Digital Connections
Between Home, Work and Community:
Multi-wave Research Findings and Policy Directions

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Abstract

This paper draws upon a series of studies that have been undertaken in Minnesota to better understand the implications for home-based online activities relating to work (e.g. telecommuting) and community activities (e.g. distance education).

Three waves of data collection activities were conducted: a survey of telecommuters in public and private organizations, a series of follow-on indepth interviews with telecommuters and colleagues from these organizations, and two focus groups with community stakeholders on broader planning challenges to integrated online community services. Key findings from these waves are as follows.

In phase I, data were collected from 797 participants drawn from a large public agency and large private sector firm. In terms of organization performance, respondent job satisfaction and productivity were perceived as greater among telecommuters than non-telecommuters, but organizational commitment was not. Findings suggest, however, that telecommuting constraints described in the literature (managerial reluctance, job requirements, isolation fear, and risk to promotion) impose obstacles to telecommuting in this sample.

In phase II, follow-up interviews were conducted with individuals from these two employers. Analyses were conducted to explore the organizational relationships among telecommuting work groups (that is, when one group member is telecommuting). Results indicate that management strategies can play an important role in ensuring the effective work of telecommuting work teams. The interviews also revealed a generally strong view held by telecommuters on their productivity while telecommuting, but several organizational tradeoffs were revealed in terms of team-cohesion.

In phase III, a set of community focus groups explored the community context for a range of potentially home-based electronic services, such as teleworking, distance education, telemedicine, and smart travel. These services were explored within substantive context of digital places and the procedural context of two design studios with community representatives in Minnesota. The design studios revealed a general understanding by community stakeholders about the value of a community network that could enhance the delivery of electronic services. However, several barriers were raised to the effective deployment of such networks, and these barriers formed the basis of planning recommendations relating to infrastructure strategy, service delivery and stakeholder involvement.

In summary, home demand needs to be seen within the context of the service and work networks that deliver these services (such as education, telemedicine); an integrated approach to planning these services can provide positive externalities making the entire system more efficient; there are tradeoffs between electronic and face-to-face interactions that need to be recognized in the design of such home-community systems; and managerial and local policies can play an important role in bringing quality community services to the "last mile"—the home.
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1. INTRODUCTION

In his 1959 book *Landmarks of Tomorrow* the ever-prescient Peter Drucker predicted the rise of knowledge work and its critical role in the U.S. economy. Indeed, recent surveys indicate knowledge workers comprise 39% of the U.S. workforce. High knowledge industries, such as health care and computer software, accounted for 43% of net employment growth in during the 1990s with continued growth expected despite the downturn in the economy (Florida, 2002). Such growth, and concurrent changes in work forms, has been largely accommodated if not facilitated by the growth in the electronic infrastructure (Weill and Broadbent, 1998).

In fact, a substantial and expanding literature suggests the continuing growth in telecommunications has the potential to facilitate remarkable changes in nearly every aspect of life: not only in the work arena, but in individual level developments in lifestyle, and travel, to more macro level changes in, for example, organizational and community infrastructure systems design and the delivery of crucial human services (Mitchell, 1999, Horan, 2000). Over the last four years, the Hubert H. Humphrey Institute of Public Affairs, University of Minnesota, and the Claremont Information and Technology Institute, Claremont Graduate University, have collaborated on research to examine the implications of telecommunications changes on local communities, such in Minnesota. The focus has been upon the implications of infrastructure and service development for a variety of community functions and systems, including but not limited to telecommuting and electronic system development.

As across the nation, prosperity in Minnesota is increasingly equated with access to knowledge-enabling information. Access to the appropriate community level infrastructure is a fundamental requirement to achieving desirable information streams. At the national and international levels, concern for adequate telecommunications capacity has resulted in several major initiatives aimed at bringing information to all walks of life via access. (Bridges, 2001) At the local level, communities across the country are wrestling with how to accelerate access. (Department of Commerce, 2000) Many states believe as the Minnesota's Citizens League (2000) declared that "telecommunications networks are the highways" of this century and, just as success in communities of the 1950s and 1960s depended upon access to roadways, economic success in the 21st century is dependent upon access to infrastructure-dependent information highways." However, research projects and public policy initiatives suggest a common theme: access to broadband services is uneven as many communities lack the necessary infrastructure. This unequal access is identified as a major impediment to realizing community benefits offered by advanced telecommunications. This research project aims to contribute to this infrastructure and policy issue by exploring dynamics surrounding several types of electronic services, beginning with telecommuting.

1.1. Telecommuting

From among a number of technology-enabled programs, telecommuting was chosen as the research focus here because of the multi-layered perspective it offers upon the problem of telecommunications-enabled social change. While previous literatures have focused in turn upon the individual, organizational, and community wide implications, the multi-year research strategy employed here has provided the opportunity to explore both the micro and macro level in an integral fashion.

The term "telecommuting" describes a growing phenomenon that anticipates substitution of the normal work commute with work at home or from an alternative remote workplace. Telecommuting has tremendous appeal in academic, management and public policy circles judging from the growing volume of literature devoted to the topic. Spurring this interest, or perhaps spurred by it, the implementation of telecommuting programs in both private and public sectors has steadily increased nationwide during the 1990s.

The appeal of telecommuting results from the multiple benefits it promises across a wide range of stakeholders including the individual employee, their families, employing organizations, and public agencies. The establishment of flexible workforce arrangements in the corporate world is driven by efforts to improve employee productivity, increase worker morale, reduce worker turnover and decrease office facility costs (McCloskey and Igbaria, 1998). Benefits to workers include the reduced expense and stress of commuting and the increased flexibility in work hours offering potentially more time for fulfilling family obligations (Duxbury, 1998, Gillespie and Richardson, 2000). Public policy supports telecommuting to achieve employee and organizational benefits as well as social advantages such as decreased traffic congestion and reductions in environmental pollution and energy conservation (Niles, 2000).

Despite substantial benefits, telecommuting is still a relatively underutilized work and travel option. According to recent estimates by the International Telework Association and Council (ITAC, 2001), 16.5 million regularly employed Americans telecommuted at least one day per month in 2000, and 9.3 million of these did so at least one day per week. When occasional telecommuters and other subsets of workers are included, the total estimate rises to 23.6 million. Recognizing the benefits to be gained, however, steps have been taken to increase its utilization among the public sector. Following the 1996 National Telecommuting Initiative Action Plan (5), federal government agencies are held to implement telecommuting as part of their overall strategy to improve services and working conditions. The Departments of Transportation generally provide project leadership, assistance or set forth examples for a functioning telecommuting policy.

