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Chapter 1

The SmartCommunities™ Concept

Introduction

For the last fifteen years the experts have been predicting that the wave of the future would be ushered in by advances in telecommunication. People would live in Telluride and work in New York. The wave has not yet come ashore, but it is within sight. Communities today ignore the trends at their peril, as the communities of the past which ignored the proposed routes of the railroads or the interstates became ghost towns, so the communities of today may face obsolescence if they do not prepare.

The structure and nature of work and the delivery of goods and services is fundamentally changing. Community leaders today face a range of challenges as they attempt to meet the pressures on basic services and to provide adequate infrastructure for the future. Many predict a future for organizations that can not be estimated based on a straight line projection of the past. We can expect a magnitude of change similar to the shift from agricultural production to manufacturing. The basic precepts of a knowledge-based society include instantaneous international linkages, access to data bases that provide more than just data but useful information, synergistic relationships with collaborators, a definition of community that is not bound by geographical boundaries but rather communities of interest that span the globe, opportunities for continuous learning, and a pace of activity that has never been experienced.

Today's companies measure competitive advantage in hours, not weeks, with regard to their ability to respond to customers and to maximize service. Communities that provide the opportunities for individuals and organizations to respond rapidly and maximize their effectiveness are the ones who will "win."

This project provides the opportunity for the State of California to play a leadership role in facilitating the transportation and economic development needs of its communities by enhancing the environment in which they operate. As California moves

toward the next century there are a number of important factors to consider as businesses plan for the future and as communities develop their telecommunications infrastructure. Previous projects conducted by both the public and private sectors have focused on the supply side. They make the assertion that: "If we provide the bandwidth for advanced telecommunications, then business and consumers will find a way to use it.". Those projects are yielding lessons about the obstacles presented by this approach which is leading to a renewed focus on the demand side of the equation. This approach emphasizes that: "If we foster the correct telecommunications environment, that brings together organizational as well as physical infrastructure, then user applications will flow from the synergy created through enhanced collaboration.".

The mandate for this type of project is best captured in the California Transportation Plan - Final Draft, March 30, 1994 Objective D:

"Develop the Electronic Highway Alternative. States: Technology and electronic highways are both an alternate transportation mode and a means of maximizing use of traditional transportation systems through linkages with the Federal IVHS Program. Going beyond just "bringing the work to the worker," this view sees mobility expanding through telecommunications to bring services to a broad mix of consumers and taxpayers, moving information and services rather than people. Examples include education, health care and government information. The deployment of telecommunications technologies for transportation needs to be fully and systematically coordinated with either modes of transportation. Federal, State and local agencies must cooperate with the telecommunications industry to establish the physical infrastructure and regulations to address transportation applications for telecommunications."

As a result, it is critical that community leaders begin to understand the combination of factors which need to occur to facilitate operations and development of applications that leverage technology. This can be done by identifying the key elements of infrastructure that must be organized for the various community elements to improve collaboration and communication. If the region's telecommunications organizations can become motivated to lead the way into the future, it may be feasible to affect California's entire ecology.

What are people thinking about the future of communities? Some believe that the desire to create a "Smart City" is nothing more than a pipe dream. However, it would be a

mistake to dismiss the smart city as merely another 'Utopian' project of the kind designed to excite public interest in new technology, and without a grounding in the real world. The smart community can provide a model for the future communications landscape precisely because it works within the limits and capabilities of current technology. The broadband networks capable of delivering the range of applications and services being trialled, will soon be available. Nippon Telephone and Telegraph (NTT), of Japan, has announced plans to provide full fiber access to its large and small business customers by the end of the century, and to residential subscribers by 2015. In the light of such developments, the smart city is not so much a Utopian vision, but a realistic attempt to define the future role of communications technologies and services within our communities.

Creators of tommorrow's "City of the Future" face a formidable challenge: Are they part of a social phenomenon that is destined to stall or implode . . . or do they represent a vibrant force, capable of building on the knowledge they have accumulated, adapting to a rapidly changing world and community needs, and ultimately achieving positive, lasting social change in their communities? Many expect this period to result in positive social change by using electronic communications as a vital enabler to bring people together, to share, learn, and work together to solve problems. It is clear, however, that the surge in interest must be matched with an influx of significant funding and a step-wise increase in the functionality and quality of the underlying applications.

The applications that constitute a smart community need to represent the interests of the community it serves. Many of today's groups must make a concerted effort to move beyond their current scope, which often represents only the interests and views of the people who organized and built the technology. The programs that will succeed in the long run will be those that have maintained a focus on the multiplicity of needs in the community and have effectively engaged the full spectrum of their neighbors.

Today, there are a host of parties representing community-based networks (i.e.; the National Public Telecomputing Network, the Center for Civic Networking, Big Sky Telegraph, Computer Professionals for Social Responsibility, the Community Learning Information Network (CLIN), and Learning and Information Networks for Community Telecomputing). Additionally, there are scores of individual parties aspiring to reach national prominence such as CityNet, CapAccess, and La Plaza Telecommunity.

The key to the successful implementation of smart community applications is to focus on demand issues. People are looking for results, solutions to their problems - not network access. Or, as Frank Odasz of Big Sky Telegraph likes to say, "real benefit for real people." That means seeking out and involving those individuals in the communities most capable of making things happen and ushering in changes. What's needed are people who are willing to question the status quo, to ask what is needed, and get things done right now. The buy-in from community leaders is the best insurance that the applications can address the broad range of challenges posed by the community.

What is a Smart Community?

The term “smart communities” has been used to identify those municipalities which have adopted this paradigm. Specifically, a **smart community** is any group of individuals, organizations and institutions located in the same area that have made a conscious effort to employ information technology to transform a major portion of their region. Cooperation between government, industry, and academe, rather than one group acting alone, is preferred. Also, the technology must be transforming, rather than incremental.

Some believe that the desire to create a smart community is nothing more than a pipe dream. However, it would be a mistake to dismiss the smart city as merely another 'Utopian' project of the kind designed to excite public interest in new technology, and without a grounding in the real world. The smart community can provide a model for the

future communications landscape precisely because it works within the limits and capabilities of current technology. The broadband networks capable of delivering the range of applications and services being tested will soon be available. For example, Nippon Telephone and Telegraph (NTT), of Japan, has announced plans to provide full fiber access to its large and small business customers by the end of the century, and to residential subscribers by 2015. In the light of such developments, the smart city is not so much a Utopian vision, but a realistic attempt to define the future role of communications technologies and services within communities.

Though proponents are enthusiastic about the potential of smart communities and the general consensus is that they can make a positive contribution to people's lives at the city or neighborhood level, critics have raised important issues. Critics question whether electronic communication will replace what little face-to-face contact there already is between people; they also see networks and communication technologies in general as a serious threat to society. They fear that these networks will only further isolate and distance us from our neighbors.

