Length of operation				✔	✔
Outreach efforts	✔	✔	✔	✔	✔
Fees charged	✔	✔	✔	✔	✔
Type/number of staff	✔			✔	✔
Partnerships	✔	✔		✔	✔

Researchers in the field of evaluation and CI stress the importance of using multi-modal tools for evaluating these programs to reach valid findings (Knox and Hughes, 1994; Shadish, 1993; Taket and White, 1997). Using a combination of quantitative and qualitative measures will enhance the richness of the evaluation. Qualitative research methods work well for exploratory studies in new fields as monitoring their progress can be naturalistic and inductive—it offers a holistic view of a dynamic situation (Patton, 1990). Use of quantitative data alone can be problematic. For instance, indicators often reflect the condition of the entire population of the community, not just those affected by the initiative. Any changes that show up in the data are not necessarily due to the initiative and it usually is not known when expected results are apt to appear (Weiss, 1995). Quantitative research methods may also be inappropriate since there are few benchmarks for interpreting measures but they are useful for providing some sense to the

range of outcomes that can be expected (Gregson and Ford, 1998). Some of the available methods for evaluations are outlined in Table 4 below and it is recommended that a variety of approaches be utilized in CI research to capture the richness of these projects.

Table 4
Methods for Evaluating Community Informatics

Method
Surveys
Focus Groups
Document Review
Content Analysis
Electronic Discussions
Ethnographic Fieldwork
Case Study
Stakeholder Analysis
Site Visits
Participant Observation
Help-Desk Logs
Usage Statistics
Existing Public Data
Pre/Post Testing

ICT Evaluation Guides

Recognizing the need for more structured guidelines for evaluating funded projects, government and non-profit sources have developed evaluation guides for CI projects. These may serve as useful starting points for persons interested in assessing CI projects. Several noteworthy guides are:

- ***CTCNet Evaluation Toolkit* (2000):** The Community Technology Centers' Network (CTCNet) is a national membership organization that promotes and nurtures nonprofit, community-based efforts to provide computer access and learning opportunities to the general public and to disadvantaged populations. The *CTCNet Evaluation Toolkit* contains a variety of resources for community technology center staff to use in evaluating their programs, as well as to learn more about their patrons, their objectives, and their accomplishments at the center. The first four sections of the toolkit describe resources that are accessible on the World Wide Web. These readily available resources provide a good grounding in the kinds of

techniques and tools that can be used in evaluation for many different purposes. The remaining sections present actual tools that can be used as is or provide ideas for creating other evaluation tools (Chow, Ellis, and Walker, 2000). CTCNet has also developed a *Center Start-Up Manual* that includes a chapter of assessment plans and sample volunteer and participant questionnaires (CTCNet, 1999).

- ***Neighborhood Networks Computer Learning Center's Assessment and Evaluation* (2000):** The U.S. Department of Housing and Urban Development's Neighborhood Networks program runs community technology centers in HUD facilities around the U.S. This short guide provides a baseline assessment and evaluation form to be completed for all Neighborhood Network centers to promote and measure the successes taking place at the centers (U.S. Department of Housing and Urban Development, 2000).

- ***Technology Opportunities Program Evaluation Guides* (2000):** The National Telecommunications and Information Administration of the U.S. Department of Commerce contracted with Westat to develop a step-by-step guide for evaluating grants funded under its Technology Opportunities Program (TOP). Four guides were developed—one each for TOP's four project funding areas: Community Networking and Services Projects; Lifelong Learning and the Arts Projects; Public Safety Projects; and Health Projects. Topics covered include: describing project inputs, activities, outputs, and outcomes; defining outcomes in measurable terms; identifying key stakeholders and their interests; prioritizing research questions; developing the evaluation design; providing results to interested parties; and includes sample evaluation plans for each of the four project focus areas (Westat, 2000a, 2000b, 2000c, 2000d).

- ***Information Technology Indicators for a Healthy Community* (2000)**: The City of Seattle's Information Technology Indicator Project is a project to measure the impact of information technology on the health and vitality of Seattle. The project involves the City of Seattle Department of Information Technology and the City's Citizens Telecommunication and Technology Advisory Board (CTTAB) who guided the development of indicators with significant participation from a wide range of interested residents, including technology, education and community leaders. The indicators cover seven categories: access; literacy; business and economic development; community building; civic participation; human relationships to information technology; and partnerships and resource mobilization (City of Seattle, 2000).