Following national standards, Minnesota policy developed in 1996 provides strong support for the implementation of telecommuting programs in public agencies throughout the state (6). In agreement with this policy, the Minnesota Department of Transportation (MnDOT) avidly promotes alternative travel behavior including telecommuting. The rationale for this endorsement has been captured in a series of goals including *improve employee well-being, increase productivity with available resources, and address the growing problems of roadway congestion and environmental pollution (6).* Seeking to realize similar benefits, particularly increased productivity, telecommuting supportive policy is also increasingly incorporated in the strategic plans of private sector organizations.

1.2. Telecommuting Research Issues

Minnesota Traffic Problems. Among macro level social concerns, the problem of congestion has largely spurred a policy focus in telecommuting program facilitation. Similarly, the impetus for this study emerged initially from a similar concern. As in urban areas across the U.S., roadway congestion presents a major, growing problem to the Minneapolis-Saint Paul region (MNDOT, 2000). Findings from a recent Texas Transportation Institute study placed the Twin Cities area 16th among 70 of the nation's most congested urban areas (TTI,2000). While population grew by 11% during the 1990's, VMT grew by 29% resulting in a doubling of freeway congestion (Met Council, 2001). Consequently, since 1991, MNDOT has joined with other state and county agencies to encourage drive alone commuters to choose alternative modes. Efforts encourage multiple solutions including carpools and telecommuting (MNDOT, 2000).

In promoting a multiple solutions approach, Minnesota policy-makers join scholars in recognizing that remote work alone is unlikely to reverse the congested roadway conditions brought about by divers changes in lifestyle, organizations and technology (MNDOT 2000). Early projections of significantly reduced roadway congestion with telecommuting emerge from theory that argues technology substitutes for travel. Research, however, suggests a more complex relationship and a number of alternative theories have since been advanced including the possibility of complementary trips and travel stimulation (Moktarian and Varma, 1998). The point of the current research is to explore these varying perspectives in exploration of the implications of telecommunications in community-level development.

Individual and Organizational Dimension. Macro level implications of digital connectivity, such as on transportation, depend upon telecommuting's rate of adoption. Adoption rates largely rest upon whether constraints or facilitators operate at the individual and organizational level Telecommuting has not yet achieved the participation levels projected in early research, and may not unless policy succeeds in facilitating removal of external obstacles (Niles, 2000). Organizational barriers to participation (e.g. managerial reluctance) constitute the largest obstacle, thus, while public policy may provide general support, organizational acceptance and promotion remains the key factor for the continued expansion of remote work (Baltes et al, 1999).

*R*esearch underscores the reciprocal nature of home and work with findings indicating the negative affect from family and personal problems can spillover into the work domain (Kraut, 1989). Undesirable on-the-job attitudes may result including reduced job satisfaction and organizational commitment. Satisfaction and commitment are important to organizational performance because of the demonstrated link between these constructs and financially costly behavior such as employee turnover (Allen, 1990). In a 1998 survey of Twin City executives 56% of respondents noted that retention of employees was one of the most significant issue for their company.

Organizational performance rests largely upon employee productivity. And a number of studies suggest a link between this construct and telecommuting with telecommuter's comparatively more productive than non-telecommuters (Dubrin, 1991, Park, 1996). Increases cited from the public and private sector alike are often quite impressive (although perhaps a bit exaggerated given that sources tend to be telecommunications firms and consultants), and have led private firms and state agencies alike to pursue telecommuting implementation in hopes of improving organization effectiveness. Research suggests a steady increase nationwide in the implementation of telecommuting programs over the last decade (ITAC, 2000). Certainly the 1997 Statewide Omnibus Survey, conducted by the Minnesota Center of Survey Research, demonstrated growth in telecommuting throughout Minnesota. Percentage of respondents claiming to telecommute at least one day per month increased from 18% in 1994 to 24% in 1997 (Jackon, 1999). The 1999 US West study, conducted for the Minnesota Chamber of Commerce, explored the extent of statewide telecommuting implementation. Interviews of 200 businesses indicate nearly one-third (36%) of respondents allowed employee telecommuting .

Despite these trends, research continues to identify various factors contributing to problems with telecommuting, including isolation and lack of organizational commitment. . Among unintended negative consequences, employee isolation has been remarked upon beginning in the early literature (Olson & Primps, 1984; Shamir & Solomon, 1985), leading Cross and Burton (1993) to observe "Isolation is the great fear associated with home working and is cited constantly in the literature on the subject" (p.352). On the whole, the literature suggests one of the more notable constraints to participation in telework is fear of isolation (Cascio, 2000; Evans, 1993; Salomon & Mokhtarian, 1997).

Results from exploratory research led Olson and Primps (1984) to suggest isolation through telework has potentially negative implications for individual employees including reductions in mutual support with colleagues. In their work, Shamir and Salomon (1985) suggest isolation from the work group is likely to actively reduce productivity because coworkers play a key role in socialization and, thus, effective performance. Plus, decreased opportunities for feedback limit learning opportunities. Richter and Meshulam (1993) maintain telework limits the social support network contributing to employee sense of belonging to the organization.

1.3. Community Network Research Issues

Access to telecommuting varies widely – even when it is offered in the workplace. Such variation is often a function of several factors—the workplace, the home environment, and the community in which it can or cannot occur.   That is, the electronic activity occurs within the context of a multi-layerd socio-technical network. The research issue addressed here in what manner community design might best facilitate integrated digital connections.

Design, in the sense advocated is more than just an exercise in academic semantics; design represents a way of seeing that seeks to understand community development as a part of an integrated whole. The frame used here has been adapted from the design process for the built environment offered by Bolan, Pitt, Rickey, Williams, and Wilwerdig (1999). From this perspective, design: "focuses on synthesizing information from many sources in such a way that it converges on a particular situation at hand. A design tends to blend and fuse facts and values – the way things are and the way things turn out to be… a good design imagines a future circumstance that is both coherent and valued, all the while being explicit about how to resolve the conflicting tradeoffs inherent in all situations" (Bolan et al, 1999:2).

Digital Place Design. A good design focuses on the built environment, and it also recognizes that physical structures are integrated within a community. As is increasingly advocated across disciplines, design adopts a systems perspective recognizing changes in one component of the environment will not only affect the built environment but other related systems components as well. Further, design focuses attention upon the potential of community development to alter not only the physical world but to fundamentally transform community relationships (Bolan, et al, 1999). This last point has particular application for integration of the electronic and physical environment. While the intangible nature of telecommunications may suggest there are no implications for community relationships, in reality, telecommunications deployment has the potential to fundamentally alter the way people create, share and exploit information. As information content and applications often reflect important underlying value structures, connectivity has the capability to profoundly change both the relationship and valuation components of the community. The goal of design, consequently, is to simultaneously develop a solution of utility while protecting critical community cultures. As Hebert Simon (1996) recognized, the design of an artifact focuses attention not only on the integrated solution but also on the values and contexts that surround the solution. This study (in the third wave) investigated this broader context of digital design—that is, not just in the home, but the home within the context of a community.