There is also concern that increased use of technology will create a division between those who can participate in the discussion of community and governance and those who have no access to the system. They question whether these new systems will disenfranchise parts of the population even further and whether the word "community" only means traditional computer users who are usually upper-income, male, and young. Frequent criticism also comes from commercial providers who object to community networks providing free or low-cost Internet access, thereby taking business away from the commercial providers. Smart Communities, large or small, must establish an economic model for their sustained operation. It is a question of economic viability, not a debate over "free access."

Discussions about economic models have also been substantive and useful. Individual communities are begining to address what sort of access they want to

subsidize for what groups of people. Many community activists have passionately and convincingly argued for no-cost availability of basic services; indeed, this question is being debated on a national scale in the federal Information Infrastructure Task Force, among other places. Bear in mind that free access to networks will almost always be structured around off-peak times and functions, riding in the "electronic empty spaces".

Whether these concerns can be overcome will determine if there is enough "critical mass" to sustain the growth of community-based applications. To spur demand, a critical mass of applications and functionality is needed to promote the sustained development of a Smart Community. The following parameters can help define what this critical mass might be:

CONVENIENCE
- Simplicity
- Ease of Use
- Fun to Use
- Portability

CHOICE
- Connectivity
- Anybody
- Anytime
- Anyplace
- Anyway

CONTROL
- Privacy
- Data Security
- Quality of Service

SPONSORSHIP
- Leadership
- Facilitation
- Vision
- Catalyst

STIMULUS
- Competition
- Demand
- Market Potential
- Value-Add

SYNERGY
- Communication
- Cooperation
- Collaboration
- Leverage

The Vision

Creators of tommorrow's "City of the Future" face a formidable challenge: Are they part of a social phenomenon that is destined to stall or implode . . . or do they represent a vibrant force, capable of building on the knowledge they have accumulated, adapting to a rapidly changing world and community needs, and ultimately achieving positive, lasting social change in their communities? Many expect this period to result in

positive social change by using electronic communications as a vital enabler to bring people together, to share, learn, and work together to solve problems. It is clear, however, that the surge in interest must be matched with an influx of significant funding and a step-wise increase in the functionality and quality of the underlying applications.

The applications that constitute a smart community need to represent the interests of the community it serves. Many of today's groups must make a concerted effort to move beyond their current scope, which often represents only the interests and views of the people who organized and built the technology. The programs that will succeed in the long run will be those that have maintained a focus on the multiplicity of needs in the community and have effectively engaged the full spectrum of their neighbors.

The key to the successful implementation of smart community applications is to focus on demand issues. People are looking for results, solutions to their problems - not network access. That means seeking out and involving those individuals in the communities most capable of making things happen and ushering in changes. What's needed are people who are willing to ask what is needed and get things done. The buy-in from community leaders is the best insurance that the applications can address the broad range of challenges posed by the community.

The goal of a smart community is to leverage the synergies among these institutions and the existing community infrastructure to expand and enhance economic and social activity. The community infrastructure consists of the institutions and services that support the needs of the community. Examples include: expertise and training, capital resources, technology institutions, and physical infrastructure.

It can be argued that the telecommunications infrastructure, necessary to empower development of a smart community, is already in place. However, these telecommunication elements are floating independently, needing to be brought together for improved communication, coordination and hopefully collaboration. The ability to structure an environment that fosters new application development requires significant

skills in the arena of "organizational development". Organizational development must be considered strategically or else tremendous energy can be expended and wasted in the process of organizing and leaving little energy for the actual mission of the enterprise.

Purpose

The purpose of this chapter is to determine the current "best practices" for a smart community. To understand more deeply the actual applications of the best practices, an analysis of specifically identified cases will be conducted subsequently. The objectives of this document are:

1. Establish a "broad brush" scope of existing thought. What are people thinking about the future of communities?

2. Review the relevant literature about smart communities. What projects are being held out as success or failures? In each of the areas of focus: what does the literature say is the best and the worst?

3. Conduct a representative inventory of smart community projects. What is the range of these projects and how realistic have these various projects been?

4. Conduct a case study on the needs of a city to become a smart community. Who are the people who would be doing the work and implementing the ideas? What organizations tend to take the leadership roles and what are their motivations?

5. Highlight the key technological, sociological, and economic impacts.

Cautions

Though proponents are enthusiastic about the potential of smart communities and the general consensus is that they can make a positive contribution to people's lives at the city or neighborhood level, critics have raised important issues. Critics question whether electronic communication will replace what little face-to-face contact there already is between people; they also see networks and communication technologies in general as a serious threat to society. They fear that these networks will only further isolate and distance us from our neighbors. There is also concern that increased use of technology will create a division between those who can participate in the discussion of community and governance and those who have no access to the system. They question whether these new systems will disenfranchise parts of the population even further and whether the word "community" only means traditional computer users who are usually upper-income, male, and young.

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Discussions about economic models have also been substantive and useful. Individual communities are begining to address what sort of access they want to subsidize for what groups of people. Many community activists have passionately and convincingly argued for no-cost availability of basic services; indeed, this question is being debated on a national scale in the Federal Information Infrastructure Task Force. Whether these concerns can be overcome will determine if there is enough "critical mass" to sustain the growth of community-based applications. To spur demand, a critical mass of applications and functionality is needed to promote the sustained development of a Smart Community.

The Participants

Who are the people “doing” the work and implementing the ideas to create smart communities? What organizations tend to take the leadership roles and what are their motivations? This section describes the major players within the community who are grappling with the challenges of Smart Communities.

COMMUNITY NETWORK ORGANIZATIONS

These are groups of people who are using the existing technology infrastructure and are taking an active interest in shaping the design of new network systems. Their motivation is centered around the following areas:

- The desire that the online medium be one in which public access and content generated by the public are protected.

- The desire to create important local content not available on other kinds of networks.

- The desire to bring together people within local communities and focus their attention on key issues within the community for debate, deliberation and resolution.

- The desire to organize human communication and information relevant to the communities' needs and problems on a timely basis.

- The desire to engage and involve - on an ongoing basis - the participation of a broad base of citizens.

- The desire to include people in low-income neighborhoods, those with disabilities or limited mobility, and the struggling middle class.

- The desire to make basic services available at a fair and reasonable cost, for broad-based access within the community.

INFLUENCING ORGANIZATIONS

The public sector, non-profit institutions and advocacy groups are coordinating various community resources both in the role of a supervisor and as a supporter of new programs. Their motivation is centered around the following areas:

- The need for governments to find effective, inexpensive ways of disseminating information to citizens.

- The renewed importance of community and local initiatives as focal points for problem solving and identity.

INFRASTRUCTURE PROVIDERS

Several business organizations are involved in supplying products and services to both businesses and residents. These companies include such groups as Internet providers, telephone companies, and cable operators. Their motivation is centered around the following areas:

- The interest of major telecommunications providers is in growing new markets that require expanded use of phone lines.

- The desire by local and national arms of the public broadcast network and local cable access providers to extend their reach into cyberspace.