- ***Telecentre Research Framework for Acacia* (1998):** The purpose of this consultant report is to outline an overall community technology center research and impact assessment framework for Acacia. The Acacia initiative of International Development Research Centre (IDRC) is designed as an integrated program of demonstration projects and research to advance the ability of disadvantaged communities in Africa to modernize ICTs and apply them to their own development priorities. This guide presents a good overview of specific research questions and specific measures that could be used to assess the impacts of CI projects (Whyte, 1998).

Recommendations for Evaluating Community Informatics

For evaluators of community informatics, several observations and recommendations are key:

1. Begin each evaluation with a theory of how the project will work so that assumptions are made explicit (Bickman, 1987). Evaluations should consider the goals of the CI initiative.

2. Involve stakeholders in the evaluation design and implementation. Evaluation results should be translatable into action by project designers and implementers. It may be useful to build ongoing forms of assessment into the CI project's activities (Gregson and Ford, 1998).

3. Include participants in the evaluation. Participatory evaluation is more likely to give information that is useful to program administrators and decision-makers since it is grounded in the experiences of staff, users, and others. Rather than simply receiving an outside evaluation report, participating in the evaluation gives a sense of ownership and is more likely to be used by those involved in the day-to-day operations of a CI initiative. Since the goal of many of these projects is to empower individuals, participatory evaluation seems especially appropriate.

4. Use an appropriate amount of quantitative data. Policymakers like hard numbers to assess program impacts and many CI projects rely on public funding. "To make measurable is to make visible" (Gygi, 1996). Coulton provides an overview of the variety of data available for small areas (Coulton and Hollister, 1998) that may be useful in the evaluation framework.

5. Use triangulation from multiple sources of data to get the most complete picture possible.

6. Comply with human subject regulations. When working with human subjects in any type of research (including what may appear to be non-invasive observation or monitoring of usage logs), most universities and many federal agencies require that an Institutional Review Board (IRB) first approve research protocols. Researchers at universities and those receiving public funding for research should first inquire about IRB procedures before conducting research involving human subjects.

Suggestions for Future Research

Potential questions for research on community informatics include:

Broad Questions

- What characteristics of a community are indicators that a CI project will succeed?
- How is community involvement related to the implementation and success of CI?
- What model of CI works best for each context?
- What are the management/operational models for CI? (ownership models? Partnerships? Franchises?)
- What are the business plans for financial stability of CI?
- What information needs do they try to meet? How effectively do they meet those goals?
- How do projects change over time?
- Are user types one-sided?
- Do the attitudes within the community toward the project change over time?

- Does the behavior of community members change over time? Are changes in attitudes and behavior gradual or abrupt?
- What factors determined the social, economic and technical appropriateness of different ICTs for the CI?
- What are effective models to maintain sustainability?

Enhancing Strong Democracy
- By what mechanisms and to what extent do they change the distribution of societal power?
- Is commitment to an online organization as strong as one made offline?
- Does ease of use facilitate increased participation?
- How do electronic meetings differ from real-life ones?

Increasing Social Capital
- How do online relationships move into offline relationships?
- Does a content analysis of discussions via community networks show differences compared with off-line?
- How do online interactions affect offline relationships, interactions, organizations, events, etc?

Empowering Individuals
- What are the success rates of CTC users in meeting their goals for participation?'
- What skills do CTC operators need? Local? Technical support?
- How effective are community networks in helping people with their day-to-day information needs?
- Where is the best place under certain environments to place a CTC?
- Do persons with disabilities participate equally?
- Examine how the lives of various groups are affected by access. Are there differences?

Revitalizing Sense of Community
- What are the roles of ICTs in community development?
- What are the disadvantages of providing community information via CI?
- What is the role of geographic factors? (i.e. rural areas with sparse populations may have different models than dense urban areas)

Providing Economic Development Opportunities
- Assess the relationship between CI and other institutions.
- What kinds of organizations benefit from hooking up to a community network and how?

Conclusions

While most people who have experience in using ICTs see at least some potential for their use improving aspects of society, little objective research exists that can back up these claims. It is imperative that the academic and practitioner community work together to develop appropriate evaluation frameworks so that a credible mechanism can be established for providing

accountability for the resources allocated to CI. Most practitioners and academics assume that these initiatives work—but it is now up to the research community to document these programs if they are to become sustainable models for improving the lives of individuals in the increasingly digitized society. The interest is clearly there, yet discussions must continue among evaluators to achieve consensus on evaluation frameworks for assessing the impacts of CI in each of the five areas discussed in this paper—enhancing strong democracy; increasing social capital; empowering individuals; revitalizing sense of community; and providing economic development opportunities.

Author's Note:

I welcome suggestions for additional theories of outcomes and use of appropriate indicators. Please contact me at dara.oneil@gtri.gatech.edu to revise and expand this study so that results may be continually modified as the community informatics evaluation field develops.

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