Previous work by Horan (2000), Mitchell, 1999; Wellman (2000) and others have outlined the synergistic relationship between this electronic infrastructure and physical communities. While it is understood that the local community provides the context, setting, and content for creating vibrant community networks, less is known about the process of knowledge sharing within this communities in creating electronic networks. While different sectors (e.g., education, health,) has an individual organizational motivation for creating intra-organizational systems, a process has to be identified and implemented that unites the disparate talents, expertise, and perspectives of individuals involved in the community effort in synergistic fashion. This synergy provides the foundation for creating new knowledge about individual community contingencies that, appropriately applied, provide for development plans to build upon unique histories and values. The second challenge is to ensure information is strategically targeted in its development and supply so as to assure both utility and availability in the ultimate goal of community-wide knowledge creation. To borrow a term from the education literature, the idea is to develop learning communities (Hart, 1993, Hord, 1997).

The concept of digital place design is envisioned to address these two fundamental challenges, thus providing a process and a system to both meet current needs and allow systems management to adapt to changing environmental demands. The first of these two challenges (the planning process) has been addressed indepth elsewhere (Horan, 1999). Suffice it to say, the community network planning *process*

has been undertaken in various settings and the possible actions of various sectors are becoming understood. For example, the e-readiness guide devised by the Computer Systems Policy Project provides benchmarks for action by various community sectors (CSPP, 2001). Several other processes contain similar methods (see Bridges.org, 2001). Not contained in these processes in a contextual understanding of how one can implement a knowledge sharing system on the community: that will be the focus of third wave of this research.

2. METHODOLOGY

This multi-phased project utilized a range of research methods to explore home-based telecommuting activity and its connections to organizational and community networks. These methods including a survey of telecommuters from two organizations (one public, one private), follow-on indepth interviews with a subset of these telecommuters and their colleagues (both supervisors and co-workers) and , finally, two focus groups with community representatives regarding broader community network development issues.

2.1. Phase I: Survey of Telecommuters

The first phase of the research was a survey offered through two employers: one public sector and one private sector.. Research questions guiding this exploratory work include:
   ?? What factors are involved in the decision to telecommute?
   ?? How does it affect individual quality of life?
   ?? How might telecommuting program implementation impact organizational effectiveness and productivity?

Data were collected from 797 participants drawn from a public agency and private sector firm. The structured survey including questions about the nature and type of telecommuting, perceptions on productivity and organizational performance, and (stated) impact on travel behavior.   A number of socio-demographic items were also included to assist in developing a telecommuting profile. (For a full description of this survey methodology, see Wells, et al, 1999).

2.2. Phase II: Indepth Qualitative Interviews

Approximately one year later a second phase of research was undertaken with the two public and private organizations. In depth interviews were conducted with approximately 51 teleworkers, their supervisors, and coworkers—these groups were identified through respondents to the first phase.   Key research questions were:
   ?? Does telework alter the social and work context significantly for coworker**s**? What is the effect on their network and learning opportunities?
   ?? Are there telework program implementation strategies that facilitate the maintenance and development of social networks?
   ?? To what extent does the telework environment provide opportunities for social learning?

Following Miles and Huberman (1994) a structured approach was employed for interview development; scripts were developed for each of the three groups. Interviews were detailed and broad in scope. Topics covered with teleworkers included: (1) characteristics of the respondent (e.g. details of employment history, demographics), (2) program implementation characteristics (e.g. rationale for implementation, nature of program guidelines, managerial expectations, training), (3) telework and work outcomes (e.g. work quality, job satisfaction, relationships with coworkers and managers, communications), (4)

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questions probing the social context of work (e.g. friendship and peer networks networks, community involvement and fellowship), and probes (5) related to explicit and tacit knowledge (e.g. turnover intentions, meeting structure and content, informal information sharing, opportunities for learning through observation, levels of work experience).

The interviews were long; discussions with coworkers lasted between 30 and 45 minutes; with teleworkers and supervisors anywhere between 50 minutes and 1.5 hours. Interviewers were conducted via telephone and taped. Transcripts of the interviews were coded in tandem by two researchers.. Analyses were conducted to explore the relationship between telecommuting and travel behavior, and the potential effects of travel outcomes for community systems. (For a complete description of this methodology, see Wells and Horan, 2002)

2.3. Phase III: Design Studio

The potential value of community-level networks were examined through two focus groups. These two meetings (DSI and DSII) were held in July and September 2000 at the Humphrey Institute, University of Minnesota. Invited participants included community leaders, experts in telecommunications development, design, telecommunications services and so forth. In DSI, participants were invited to ponder and offer insights into the problem of identifying possible workable telecommunications services. They were invited to consider the questions:

?? What set of telecommunications related services would help create better communities in Minnesota?
?? How do we implement telecommunications infrastructures that simultaneously achieve envisioned benefits while preserving community integrity and important underlying values?
?? What local institutions and settings can play a key role in ensuring quality services and access?

During DSII, participants enacted and explored the potential of the design studio. Prior to meeting they were provided an agenda with brief guidelines for the design studio. The five steps included: (1) Describe the context by identifying key values, existing services, and community goals (provided by the researchers in this case). (2) Using this information, frame the problem through discussion and generative metaphor. (3) Identify services to improve and integrate community services and values (again provided by researchers and including distance education, telework, smart travel and telemedicine). (4) Engage in scenario-building exercises for a "Studio Town": The real or near-real town for implementing services with the goal of recommending an integrated set of infrastructures, services, and physical designs. (5) Through iterative discussion and reflection, identify implementation challenges and potential community impacts. (A complete description of this focus group methodology can be found in Wells and Horan, 2001).

3. FINDINGS

3.1. Understanding the Decision to Telecommute

Table One presents summary findings of the telecommuting survey. Of the 797 individuals surveyed in phase 1, 43% engage in telecommuting while 57% do not. Few respondents have engaged in telecommuting for more than two years. Thirty-eight percent of the sample has engaged in telecommuting for a period of less than 1 year, 39% from 1 to 2 years and 23% indicate length of participation longer than 2 years.