BUSINESS CONSUMERS

Companies, not directly involved in providing technology, see an opportunity to leverage existing infrastructure in innovative ways to meet new market demands. Their motivation is centered around the following areas:

- To stimulate and support new business development and the expansion of existing industry clusters, to attract new industry, and to assist communities in preparing for the contingencies these activities require.

- The emergence of the Internet as the primary, interlinked telecomputing network.

COMMUNITY IMPACTS

What are the key technological, sociological, and economic impacts of the various smart community initiatives? This section reviews some of the effects that communities can expect to encounter as they try to implement smart community applications. There is no one technical solution that is right for all communities - or even for all communities within a region. In a very real sense, community leaders are all re-learning the lessons of how organizations have to adapt their thinking . . . away from the centralized model for information systems to a much more distributed approach, where the functionality is vested in each department or user. Centralized systems fall short when the key is local ownership of information, interconnection, and seamless interoperability. Systems designers must move beyond the one-system approach, and act as the integrator of community services, rather than the controller. The community network may provide one central system, but more important is providing the enabling technology to interconnect - thereby allowing networks run by schools, churches, libraries and the like to work with the clients of these networks. It is this core system, as well as internetworked connections

and information integration capability, that will typify the successful community networks of the future. By letting activity be physically farther apart, yet functionally very close, technology such as trains, electric trolleys, cars, and trucks helped shape the first industrial city and later helped create the first mass production metropolis. Today, information technologies are playing a similar role.

Technological development has not been a continuous process, but rather has been one in which clusters of infrastructure emerge in fits and spurts. Community development has likewise been driven by transitions that redefine urban hierarchies and bring new types of specialization to a region's economic base. As a result, the pattern of development has not been a smooth evolution, but has been marked by cycles of major transformations. Technological and sociological change is likely to continue to exacerbate uneven community and economic development patterns. Therefore, stronger linkages between all parts of the community are needed more now that it is understood that the community is not a collection of small, nearly self-sufficient entities, but is a truly organic system of inter-related components. The unfortunate fact is that only five percent of U.S. local governments had written telecommunications plans outlining the opportunities for better community integration.

SOCIOLOGICAL EFFECTS

There is a growing view that the strands of community life are unraveling--violence, alcohol and drug use, crime, alienation, degradation of the political process, and ineffectual social institutions area increasingly accepted as inevitable. Computers and communication technology are often touted as saviors of the modern age, but the benefits of the "computer revolution" are unevently distributed and the lack of access to communication technology contributes to the widening gulf between socioeconomic classes. Some advocates believe that computer technology in concert with other efforts could play a role in rebuilding community life by improving communication, economic

opportunity, civic participation, and education. Whether these aims are realized will depend to a large degree on a diverse group of community leaders, whose experience and expertise make them vital participants in the development of future systems. In contrast, cities that will not or cannot adapt run the risk of being left behind of face stagnation or decline.

Community members and activists all over the world have developed and are developing community-oriented community networks with a local focus. These community networks, some with user populations in the tens of thousands, are intended to advance social goals such as building community awareness, encouraging involvement in local decision making, or developing economic opportunities in disadvantaged communities. They are intended to provide "one-stop shopping" using community-oriented discussions,question-and-answer forums, electronic access to government employees and information, access to social services, email, and in many cases, Internet access. The most important aspect of their community networks, however, is their immense potential for participation.

An ad hoc alliance of librarians, educators, network and bulletin board systems users, community activists, social service providers, government agencies, and concerned computer professionals is developing around the community network issue. Several distribution lists now exist on the Internet providing active forums on these issues. There are an increasing number of conferences and workshops on these topics, including two influential round tables organized by Richard Civille for Computer Professionals for Social Responsibility and for the Center for Civic Networking. Organizations increasingly are rallying around this issue.

ECONOMIC EFFECTS

No opportunity is as great as that posed by the newspapers, libraries, local television and radio stations in the local communities. The newspaper business and

television networks, in particular, possess a vast amount of local information about the community - probably much more than other organizations could amass without great expense and effort. Clearly, should the newspapers, libraries, television, or radio stations consider providing substantial information applications, they could pose a formidable - if not dominating-influence to current applications. Of course, in a more positive sense, these institutions could be their own greatest collaborators. The local news media in particular can be valuable partners, given their understanding of how to frame local issues and concerns and their vast repositories of locally relevant knowledge and experience. The challenge to leaders in the community is to recognize that they are in an extremely dynamic and fluid situation - politically, economically, socially, and technologically. Competition for access to the local community will be real. As in all other walks of life today, the community-based network solutions should be looking at the local and external collaborations that will enable it to continue to serve its community.

Second, new ways of working will have an impact on cities, but that impact will be more pronounced in some sections of some cities than others. New technology is as likely to be a force for continuity in the structure of cities (with more "intelligent" vehicles, telematics for transport systems, and new propulsion technologies) as a force for change. The reasons for access to city centers in the wealthier parts of the world may have changed, but the imperatives for access will remain. Personal preference and economic forces will combine to make personal motorised mobility still the first choice and public transport-a congestion and poverty related alternative.

Adaptation of people, institutions, and the built environment will be important to community economic survival. In particular, new local and regional strategies are even more critical if communities are expected to respond to these fundamental changes. Efforts to better integrate the social and economic prospects of distressed communities and the lives of disadvantaged people are an amalgam of disjointed activities, usually with very little overlap, cooperation, or coordination. Moreover, many economic and

community development programs do not work closely with industry and, as a result, have limited effectiveness. These programs are often bureaucratic, content with supplying general information rather than real services, passive in orientation, and uncertain in how to develop working relationships with private firms. The best programs are customer-oriented, focused on continuous interaction with all community leaders, and flexible to respond to changing user demands. Non-governmental organizations and public-private partnerships often do this best. Efforts are underway in a number of locations throughout the world to develop partnerships that build closer ties among industry, education, healthcare and local government. These partnerships have played a key role in bringing community leaders together and marshalling the resources of the region.

SUMMARY

Communities marshaling these requisite human and economic resources to become “smart” will become the models of enlightened urban development in the early 21st century. Their transformations may be less motivated by a desire to be innovative than by a desire to survive. Therefore, planning for smart communites needs to commence now.

Chapter 2
Telecommunications Project Review: Cluster Analysis

Introduction

This chapter describes information projects and issues that spawned these efforts. The catagories created below are not been to suggest that such projects are insular. Rather many projects are cross-programmatic and ofter a number of information services outside of its given category (Government, Education, Health Care/Wellness and Business/Industry). Such a classification system was merely created for convenience and to examine issues particular to that cluster. In addition, this literature review does not intend to be exhaustive. Rather, its intention is to provide a sampling of representative projects projects nationwide.

Government and IT

These are not easy times for government. The federal budget deficit has been a serious economic problem and political fact of life for many years. Until recently however, states and localities escaped chronic deficits. Most state deficits resulted from one-time shifts in spending or revenue that could be addressed within the confines of a single budget year. By the early 1990s, it had become clear that something else was happening. In 1991, New York posted the nation's largest-ever state budget deficit, $6 billion--its fourth consectutive multibillion-dollar shortfall. The following year, California set a new record for state budget deficits--$11 billion. According to the Center for the Study of the States, most states now have "structural deficits" (Gold, 1991). They are not facing occasional mismatches between spending and revenue. Instead, their tax systems now are unable to produce enough revenue to maitain current services.

To complicate matters, public expectations for the level and quality of government services were formed in better economic times. Those expecations have grown while satisfaction with their fulfillment has steadily declined. In the past few years, it has become evident that cutting fat, eliminating waste, and preventing abuse--the management watchwords of the 1980s--are not nearly enough. Government needs to rethink its methods and restructure its approach to providing services. In the past, major operational reforms have rested on the infusion of new tax dollars and new people. Today, these solutions are no longer available. Communities need to learn to make more effective use of a fixed or shrinking pool of public dollars. Improvements in operations and services must occur within these resource constraints.

To meet the rising tide of dissatisfaction and ever-increasing costs, government managers of the 1990s need more than admonishment to change their thinking. They need new tools for designing and managing programs. Strategic use of information technology may offer one of the few promising options for lasting improvement. Although technology has been a means for past innovations, it has typically been used to "computerize," to automate existing processes without significantly improving them. To adopt a popular metaphor, we have paved over the old cowpaths without asking where the best pastures are or whether we ought to be farmers. This is where the public-sector conversations about smart communities begins.

Federal Support

Around the world, there will most likely be a variety of models of state intervention to build the Information Society. Small nations like Singapore, with its IT 2000 aspirations, and Hong Kong are bounding down the superhighway with considerable government support. France, in the traditions of the grand projet, is considering a F600b scheme to connect every household and business with fiber-optic cable. In the UK, the Millennium Commission is dispensing largesse to imaginative telematics projects pushed forward by combinations of local authorities and businesses. A similar but arguably less random approach is adopted by the European Commission through its structural funds and telematics applications programme.

In the United States, the Clinton-Gore Administration has supported government initiatives which contribute to the delelopment of smart community ventures. Its three chief instruments consist of White House publications outlining the criteria for National Information Infrastructure (NII) and Global Information Infrastructure (GII) action plans, programs facilitating communities' creative integration of IT, and reports evaluating users' needs. In the document *National Information Infrastructure: Agenda for Action*, the Administration envisions the NII as enabling "all Americans to access information

and communicate with each other using voice, data, image or video at anytime, anywhere" (p8). It states that the value of a NII depends on the quality of its components including content, navigational tools, applications, network interoperability, and private sector leaders (*The National Information Infrastructure: Agenda for Action*, p9).

Benefits of the NII can be both economic--in terms of an increase in jobs, GDP, technological leadership, government operations, efficient electronic commerce--and social--in terms of promoting research capabilities, health care reform, an informed electorate, and universal access to services (*Agenda* p27-31). To promote these changes, the proposed principles for NII development include private sector investment, competition, open access, universal service, and flexible regulations (*Agenda*, p1).

With the progressive visions of the Administration, numerous communities are being directly supported to create innovative "Information Superhighway" on-ramps. For example, the Telecommunications and Information Infrastructure Assistance Program (TIIAP), supervised by the National Telecommunications and Information Administration (NTIA) and in 1994 awarded $24.4 million in matching grants to 92 nationwide community projects which seek efficient use of IT. The program delegated $35.7 million to 117 projects in 1995. Communities' response to the offered financial assistance has been staggering considering the TIIAP is a relatively new program; there were over 1,070 applicants in 1994, for the 1995 round there were about 2000 applicants.

Several main categories received consideration by the government. The breakdown of the 1994 award recipients and the number of funded projects includes the following: Community Information (27), Health (14), Government (15), K-12 Education (14), Higher Education (7), Libraries (5), Social Services (2), Public Information (4), Arts & Culture (2), Science (1), Public Safety (1). For 1995 (see Table 2), the categories varied only slightly: Community Networking (28), Health (12), Government (7), K-12 Education (20), Higher Education (13), Library Services (8), Arts & Culture (1), Public Safety (5), Human Services (9), Economic Development (12), Statewide or Local

Infrastructure Planning (1), Other (2). The categorization of distinct sectors demonstrates the Administration's effort to further technological, economic, and social development within communities.

As a complement to the TIIAP objectives, the Administration has supported "needs assessment" reports of communities at risk of lacking vehicles to travel the evolving infrastructure. For example, the Institute for Telecommunication Sciences (ITS), a research and engineering department under the NTIA, prepared a report entitled *Survey of Rural Information Infrastructure Technologies*, which analyzes problems facing rural communities. Since approximately 20% of the US population, or 52.4 million people, reside in nonmetropolitan counties which consist of an estimated 80% of US land, a substantial number of people lack access to information via IT (Survey of Rural Information Infrastructure Technologies, p9). The ITS report concludes that the geographic isolation may result in an decline of a community's economic base, personal income, workforce particpation, and retention of talented individuals (p7).

These afflictions are also endemic to other information-poor communities such as inner cities, which have been traditionally regarded as unprofitable, and consequently, undesirable by the private sector. The telecommunications services and information applications which the ITS defines are of interest to rural users, are also vital elements for poor socio-economic groups. The services include voice and audio, computer, and video telecommunication services; the applications embody electronic mail, remote access to computer-based data, distance education, Local Area Network interconnection, electronic commerce, and electronic government (*Survey of Rural Information Infrastructure Technologies*, p10-15). Fortunately, as evidenced by several state and local smart community projects, IT initiatives are not limited to geographically, economically, and socially desirable cities.

The most interesting TIIAP-financed initiatives, and possibly the most beneficial to communities, are those which forge diverse private-public partnerships. These act as

an information bridge between the private sector and rural towns or inner cities, and indirectly produce a second-tier of networking projects. For the communities to reap the full benefits of the IT-rich plans, the projects which are diversified by experimenting with as many communication applications as possible will best assess the needs of its members.

The San Francisco Public Library exemplifies the use of several private and public partners as well as various communication applications. It is constructing an automated system to provide health care, cultural, and educational services. The Library's partners include city departments such as Recreation and Parks, Public health, the Unified School District, Public Housing, and the Mayor's Office of Children, Youth and Families. The transit system, Pacific Bell, the San Francisco Arts Commission, and Citywatch 54, the city's cable channel, are also associates.

New technology also enables various communication transactions to be utilized by geographically-dispersed users via one initiative. The Native American Public Broadcasting Consortium, Inc. plans to connect an estimated 500 nationwide Native American tribal governments with attention to telemedicine, economic development, child care, education, cultural preservation, and government services. The State of Alaska supports the Southeast Alaska Network which will link seven isolated communities to the Internet, the state library and government offices, and to information on health, education, community services, and commerce. The mission of this project is to provide the residents with affordable Internet access and tools "necessary to broaden their daily lives (Fiscal Year 1995 Grant Awards, p2)."