Most respondent telecommuters work from home with only 5% traveling to a telecenter. In an average week over half (55%) of telecommuters engage in remote work for 3 to 4 days, 38% 1 to 2 days,

while only 7% telecommute full-time. Public agency respondents (M = 2.99 days, SD = 3.18) tend to telecommute more frequently than do those from the private sector (M = 1.92 days, SD = 1.45.

Survey findings suggest person/situation characteristics that may predispose one to seek opportunities to telecommute. Telecommuters in the present sample are more likely to have a high degree of formal education (Pearson chi square (6, $\underline{N}$ = 771) = 22.47, p = .001). They are also more likely to be married (Pearson chi square (3, N = 750) = 16.29, p = .001), women (Pearson chi square (1, N = 767) = 4.33, p = .037, and have children (Pearson chi square (1, N = 768) = 17.05 p < .001). Findings agree with the literature and suggest telecommuting may provide a way for career-oriented women to balance the often-conflicting demands imposed by both work and family roles.

In the survey, telecommuters were also presented with a list of ten of the most frequently reported arguments for telecommuting. They were asked to choose as many as three. Among public sector respondents, the number one choice was *I can get more work done away from my usual workplace* (30%), second was *It saves me money* (13%), with the third most frequently choice was *I have a long commute* (10%). The same three were chosen among private organization participants, but in reverse order. Cost savings was still number two (17%), while a long commute moved to number one (23%) and personal productivity fell to third (16%). Note that half of the participants from the private firm and 19% of public respondents' travel more than 20 miles to and from work. This notable difference may explain the emphasis placed on commute distance factor by private sector respondents in the decision to telecommute.

Survey queries explored constraints that might function to prohibit interested employees from telecommuting. Again, participants were presented with a list of the ten most commonly reported constraints. Among private sector respondents, the top three reasons are ordered as follows: *Work tasks require face-to-face interactions with clients* (23%*)*, concerns that he/she would *miss important work-related information* (16%*)*, and he/she *would feel lonely/isolated* (11%). As for public respondents, the three most commonly chosen constraints include: *Work tasks require face-to-face interaction with clients* (25%*)*, *tasks require face-to-face interaction with coworkers* (20%), and *My manager will not allow me to telecommute* (11%).

Telecommuting and Employee Productivity. Previous studies suggest telecommuters are more productive when compared with non-telecommuters. While such work behavior is best measured using a combination of methods – performance appraisal, work portfolios and other such items that allow specific, concrete comparisons to be made upon specific performance indicators – survey data can provide a useful first step in productivity assessment. Two questions were used to gauge work performance in the survey. One measured self-perception and the second provided combined telecommuter/non-telecommuter perceptions.

Respondents were asked to rate themselves in terms of work location and productivity. To do so, they were presented with two statements, the first stating that the employee could complete more work *away from the workplace*, and the second suggested he/she could *complete more work tasks at work*. A cross-tabulation comparing telecommuters and non-telecommuters on these two elements indicate significant and perhaps not surprising differences. Seventy-two percent of employees engaged in telecommuting reported that they are more productive away from work; only 31% of non-telecommuters said the same. On the other hand, non-telecommuters (42%) compared with telecommuters (20%) were more likely to provide a self-assessment suggesting greater productivity at the workplace. These differences were significant (Pearson chi square (3, $\underline{N}$ = 776) = 100.71, p < .001)

Respondents were presented with the following statement and choices: *Telecommuters, when working outside the office, are* (1*) less productive than at the office*, (2) *more productive than at the office*, (3) *equally as productive as at the office.* Results indicate non-telecommuters tend to perceive telecommuter productivity outside the office as equal to in the office (56% non-telecommuters versus 33% of telecommuters). Telecommuters, on the other hand, are more likely to characterize themselves and their fellows as more productive when working away from the office (64% versus 29%). Few participants assessed telecommuter productivity outside the office as lower than in the office -- although more non-telecommuters (15%) than telecommuters (3%) made this assessment. Again, overall analysis

of responses indicate telecommuting and productivity are significantly related (Pearson chi square (3, $\underline{N}$ = 760) = 100.70, $\underline{p} < .001$).

   Job Satisfaction and Organizational Commitment. Employee satisfaction and organizational commitment are two attitudes widely examined in organizations because each has important bottom line implications. Both are related to low turnover and reduced absenteeism and such outcomes typically reduce human resource costs for organizations. Both attitudes were explored in the survey.

   An independent samples t-test was conducted to evaluate the hypothesis that telecommuters exhibit greater job satisfaction than non-telecommuters. Agreeing with previous studies, the test was significant ($\underline{t}$ (776) = -3.28, $\underline{p}$ = .001) and indicates that non-telecommuters ($\underline{M}$ = 3.59, $\underline{SD}$ = .83) overall exhibit less job satisfaction than do telecommuters ($\underline{M}$ = 3.79, $\underline{SD}$ = .86). However the effect size (d = .24) is small.

   Contrary to previous findings, telecommuters in this sample do not report stronger affective organizational commitment than do non-telecommuters. Results of the t-test were non-significant with $\underline{t}$ (781) = -1.91, $\underline{p}$ = .06. In a range of 1 to 5, telecommuters have a mean commitment of 3.28 ($\underline{SD}$ = .66), and non-telecommuters average 3.19 ($\underline{SD}$ = .60) – in neither group is commitment particularly strong.

3.2. Exploring the Organizational Network Surrounding the Teleworker

   Organizational Context. The second phase interviews examined more closely the organizational network that surrounding the telecommuting employee. Beginning with organizational motivations, interviewees from the private firm named attracting and retaining qualified personnel as the key operational issue facing their organization. Most of the work entails substantial interface with technical equipment, and as elsewhere, the demand for workers skilled in high tech exceeds the number of individuals available to do the work. Consequently, telecommuting has been implemented largely as an employee incentive with primary goals of employee attraction and retention.

   As an employee benefit, the private firm telecommuting program is designed to maximize employee autonomy, flexibility, and control. Agreements and expectations tend to be relatively unstructured. Participants tend to choose their own schedules with most telecommuters electing to work remotely no more than two days of that workweek. The only scheduling requirement dictates telecommuters should be available either physically or through remote connection during core work hours of 9:00 a.m. until 3:00 p.m.

   Budget restrictions reportedly pose the overriding concern for the public sector organization. Key operational issues for this agency include overhead cost cutting, with a focus on space use reduction, and accomplishing the same workload with fewer employees in the wake of employee attrition. Consequently, interviewee perceptions indicate telecommuting is implemented primarily to realize the organizational advantages of cost cutting. With most agency departments located in expensive urban areas, a strong impetus behind agency telecommuting implementation has been to address the growing need to contain or reduce space usage. Employee morale is also a goal, but matched by an emphasis on increased productivity (to justify the expense of telecommuting). In some units, interviewees noted productivity increases are assured by assigning telecommuters an approximately 10% greater workload.

   Organizational Impacts. In a portion of each interview, teleworkers were asked specifically about their experiences with a major component of the remote work program –work from home or a remote satellite office. In general terms, teleworkers in both agencies noted a high level of satisfaction with the program. Most indicated an increased level of productivity, job satisfaction, and improved personal well-being. However, the findings suggest the strategy selected for telework implementation may have unintended consequences for workplace functions and processes – particularly upon social networks, supporting informal communications, and social learning opportunities.

   Spontaneous comments from manager interviews served to highlight the importance of social learning to the agency. A couple of agency supervisors expressed concern that telework might play a negative role. For example, asked *To your knowledge, are there plans underway to expand telework [in*

the agency] in the future" one manager said "Yes, although there has been a hold on telecommuting, because we [department managers] didn't want more than 30% of the staff telecommuting. One of the reasons given for the halt was widespread concern among managers that the more experienced workers would be telecommuting and not available enough in the office. Specifically, our concerns related to the problems this might bring about for informal learning and socialization of new employees."

When queried regarding the potential disadvantages of telework, another agency manager expressed similar concerns saying: "Brainstorming is compromised by telecommuting. Just the interchange that takes place in the office, talking with someone and maybe someone in the next cubicle overhears and says 'oh yes, I had something like that happen' and can we talk about it? In this way they find new solutions for issues." In part to facilitate social learning opportunities in the workplace, this manager has made it a policy to enforce personal attendance at bimonthly staff meetings because "Meetings are often held around the computer so we can see particular problems with a case." In this way, both tacit and explicit learning is facilitated by group/team exploration of complex problems.

Asked to comment about communications among staff since implementation of telework, another agency supervisor had this to add: "Teleworkers and coworkers probably communicate a little less, but when telecommuters do come into the office, they communicate with their coworkers more than before telecommuting. This is understandable since telecommuters want to build upon and maintain connections. For this reason I believe more than half time telecommuting would be a problem and lead to a feeling of disconnectedness and not belonging to the group."

A second supervisor concurred, noting virtual employees tend to drop out of site and 'out of the loop' more than do those who work remotely, off-site, part of the week. Speaking from the perspective of his department, this manager observed: "We really have three classes of employees now: Satellite, off-site workers [virtual], home workers [in the office part of the time], and in-office employees. The satellite staff we hardly ever see; telecommuters we see more often and they seem to make more contact with fellow employees… But still telecommuters are in the office less frequently and so telecommuting doesn't do a lot to foster informal learning, communications, or esprit de corps. The groups have been divided along lines now – telecommuting, satellite, and in-office, and those who don't come in as frequently are now looked upon more as an "out" group." In an effort to combat this situation, this manager has also made in-person attendance mandatory for bimonthly meetings. He also has made a conscious effort himself to contact satellite employees more frequently and encourages his other staff to do so as well. Nevertheless people who work virtually, according to this manager's observations, are "more likely to disappear".

The potential for a divisive "us" versus "them" perspective across non-teleworkers and their teleworking employees was another concern echoed across public agency managers. Illustrating manager comments, interviewers noted coworkers referred to in-office, non-teleworking staff as "us" and teleworkers as "them" across agency interviews. And one of the chief concerns expressed among agency teleworkers is the effect their work location has upon relationships with coworkers. Such observations and comments imply a common recognition of the potential negative implications for social network maintenance across employees and their supervisors in the agency.

Teleworkers' Perception. The private sector telecommuters had quite different perceptions than there public sector counterparts due to the different context of the program. For instance, because the (private sector) program was open to all employees and acceptance nearly guaranteed, enterprise teleworkers do not express as much worry about potential coworker resentment. Attenuated coworker tension probably also results from the fact that most firm teleworkers elect to work from home only a part of each workweek, thus there is less perceived potential for work to spillover onto in-office coworkers.

Related to this last observation, few teleworkers in the private organization report the sense of isolation or loneliness reported by those in the agency. One teleworker respondent observed: "I currently telecommute just part time, two to three days per week. I tried to do four to five, and that did not work because I felt too isolated and it was too hard to communicate with coworkers. This is why I only telecommute part time."

In this organization too, five of the nine teleworkers did mention the potential for remote work to disrupt social networks and learning opportunities. This seems to be especially the perception and experience of virtual employees. For example, one respondent noted: "Maintenance of [work] relationships is very dependent on face-to-face. I wouldn't want to telecommute every day for this reason." When asked *Have you noticed any change in your relationship with coworkers?* another observed: "No because we all do, however, those that telecommute most of the time are now more distant than the rest of the group. Out of site, out of mind, that kind of thing." A third who works 80% from home noted feeling lonely and missing out on important information and ties, noting "Yesterday I just discovered that a coworker had resigned and the last day is today. This causes me to wonder if 80% telework is too much."

As with in agency, teleworkers commented upon a number of useful strategies for maintaining social networks. Again, they are required by agreement to be available during core hours (10 a.m. to 2:00 p.m.). And as one teleworker noted the biggest challenge is "realizing the onus is on me to stay connected." Working out of the office for the majority of the workweek, this teleworker reported increased efforts to send more emails and "pick up the phone" more frequently.
Another respondent noted realizing: "When I'm on site, it is very important to have face time. I go and have an informal conversation at some point with each team member." Yet another teleworker said: "I try to maintain contact by scheduling lunches, and so on to maintain face to face contact with each of my coworkers." A third respondent commented upon the critical importance of full attendance, face-to-face unit meetings saying "meetings become important. Aggressive scheduling has to take place to make sure they really take place with all members." One respondent related that teleworker guidelines include rules regarding meetings. Teleworkers have to be willing to adjust their own schedules to attend manager's weekly staff meetings. Again the combined efforts of employees and management seems to be key in maintaining important social network ties.

Coworker Perspectives. By and large worked coworkers have worked closely with one or more teleworkers for years across both organizations. Private firm respondents have actually had longer, direct experience, with five reporting direct association for four or more years, three from two to three years, and the last for one year. Among agency coworkers, three have worked closely with their teleworking coworker(s) for at least five years, three others, for two years, and two for one year. Most also worked with teleworkers before they began remote work, so they were often able to compare and contrast "before and after" experiences.