Federal government policies also indirectly support a second-tier of networking projects. For example, the National Public Telecomputing Network (NPTN), strengthened by a 1994 TIIAP grant and the Administration's goals, is a non-profit organization "dedicated to the development of public-access community computer systems." It provides financial and logistical support for local Free-Nets, which is

described as multi-user systems designed and operated by the community. Although the federal grant will help NPTN finance twenty rural Free-Nets, the organization has pursued its own initiatives. It has created Rural and Metro Information Network "starter" packets and it collects data on nationwide Free-Nets.

State/Local Support

State and local governments have also independently launched IT initiatives to benefit citizens. For example, in August 1994, Washington State's Department of Information Services (DIS) teamed up with IBM and 19 state and federal agencies to provide information-services kiosks ("Public Sector," p23). The ten permanent, and one "floating," kiosks offer 42 services including information on student loans, vehicle registration, and licensing procedures. George Lindamood, director of DIS, states that it is promoting other agencies to enable direct citizen access to government information and services. Not only has DIS advanced the relationship between government and communities, the kiosk project, which DIS evaluated had been primarily utilized for job search applications, educates state officials regarding the needs of their constituents. In Iowa, the Iowa Communications Network (ICN) is a 3,000 mile state-owned two-way full motion interactive fiber-optic network (DS-3) connecting each of Iowa's 99 counties with data, voice, and video services. As of September 1995, the ICN consisted of 129 video sites, providing all Iowans nearby access to geographically distant resources. These sites are located at school districts, public and private institutions of higher education, and at area education agencies. Part III of the ICN calls for connections to additional public and nonpublic schools, remaining area education agencies and selected public libraries.

California, in particular, has a number of state agencies that are encouraging the adoption of telecommunciations-related initiatives. A recent Governer's Council on

Information Technology report ("Getting Results") focused on how information technology can be used to increase government efficiency; improve the public's access to government information ans services; and improve education for K-12, post secondary, and lifelong learning. In addition, the Council's report examined government regulatory and procurement policies affecting private investment in telecommunications infrastructure in California, and how they can be changed to promote the lowest cost and highest quality of telecommunications services.

In 1992, the California Council on Science and Technology launched Project California, an initiative to position the state as the world leader in research development, production and deployment of communications technologies. The Project California study indicated that in order to attract new businesses in the advanced telecommunications sector, California must provide an advanced infrastructure of interoperable networks, and that it must create a market environment that promotes innovation.

In recent reply comments to the California Public Utilities Commission proposal to change universal service rules, the California Department of Consumer Affaris (DCA) recommended that the additional subsidies collected from the federal government as a result of improved recipient verification procedures--approximately $52 million dollars worth--could be used to ensure that education, libraries and government in the state are early recipients of advanced information technologies. The DCA suggests that a coordinating entity be created that would bring together private industry, local governments, community organizations, educational institutions, and various state agencies to build a state-of-the-art telecommunications network through which all of California’s businesses and consumers might have access.

Finally, the California Department of Transportation (Caltrans), for example, published in 1994 a transportation plan recommending the state "Develop a Highway Alternative." The document describes the potential for telecommunications to expand mobility by bringing information and services to the consumer. It describes how enhancing mobility and linking people will not only improve business, it will also improve prosperity, adding to the quality of life by increasing productivity, making it easier and more efficient to live and work in a "wired" environment. Caltrans is also currently involved in a number of community networking projects in the Sacramento/Davis, Los Angeles and San Diego regions. The projects exemplify the Departments mission while creating opportunities for economic prosperity throughout the state.

Regional Initiatives

Despite the lack of a statewide initative to build a broad-based telecommunications infrastructure, the state of California has a number of community networking initiatives and regional public/private efforts to implement technology-based strategies .

San Diego: City of the Future

The San Diego-Baja (Mexico) region has taken a major step toward becoming a telecommunications hub on the Pacific Rim. A regional 1992 study, "San Diego in the Global Village," concluded that development of a regional telecommunciations infrastructure is vital to the local economic development as the country moves from a manufacturing-based economy towards a service-based economy. The follow-up “City of the Future” study (1994) determined that unless San Diego can bring the full benefits of advances in telecommunications to businesses, government and individual consumers,

it will fail to capitalize on these opportunities. Specific recommendations of the 1994 report were to:

- Establish a private/public partnership
- Develop a Telecommunications Policy Office
- Accelerate government use of telecommunications
- Establish a federal/state funding task force
- Identify and reward private initiatives
- Continue the study effort: the role of telecommunications in the San Diego region
- Maximize San Diego's human resources: education and defense conversion
- Blur the borders (political and geographic)

The study concluded that "economic and social rewards will go to the . . . regions that organize themselves to participate effectively in the information-led economy." Since the publication of the study's recommendations, the City of San Diego has issued a RFP to build a broadband communications grid that will may together a number of public and private networks and provide for various business, government and consumer services. Notable of the City of the Future effort is its developing collaboratory: The project is being implemented under the umbrella of the San Diego-Baja Communications Council. Its membership, numbering several hundred, brings together global corporations, local businesses, educational entities, local government and others to foster and develop a regional information infrastructure plan.

San Francisco Bay Area

Smart Valley, is facilitating the creation of an electronic community by developing an advanced information infrastructure and the collective ability to use it.

Smart Valley, Inc., is a 501(c)(6) nonprofit organization that acts as an independent, unbiased broker between technology providers, service providers, application developers and end users. Smart Valley, Inc. was one of the first initiatives launched by Joint Venture: Silicon Valley Network. The Smart Valley vision is to create an electronic community by developing an advanced information infrastructure and the collective ability to use it. The goal is to facilitate the construction of a pervasive, high speed communications system and information services that will benefit all sectors of the community -- education, healthcare, local government, business and the home. The infrastructure to be implemented will help transform the way people work, live and learn. The technologies and products will be marketable around the world as more and more communities move into the information age.

Smart Valley, Inc. is building awareness of the potential of new information technologies and services to the community and stimulating applications of the new technologies that demonstrate the value of the network. Smart Valley, Inc. is working with more than 20 pilot initiatives focused on demonstrating applications of information technologies in such areas as telecommuting, education, healthcare, government, multimedia and electronic commerce.

Smart Valley, Inc. is working with national and local governments to resolve public policy issues that affect the implementation and management of the information infrastructure. Smart Valley, Inc. is helping broad elements of the surrounding community understand the potential benefits and social challenges implicit in the information superhighway revolution. It is also facilitating grassroots efforts that identify and implement a diverse set of applications by a broad range of users in business, government, education and the community. Smart Valley, Inc. is also working with equipment providers and software developers to ensure that the information infrastructure is implemented in Silicon Valley to meet the needs of end users.

Also in the Bay Area, the Public Access Network (PAN) has brought together a number of interesting elements under the leadership of the Public Library, using sites scattered about the San Francisco Peninsula and Bay Area. The PAN stations are equipped with a map to guide novice users to entertainment, business and government. At The Health Library in the Stanford Shopping Center, the librarians and volunteer staff travel new paths to medical sources. They find interactive material, such as pictures of bright slides of liver cancer, posted to the Internet by a university physician who leaves his e-mail address for responses. At The Health Library, PAN augments the pamphlets and periodical listings on InfoTrac, a CD ROM database of medical information available there for the last six years. At Fry's in Palo Alto, the PAN site is next to the service desk. Since June 1995, public access to the Internet has been offered free at computer terminals in public locations, museums, libraries, shopping centers and retail stores.

Sacramento/Davis

The Net at Two Rivers (N2R) project was spawned in early 1995 to develop a shared telecommunications network that links Sacramento-area municipalities and outlying rural areas via the Internet. The organization's goal is to develop a dispersed, decentralized regional information infrastructure that promotes the open flow of information throughout the 15-county region. Included in the regional partnership is the Davis Communty Network, which with the support of Caltrans, is implementing a testbed community network.

Los Angeles Metropolitan Area

The Southern California Association of Governments (SCAG) has initiated the Telecommunications Cluster Project to devise a coordinated plan in a six-county region for using telecommunciations to help relieve the anticipated traffic congestion and continuing decline in air quality by moving information instead of people.

Telecommuting is the leading example of using telecommunications for trip substitution, but work-related commuting amounts only to 21 percent of regional driving. The Cluster Project is identifying means of utilizing telecommunications to reduce travel in the remaining 79 percent of trips as well.

In conjunction with the Los Angeles County Metropolitan Transportation Authority (LACMTA), the California Department of Transportation (Caltrans) is exploring the concept of using fiber-optic capacity within the right-of-way of the rail line for service delivery and information movement. The Blue Line TeleVillage Demonstration Project will establish telework centers at train stations in South Central Los Angeles. Additionally, through a telecenter at the Antelope Valley Fair, which was originally set up in response to the Northridge earthquake, Caltrans is exploring the potential for using the satellite wagering facilities of rural fairgrounds to provide electronic access to small communities. And through a partnership with the California Community Colleges, they are investigating the links between transportation and college facilities. The program will establish residential area-based offices on college campuses for use as telework centers by non-college employees, as well as for distance education and administrative tele-meetings.

Atlanta Project

The corporate-funded, non-profit, public-policy institute, founded by former President Jimmy Carter, is demonstrating the use of technology in strengthening organizations and in problem-solving. The project has an elaborate computer system for keeping in touch with its 20 widely separated and diverse centers in the inner city of Atlanta. Each of these centers, or "cluster communities", has a computer tie-in with a central collaboration site. The centers use the system for e-mail, training, and conflict resolution.

Colorado Springs CityLink

There are approximately 135 computer bulletin board systems in Colorado Springs that on several occasions have proven to be quite effective at mobilizing opinion and swaying government decisions. Supporters believe that these systems can combine the virtues of the Chautauqua and the New England town meeting in a modern setting, reviving debate in a public that has been numbed by soundbyte politics and apathy. Online computer systems enable people to be activce participants in debate rather than passive observers; this can breed a sense of engagement in place of alienation. Cheryl Gillaspie, one of the two city council members who participates in CityLink's online discussions, believes, "Colorado Springs is at a crossroads in deciding what the proper role of government should be, but there is no consensus. We need an organized forum to know what the people want." Ms. Gillaspie believes the electronic bulletin board could open a needed channel of communication between government and the public.

Education

Education represents the economic backbone of any community. The demand for more cost effective delivery mechanisms for education is expected to dramatically increase over the next decade. The business community has recognized the need for an educated workforce that will support its industries into the next century. Given the drive for global competitveness, education is both an economic development issue as well as a human development issue. No institution is adquately equipped to handle the multiple, often competing objectives of education. But within the immediate community are a number of organizations dealing with the same students and their families, and armed with expertise, constituency support, organization resources, and information. With effective horizontal linkages, departments of social services, health, and economic development, among others, could make important contributions education. These organizations do not necessarily have to grow in order to better serve their constituencies, nor do they need to absorb an ever-increasing share of public resources. Rather, they need to work differently and together. Understanding the range of relationships at work in a given policy area is the first step toward improvement. Once these relationships are well defined, inter- and intraorganizational information systems can provide the linkages necessary for effective action. These, in turn, can help bring about the synergies needed to address the community's problems.

Changing the Curriculum

Schools often have difficulty implementing curricicular change. However, according to Dyrli and Kinnamen, designing a new curriculum "shouldn't be a cumbersome process,.instead, curriculum development should be action-oriented, focused directly on school goals and student activities, and evolving through practice

(1995b)." In 1987, the Saco School District in Montana collectively agreed to a simple goal to "get into the computer age." Today that rural 147-student district is the home of "one of the most innovative classroom technology systems nationwide." Superintendent Carl Knudson explained that "the school board and staff are committed to providing opportunities for students so they can succeed in any area they choose (Kneidek, 1994)." The Broken Arrow School District began planning for technology with a team of 100 people who represented a cross section of the business, parent, and education communities. Two years later that district became the first in Oklahoma to have all of its facilities connected via a fiber-optic network (Hill and Judd, 1995).

Designing a curriculum to foster information technology will may not happen overnight. Nancy Hechinger of the Edison Project stated that changing the school culture to embrace technology may take three to five years (Issue 1, 1995). For example, in the Tucson Unified School District it took five years to implement all of its technology projects (Whitaker, 1995). Even with full implementation, technology projects are unending and ever-changing as was noted at the Second Annual Secretary of Education's Conference on Educational Technology: "Planning should be an ongoing process that involves evaluating current technology programs, keeping abreast of new applications, assessing new needs, and modifying plans accordingly (Issue 1, 1995)."

Collaborative and Interactive Learning

Some of the most important benefits of information technology for students are acquiring the skills of collaborative project management and interactive learning, for these skills are becoming increasingly important determinants of success in the "real world." To this end, New York state has mandated that all of its school districts form shared decision making (SDM) teams of educators, administrators, parents, community members, board members, and students to brainstorm education-related issues (Jones, 1995). In Pennsylvania's Lehigh Valley School District, seventeen business-school

partnerships were forged. One business leader described the goals of the partnerships: "the children [should] understand the value of working in teams and the value of using data for decision making (Faylor, 1995)." According to Strommen, numerous studies confirm "that cooperative learning fosters the development of leadership abilities, a sense of teamwork, and improved self-esteem (1995, 27)." The Global Schoolhouse Project, based in Oceanside, California, uses the Internet and cooperative learning strategies to connect students with shared interests to participate in team projects (Strommen, 1995, 34). The International Education and Resource Network is an international telecommunications network of primary and secondary schools in twenty-one countries in which students work collaboratively to find solutions to global problems (Haakenson, 1994). The AT&T Learning Network groups students and teachers into geographically diverse "learning circles" that share information on math problems across networks (Issue 3, 1995). The development of collaborative and interactive learning programs to prepare members of tomorrow's workforce is enabled even more by telecommunications technology. "Educationally, these technologies allow users to overcome the restrictions of time and place, restrictions that can easily obstruct collaborative, project-based learning (Dyri and Kinnaman, 1995b)." Warren Groff suggests that this solution-based learning shifts the emphasis "from the acquisition of factual information to the solutions of problems and learning to learn through problem solving (1994)."