Coworker comments overall tend to reveal a positive view of telework, however, they too remark upon the potential for negative outcomes related to social networks and social learning. As in the telework interviews, the more negative experiences seem to relate to full time, or virtual, telework. For example, when asked *What do you think about telecommuting – is it a good idea, bad idea?* one agency respondent, who worked in a full time only telework department said: "I do think overall it has had more of a negative than positive effect on our organization and the group as a whole. It has totally alienated everybody as far as you don't see anybody anymore, except rarely. They come in for meetings once in a while so if you want to talk to someone you have to call them. I think the morale is worse and there's no camaraderie anymore." This respondent added: "But it would have been a whole different story if telecommuting were done differently here. There may have been better ways to do it, but employees weren't given the chance to give their input into how it might best be implemented."

Several private firm coworker respondents also perceived telework as having a negative impact on the social network. One noted "We don't have personal interactions now, it is all via email, which takes away from the relationship." Another said: "The drawback [with telework] is that the more people are telecommuting means the less often people see each other, so there is not the same rapport with co-workers." Similarly, another respondent suggested incompatibilities with social learning, observing: "You can't just walk down the hall and ask questions in a face-to-face situation. I have to email questions and wait for a response, possibly requiring two or three rounds of clarifying messages." A second agreed saying "People are not together so there is less interaction. And I have a tendency to think of

telecommuters as 'away doing something important, so I won't bother them.' It's much easier to do logical thinking and problem solving through face-to-face interaction."

Neither agency nor private firm coworkers seemed to express the resentment their teleworking colleagues feared. The most common source of dissatisfaction on the part of coworkers came from perceptions of slowed responses. One respondent noted: "The people I work with [teleworkers] really, really like it and that makes them good and happy employees and I think that's a good thing. Other than a couple of times I've needed to get hold of a teleworker at home and have not been successful or not gotten an immediate response, it [telecommuting] doesn't impact me at all." Several other coworkers noted a slowed response from telecommuters – in each case the constraint was not perceived as characteristic of telework per se, but rather attributed to individual characteristics of the employee (good versus bad), technology problems, or information overload.

In contrast, several private firm coworkers noted that they perceived teleworkers as more accessible than are co-located colleagues. One remarked "It's easier to reach a telecommuter at home." Another coworker of a field service teleworker noted: "response times are faster as it's more efficient to have the teleworker log on from home." However agreeing with agency respondents, three coworkers did note teleworker responses seemed a bit slow.

As previously observed in agency teleworker interviews, the more effective teams and units have developed strategies to foster social learning and strengthen network ties. For example, several report that they engage in both formal and informal meetings. For instance, when asked: *Have you noticed any change in your interpersonal relationship with him/her*, one agency respondent said: "No change. Relationships with telecommuters have remained close because coworkers function as a team. We help each other out a lot and are frequently in contact." Another observed that coworkers and teleworkers both attend meetings in which they discuss difficult cases and possible solutions. These provide opportunities in which "we learn from each other's experiences." Yet another respondent said: "Every two weeks we all try to have 'informal time' when we all get together for lunch, and we catch up there. Everybody's kept 'in the loop' and we find out what's going on with each other."

Finally in agreement with agency teleworker interviews, a couple of agency respondents noticed and commented upon increased incidents of "good citizenship" behavior among teleworking colleagues. These help to facilitate social networks and offset potential resentment. One agency coworker related: "When I went on vacation…they [teleworkers] just offered to take my cases and that was very helpful to me since I didn't have to worry about work so much on my vacation. I came back and things were really great."

3.3. Digital Network Findings

During a telling interview, one manager suggested problems with network maintenance among his telecommuters was due largely to uneven availability of and access to electronic/digital infrastructure across local communities. The third wave of activities occurred in Summer and Fall 2000, builds upon this observation and explores the problem of access in the wider context of community implications of digital technologies. Below are the findings and directions from the two roundtables.

In general, roundtable participants recognized important community benefits from telecommunications infrastructure implementation. Improvements in health care, education systems and other important services, including telecommuting, were all perceived as achievable across communities but their delivery is perceived as stalled by inadequate or non-existent infrastructure. Developing such infrastructure was seen as a desirable and critical goal for economic development.

Achieving actionable solutions to the problem of inadequate access proved difficult as illustrated by the use of multiple and diverse metaphors/frames used to understand the problem. These included, for example, (1) a business problem, (2) policy quagmire, (3) a problem of achieving and maintaining intra-community relationships, and (4) a problem of equitable information access. Note, participants observed

the framing would, in reality, depend upon the individual community circumstances. Contingencies in the environment would likely force a particular frame. The abstract exercise of a generalized Studio Town posed a level of uncertainty in DSII and made framing of an actionable problem quite difficult.

Results from DSI and DSII, however, suggest utility in the service-driven, integrated design approach. These recommendations were then re-considered in light of relevant literature (noted above) resulting in the following recommendations for achieving useful, accessible, and needs-driven community network designs (Wells and Horan, 1999). This analysis of focus group discussions revealed a plethora of planning issues, which were grouped into infrastructure, service-delivery, and stakeholder issues. These are summarized below.

Infrastructure Issues. Community planners are often daunted by the prospect of tailoring the "right" infrastructure to rapidly changing conditions and technologies. Participants in DSII suggested an all-at-once approach is untenable and, argued for a needs-driven strategy focusing upon service delivery improvement. For example, representatives from Southwest Minnesota noted that the interest in jobs and economic development was a key driver for developing services in their (rural) region. From this perspective, infrastructure design should begin with assessment to identify which services would best fit community needs. This assessment should expand beyond consideration of current infrastructure and should include description of the context, current economic clusters, institutional structures and so on.

Particularly in rural areas, the 'last mile' has proven an imposing barrier to ubiquitous access. Participants in DSI and II noted it is not always practical or possible to achieve infrastructure to each individual dwelling and, accordingly, community centers for access were recommended as a solution in several instances. This observation supports an integrated approach to system design in which the current built environment provides nodes of access to the electronic environment (e.g. school, library, and town hall access). Exploration of possible existing nodes of access would provide a way to build upon and strengthen existing community institutions plus achieve the goal of ubiquitous access across residents.

Service Delivery Issues. DSP II participants acknowledged the challenge if integrating various service streams (e.g. distance learning, telecommuting) In DSI and II participants noted the need for leadership to achieve an integrated telecommunications infrastructure design. Participant experiences suggest implementation especially is facilitated through inclusion of community leaders and decision-makers from the very beginning in design efforts. While this leadership often came from existing institutional players (for example, state colleges such as Winona State Unversity in Winona), participants concurred on the need to develop an "action oriented forum" that allowed these traditional institutional players to operate outside of their traditional purview and develop a shared understanding of the community needs.

. Comments from DSI and II suggest creating sources of knowledge and user-focused services may be particularly important for the long-term prosperity and well-being of small and rural regions –especially those that have relied historically upon traditional industries. In Minnesota, as elsewhere in the U.S., logging and agriculture, for example, are losing ground to knowledge work industry including medicine and medical device development. Developing local infrastructures and information resources will allow access to and participation in the same industries with consequent positive implications for rural economies.