Access

Telecommunications networks can remove obstacles to access faced by rural students and by students in disadvantaged neighborhoods (Vedantham and Breeden, 1994). Decisions that school districts and states are making right now will determine whether technology becomes a wedge that divides the advantaged from the disadvantaged communities or the bridge that closes gaps between the technological haves- and have-nots (Issue 1, 1995). Educational writer Lee Caudell described the

limiting effect of classicism that telecommunications can overcome when she related that "a poor child attending a run-down inner-city school on the West Coast could access the Library of Congress with a wealthy child attending an elite prep school on the East Coast." The separation caused by political borders is breaking down as well, as Caudell further points out, "A rural teacher in Montana could chat on-line with an urban teacher in Alaska. Or New York. Or France (1994)." Linda Morra, Director of Education and Employment Issues for the Department of Health, Education, and Human Services testified recently that "to prepare the nation's children and teenagers to be competitive as workers in the 21st century, experts and business leaders say modern communications technologies need to be part of America's elementary and secondary education, not just the sole province of a few special schools (1995)."

Integration of Information Technologies

Educational technologies, when implemented, have often been placed in such a way that access is more of a privilege than a necessity. Many schools today place a majority of their computers in computer labs rather than individual classrooms. This problem is compounded by the reality that, generally, a sophisticated educational telecommunications infrastructure is overlooked by most school administrators: fewer than one teacher in eight has a telephone in the classroom (Chapter 3, 1995). In Ramona, California, it was discovered that one elementary school had such an old electrical infrastructure that if four teachers used their classroom electrical outlets at the same time, the school's breakers would trip (Morra, 1995). In 1995, the National Center for Educational Statistics reported to the Secretary of Education's Conference on Educational Technology that while 35% of schools had some form of Internet access, only three percent provided access in classrooms and other instructional areas (Issue 1, 1995). Experts have suggested that schools that are designing information technology systems should extend the infrastructure to the classroom, rather than a technology lab (Issue 4,

1995). Some educational technology programs have even integrated technology beyond the classroom. The Christopher Columbus School in Union City, NJ, provides every student with a home computer. The Buddy System project in Indiana has placed computers in the homes of some 6000 fourth- and sixth-grade students, and now banks are offering low-interest loans for other families to purchase their own computers (Issue 1,1995).

Funding

One of the greatest obstacles facing educational facilities in acquiring telecommunications technology is cost. Of course, this barrier is not a new one for the educational establishment. In 1983, Charles Self pointed out the difficulties in implementing personal computers into the classroom when they were first introduced to the market, "The most obvious barrier to the implementation of new technologies is cost...the initial investment is quite high." Additionally, the nature of hardware and software development requires a constant reinvestment strategy making budgeting a difficult process. Despite the fact that in 1993, approximately twenty-five percent of all K-12 courses in the US have introduced technology into the curriculum (SPA issues education..., 1995), much of the equipment is too old to utilize the newest applications. According to Jeanne Hayes of Quality Education Data, in the 1994-95 school year, nearly 46 percent of the computers in school inventories were Apple IIE vintage, used mostly in early elementary grades (Issue 1, 1995). These outdated computers cannot support CD-ROM sized databases or networked integrated systems which are needed today (Chapter 3, 1995). One of the reasons for the large number of outdated equipment is that it is often donated by companies that have upgraded their computer hardware. In fact, there are organizations whose sole job is to act as a broker between technology donors and receivers.

To assist schools in technology acquisition, the federal government provides many programs from the different agencies such as the Department of Education, the NSF, the Department of Energy, the Department of Commerce, and NASA. State governments have also helped education adopt new technologies. Florida spent $73.5 million over three years to develop a networking infrastructure in little over 10 percent of its schools. New York State spends about $14,000 per school to network its schools. TENET, the Texas Education Network, has an annual budget of about $4.5 million and supports 43,000 users in 21 cities (Issue 4, 1995). However, some successful telecommunications-based programs have not limited their funding to the public sector. The Global Schoolhouse has partnered with businesses like MCI, Sprint, AT&T, Aldea Communications, and Microsoft (Global Schoolhouse, 1995). Tele-learning Infosource (Telis) has partnered with MCI and GTE to move "California into the 21st Century," according to Telis president Keith Vogt (MCI to bring California..., 1995). 3Com of Massachusetts has partnered with surrounding community schools and provided matching grants to others to connect them to the Internet. 3Com CEO Eric Benhamou expressed his company's commitment to education recently by stating, "3Com is a large and expanding employer in Massachusetts and we are committed to leveraging our expertise in building enterprise networks to partner with concerned educators and parents to create an exciting and instructional motivating educational experience for our children (3Com Corporation..., 1995)." In Boulder, Colorado, Valleylab Inc., a local subsidiary of Pfizer Corp., donated $15,000 to the local school district for T-1 phone connections. Interestingly, the one stipulation to the donation was that when Valleylab established Internet access, students were required to show the ValleyLabs employees how to browse the World Wide Web (Trotter, 1995). In Raleigh, North Carolina, the *News and Observer* and locally based long-distance phone service provider BTI have made an on-line informational network available to schools throughout the state at no charge. The newspaper hopes students will initiate subscriptions when they graduate and, in the

short-term, is hoping that the students will install the software at home for family use (Garneau, 1994). Pacific Bell, AT&T, Atlantic Bell, and other telephone companies have offered free services, even if only for the start-up period (Naik, 1995; Pacific Bell, 1994, Bell Atlantic, 1994). Recently, President Clinton appealed to the business community to help link every California school to the information superhighway by June 1996 (Saillant, 1995).

Additional Implementations

Big Sky Telegraph: Frank Odasz of Western Montana University in Dillon started the Big Sky Telegraph in 1988 by electronically linking one- and two-room school houses across Montana. Now a fully distributed system consisting of "Big Skies" and "Little Skies," Big Sky Telegraph is an "action-oriented rural telecomputing testbed" designed to overcome some of the problems of the rural American western states related to sparse population and long distances between communities. Big Sky Telegraph's approach is to use appropriate technology to demonstrate "low-cost, low-tech, high-imagination, scalable, networking models." Education is the key and economic opportunity and self-sufficiency are the goals. Big Sky Telegraph offers 600 K-12 lesson plans and serves as a "telecurricular clearinghouse" for K-12 projects running on networks all over the world. It uses the telegraph metaphor, an approach reflecting the influential communication technology of the last century. As their brochure on "Homesteading the Educational Frontier" states, "Teachers in rural Montana serving as circuit riders, community telegraphers, and teletutors have used modems to overcome time, distance, and economic limitations to empower rural education and community survival through the Big Sky Telegraph network."