At the same time, participants emphasized the local opportunities and benefits of information infrastructures and knowledge creation are unlikely to be fully realized without facing challenges of community development – providing opportunities for change that will simultaneously respect, preserve, and even build upon the integrity and valued characteristics that make communities unique.

Stakeholders Issues . Participation is a critical prerequisite to achieving an effective design. Multiple perspectives aid in the generation of actionable solutions, and participation is acknowledged as an important component in achieving commitment (Sanoff, 1997). DSII discussion also suggests citizen participation speeds resident education with improved use of the system. In addition, inclusion of local decision-makers helps speed implementation. The proposed design studio provides an ideal learning/decision-making forum for both to occur.

To realize effective community networks DPD, strategic alliances and partnerships were viewed as instrumental. These must be identified and developed early in the process. DS II comments suggested that, lacking strategic partnerships (e.g. providers, intra-community relations, nodes of access), effective telecommunications infrastructure is difficult to achieve. A number of experts in developing telecommunications note it is difficult if not impossible for any single organization (government or private) to be responsible for developing all of a community's information infrastructure resources (see for example, Thompson & Hunt-Coffey, 1996). Local government might take the lead but partnerships must be actively pursued to provide the necessary ingredients for realizing community e-riched visions (e.g. capital, expertise, resources, and maintenance). DPD efforts should make it a priority to target a range of partnerships. These can and should begin with identified nodes of access in the built environment and community resources including museums, schools, hospitals, churches, and community centers. Such points in the built environment can become important "third places" for enhancing access to digital technology services and resources (Oldenberg, 1990).

As noted earlier, a number of problem frames were proffered by participants as instructive for developing telecommunications system design. The unfolding of these multiple perspectives serve to iterate the critical point in a design perspective: multiple possible frames exist for any problem and the frame depends upon the individual/professional lens or perspective used and the context in which it is developed. Multiple actionable solutions are possible in response to these varying frames. This suggests two points brought out in DSI and II. First, there is no one best approach to the design of telecommunications systems. The "right" approach depends upon the individual community context and current needs of residents. A needs assessment should drive infrastructure development. Note as well that frames are not mutually exclusive but can and should be integrated in the design process such as "reflective practice" (Schön & Rein, 1994). Second, participation with a number of perspectives elicited is a necessary prerequisite -- the "true" problem often lies somewhere at the convergence point.

4. DISCUSSION

4.1. The Home-Work Environment: Telecommuting and Beyond

Examination of the overall telecommuting environment suggests advantageous outcomes may be realized at both the micro and macro levels through policies supporting telecommuting.   Concurring with other studies, such programs do seem to offer benefits that would facilitate telecommuting choice among individuals, for example, by reducing stress, escape from a long commute, and financial benefits.

Results also demonstrate variables important to organizations such as productivity and job satisfaction also relate to telecommuting. These variables are of critical importance to organizational performance and findings provide an argument for continued promotion of telecommuting in both the private and pubic firms included in the study.

Results from this study also suggest outcomes associated with telecommuting are not always as clearly advantageous or apparent as previous studies predict. In instances such as negative work-to-home spillover, telecommuting did not have the anticipated positive impact in either of the two participating organizations.   Also, even when positive relations were found between telecommuting and desirable outcomes, analyses often demonstrates a relatively small effect.

Results from this survey agree with earlier studies that show variables, related to the individual as well as external factors, function to constrain telecommuting. Among public respondents, a number of non-telecommuters reported that their manager would not allow them to telecommute – managerial resistance is an obstacle frequently mentioned in the literature. The realities of the employment environment such as jobs that require face-to-face interaction with clients/customers also impose obstacles that will likely continue to effectively limit telecommuting.

Finally, the indepth interviews noted the blurring of organizational/working networks across business and home-network lines. While a telecommuter may be working at home, often his or her "work network" resides in the office place. And, therefore, a range of management policies and practices need to be implementing to gain the advantages of telecommuting while minimizing the potential adverse consequences.

4.2. Community Environment: A Service-Driven Approach

The design studios revealed the importance of networks within the community setting as well. And, like the private sector, there needs to be consideration for the perceived value of the information being transmitted electronically (vis a vis traditional face to face) Electronic services must be perceived to fill a need in order for it to be used -- and consequently useful -- to community members. Thus, community leaders and planners should begin by embracing an attitude tantamount to a classic marketing perspective and ask a fundamental question: "What is truly a 'service', truly a 'utility' to the customer." (Drucker, 1985). This service-driven perspective is advocated for designing infrastructure appropriate to developing learning communities. It also underscores an important point made by participants in the course of the design studio meetings – planning is best done for prevailing needs in the 'here and now' rather than with a future orientation. Assessing and meeting current needs is a much more achievable goal than predicting and/or determining future needs, particularly given the dynamic quality of the environment.

Given the current focus upon knowledge creation as key to economic success, it seems logical to target systems of learning in infrastructure design. Schools become obvious access nodes. One of the distinguishing characteristics of a knowledge-driven society is that "access to jobs is gained through a good deal of formal education and the ability to apply theoretical and analytical knowledge. Above all [knowledge workers] require a habit of continuous learning " (Drucker, 1995:226). One way to ensure effective community knowledge management is to ensure opportunities for learning through strategic implementation of distance education or tele-education services.

Distance learning has been applied successfully at the K-12 level to achieve a number of benefits. Of broad appeal is the use of the Web as a tool to enhance learning opportunities in traditional school settings by promoting inquiry and learning that reaches beyond the limitations of textbooks (Barker, 2000; Cohill & Kavanaugh 2000). In Blacksburg, Virginia, school networking has proven successful in improving family and community involvement – both of which are related to student performance (Ehrich & Kavanaugh, 2000: 150). Similar efforts are underway in Minnesota at the elementary school level (Minnesota Office of Technology, 1998).

At the higher education level, universities--such as the University of Minnesota—have taken steps to play an important role in provision of continuous, life-long learning possibilities. For example, a wide number of courses are offered through the University of Minnesota's Independent and Distance Learning program (College of Continuing Education, 2000). Fittingly, scholars such as Eli Noam (1995) have oberserved that the most powerful learning environments may very well be those that combine the on demand characteristics of the online learning environment with the strongly tacit characteristics of the physical learning environment. Writing in *Science*, Noam notes "True teaching and learning are about more than information and its transmission. Education is based on mentoring, internalization, identification, role modeling, guidance, socialization, interaction and group activity. In these processes, physical proximity plays an important role. Thus, the strength of the future physical university lies less in pure information and more in college as a community; less in wholesale lecture and more in individual tutorial; less in Cyber-U and more in Goodbye-Mr.-Chips College. Technology would augment, not substitute, and provide new tools for strengthening community on campus, even beyond graduation."

Beyond education, a number of other community services could be targeted for improvement, but three others -- medicine, work, and transportation – tend to be of importance across communities in terms of desirable communities, resident well-being, and economic success. These are also increasingly the

focus nationwide of the sort of service improvement efforts associated with telecommunications advancements, consequently, design efforts might successfully target services availability including telework, smart travel, and telemedicine. There are myriad beneficial implications of such information-dependent services (e.g. increases in productivity and individual well-being with telework [see Ellison, 1999]; improvements in highway capacity, safety, mobility and accessibility with smart travel [see Crowell, 1997; ICMA, 1998]; more widespread and speedier access to medical facilities and professionals with telemedicine [see U.S. Department of Commerce, 1997:1]). However, availability depends upon infrastructure – uneven in availability, but currently the focus of development efforts across Minnesota. Approaches to designing infrastructure in such a way as to maximize service accessibility and utility to communities were topics explored in the experiential design studios.

4.3. Research Directions

There is more than one approach to telecommuting; this study focused on instances where telecommuters remain part of the "traditional organization", are typically home-based or in a satellite office and enjoy the benefits for both employer and employee. Studies show, however, that new, small organizations built around networked technology have been established in the last 5-10 years, often resulting from outsourced tasks from larger traditional organizations. Their structures and methods and location of working may be fundamentally different from the more traditional organization. Increasingly, the U.S. economy depends upon such small entrepreneurial businesses. Small businesses tend to implement telecommuting and other alternative work approaches in an effort to offer benefit packages that are competitive with those offered by large organizations. Thus future research should focus upon telecommuting in these non-traditional, small and/or home-based organizations.

Employee productivity continues to be an issue for organizations and key to organizational acceptance and implementation. Results from a number of surveys suggest employee productivity may be maximized with a part time schedule but suffers with full time participation. Some organizations have implemented enforced full time telecommuting in an effort to reduce overhead cost. What are the implications for productivity? Also, research shows that many participants do not view telecommuting as a long-term solution but rather tend to engage in it periodically. What are the implications of episodic telecommuting for productivity?

Organizational barriers to telecommuting continue to limit this mode choice. In particular management distrust is still an issue. Further research should focus upon the link between management support and telecommuting. What sort of organizational cultures support telecommuting? Are there effective methods of training that will aid in overcoming management's hesitancy?

Finally, the community context needs to be better understood, both in terms of the linkage from the home to the employer, but also the home to various civic institutions. These additional services—telemedicine, distance learning, smart travel, for example, can help establish a strong robust use pattern between the home and the community. More broadly, community networks are emerging as mainstream approaches to enhancing community value. While originally begun as earnest attempts to provide citizen access to governmental services ("civic nets"), these networks are being deployed in a range of settings and for a variety of reasons. This includes as a community/social amenity (e.g., community-wide intranet), as a means for local small business development (e.g. local e-commerce), and as an alternative to traditional telephony-media services (e.g. VOIP-telephony, fiber to the home internet). However, very little effort has focused on connecting issues arises from the home-based activities to the community level network development. This multi-wave effort was conducted to explore such connections, but more systematic research on case implementations is clearly needed.

4.4. Conclusion

In conclusion, knowledge creation and management are increasingly viewed as essential for effective performance of individuals, organizations, and even larger communities. Yet, planning efforts toward planning and management of information-access infrastructures are frequently misguided. The focus is too heavily upon the provision of information as a proxy for knowledge and of multiple streams of information without due consideration of their actual value to knowledge creation (Nonaka & Takeuchi, 1995; Davenport, 1997). And, while information is a necessary material for obtaining and developing knowledge, it can not be equated with knowledge. The two concepts are related; they each focus upon meaning, and are context specific and relational; that is, both "depend upon the situation and are created dynamically in social interaction among people (Nonaka & Takeuchi, 1995:59). However, "information is a flow of messages, while knowledge is created by that very flow of information, anchored in the beliefs and commitment of its holders" (Nonaka and Takeuchi, 1995: 58). Access to information alone is not, therefore, useful to individuals unless it is suited to the context and in alignment with and readily integrated into member belief and value systems.

A similar observation is made by Davenport in his *Information Ecology* (1997) in which he urges an approach to managing information that ensures materials suited to context, need, and the values of end-users. Davenport writes: " the status quo approach to information management – invest in new technology, period – just doesn't work. Instead managers need a holistic perspective, one that can weather sudden business shifts and adapt to changeable social realities. This new approach… emphasizes an organizations entire information environment. It addresses all of a firms values and beliefs about information (culture); how people actually use information and what they do with it (behavior and work processes); the pitfalls that can interfere with information sharing (politics); and what information systems are already in place" (Davenport, 1997:4).

While Davenport's observations were written about individual organizations, the same statements could be made concerning telecommunications infrastructure planning and management at the level of the community. Providing communities with information-producing infrastructure will not provide the sort of resources needed for effective development unless community members perceive the information to be of value, readily accessible, and of use.

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Table1 : Respondent Demographics and Telecommuting Behavior

	Public Agency		Private Organization	
Demographics				
*Percentage of women	77%		47%	
*Occupation	Customer service/Clerical	38%	Technical work:	56%
	Professional and paraprofessional	48%	Managerial:	22%
			Administrative/clerical	7%
*Education	Associate/Tech degree	15%	Associate/Tech degree:	31%
	Post-graduate degree	30%	Post-graduate degree:	8%
Percentage of married participants	63%		68%	
Participants with children	56%		60%	
Percent aged between 35-54	72%		69%	
Telecommuting Behavior				
*Percent telecommuters	45%		38%	
*Frequency (mean number of days telecommuted)	Mean=**2.99**, sd=3.18		Mean=**1.92**, sd=1.45	
Telecommuting location	**Home**		**Home**	
Top three reasons respondents engage in telecommuting	Increase personal productivity	30%	Long commute	23%
	To save money	13%	To save money	17%
	Long commute	10%	Increase personal productivity	16%
Top three reasons non-telecommuters do not participate	Tasks require face-to-face interaction with clients	25%	Work tasks require face-to-face interaction with clients	23%
	Tasks require face-to-face with coworkers	20%	Would miss out on important work-related information	16%
	Manager will not allow	11%	Would feel lonely/isolated	11%

* Statistically significant differences (at .05) between public and private firm samples