Iowa Star Schools: Star Schools is a national program that encourages quality instruction through distance education technologies. The program focuses on increasing opportunities for instruction in mathematics, science, foreign languages, and other subjects such as literacy skills and vocational education to underserved populations, including disadvantaged, illiterate, limited English proficient, and disabled students through distance learning technologies. In 1992, a partnership of Iowa educators sought to take advantage of this grant opportunity by writing a Star Schools grant proposal entitled "Iowa Distance Education Alliance: Partnerships for Interactive Learning Through Telecommunications in Iowa's Elementary and Secondary Schools."

The partnership included representatives from Iowa Public Television, the Iowa Department of Education, public universities, community colleges, area education agencies, independent colleges and universities, and local school districts with support from teacher, administrator, and school board professional associations. Iowa's proposal was unique in that instruction could be carried over a statewide two-way full motion interactive fiber optic telecommunications network, the Iowa Communications Network (ICN). On September 24, 1992, the efforts of the Alliance were rewarded with a four million dollar grant award. Additionally, on September 23, 1993, Iowa received Star Schools funding for a second year.

The goals of the Iowa Star Schools project include: coordinating distance education over the ICN; promoting awareness and understanding of the ICN; preparing and supporting teachers as they use distance education; electronically connecting educators to state, national and international telecommunications networks; improving and increasing the opportunities for instruction in mathematics, science, foreign languages, literacy skills, and vocational education; and establishing a program of research and evaluation to document the impact and effectiveness of distance education over the ICN.

Public Libraries: Seattle's public library Internet-training courses - "Driver Education on the Information Superhighway" - are packed. So popular are the courses with senior citizens that the library is teaming with the American Association of Retired Persons to teach seniors how to get their fellow seniors online. Other library services include kiosks with access to state and local government data and a link to the city's geographic information system. After the Seattle library garnered headlines for putting the homeless online, the Clinton administration picked it as a test site for the White House home page on the World Wide Web.

From Seattle to Boston, public libraries nationwide are helping patrons move forward into the brave new world of cyberspace, CD-ROMs, and digital data. In Maryland, for example, a library project called Sailor has made that state the first to offer free Internet access to all residents (gopher to sailor.lib.md.us). The $ 2 million program lets users tap a gopher menu that includes government agendas and archives, weather reports, job listings, tourism tips, and education and economic data. Adding an electronic-mail account to the free basic service costs just $ 35 a year; full Internet access is $ 100 a year. Eventually, the Maryland Library Community hopes to offer dial-up access from kiosks in supermarkets around the state.

But Maryland is just the leading edge of libraries online. The Commerce Department's Information Infrastructure Task Force recently identified libraries as one of seven key areas in providing equal access to the National Information Infrastructure (NII). And President Clinton, in his 1994 State of the Union Speech, set a goal of connecting all the nation's libraries to the NII by the year 2000. The public, too, sees libraries as essential way stations into cyberspace: A 1994 survey for MCI found that consumers rated being able to connect to libraries and educational materials as the top priority for the "information superhighway."

There is a long way to go, however, according to an ALA survey. Although 79 percent of public libraries serving cities of 100,000 or more offer CD-ROM database

services and 60 percent boast online public-access catalogs, only 29 percent have remote dial-up access. And the inroads of information technology drop off sharply outside metropolitan areas. Nationwide, only 20 percent of the US' 15,872 public libraries have some connection to the Internet, and a mere 9 percent link patrons directly to the Net.

Libraries are looking to corporate America for help. MCI's LibraryLink program has given libraries in eight cities $500,000 in computers and training. IBM is giving equipment to the New York Public Library. Bellcore has hooked up 32 libraries in Morris County, N.J., to the Internet. And Bell Atlantic helped wire the library in Blacksburg, Va., as part of its $ 7 million in assistance in making that town one of the nation's most-wired communities.

In Illinois, for instance, a $ 2 million state grant launched Illinet, a statewide catalog of 5 million titles from 800 public, academic, corporate, and research libraries, all just a modem call away. Now, more and more public libraries are adding the Internet to their online public access catalogs (OPACs). The Carnegie Library of Pittsburgh put an Internet menu on terminals in the library early in 1994, then extended access to dial-in patrons. Users can choose between Caroline (short for Carnegie Online, the library's own catalog) or Sesdial, a Net-connect product that brings up a menu of 15-20 Internet sites. Included are the Library of Congress, the local Free-Net (which the library also helped launch), local university libraries, even an AT&T 800-number directory.

Other public libraries across the country have done similarly: the Cleveland Public Library and Baltimore's Enoch Pratt Free Library let patrons go Net-surfing. Terminals at all of the San Francisco Public Library's 30-plus branches offer Internet access. In St. Charles County, Mo., the Westplex Information Network plans to have 10,000 registered users accessing community information and the Internet via eight branch libraries by the end of its first year.

Faster, flashier access may be coming to your local library by cable modem. The Global Electronic Library, from Jones Education Networks Inc., lets libraries access

digitized data up to 60 times faster than by standard modems. GEL will launch pilot projects this year in Alexandria, Va., and Los Angeles, with 1996 plans for libraries in New York, Chicago, Albuquerque, and Miami. Special marketing drives will help raise the $ 50,000-$ 60,000 hookup costs for the system, which GEL envisions expanding someday to homes and offices.

But it's not just catalog data or even the Internet that public libraries are making available to patrons online. Visitors to the Clinton, Iowa, public library can tap a statewide BBS of 1,500 job listings. In Pennsylvania, small businesses without their own corporate libraries can turn to Business InfoNet, a project of the Reading and Berks County public libraries and Metropolitan Edison Co. The Boston Public Library posts a guide to the more than 5,000 free events held each year at the library and its branches on BOSNet, a local BBS. The Greene County Library in Springfield, Mo., uses library terminals to access a database of events not just in the library but throughout the region.

The J. Robert Jamerson Memorial Library in Appomattox, Va., serves a population of only 12,300. Yet the library has made the switch to CD-ROM for almost all its encyclopedias. The library also uses the Internet, through a project sponsored by Virginia's state library, and is a test site for public World Wide Web access. Librarians have used the Net to fill research requests ranging from George Washington's farewell address to speeches by President Clinton to information on the space shuttle.

Health Care

The hope for the future of health care is improved affordability, quality and access through the use of advanced telecommunications and computing technologies for the delivery of services. Health care delivery services and research are information intensive. Health professionals collect, create, and use large amounts of information while caring for patients; the clerical tasks involved in maintaining records are time consuming and divert time and resources away from patient care. Sometimes previously collected information is not available when and where it is needed; the difficulties of communicating information can delay appropriate care or lead to expensive duplication of tests. Health care providers, suppliers, payers, and others manage large amounts of information for administrative purposes, and the costs of processing this information adds to the cost of health care. In addition, providers, payers, medical researchers, and government policy makers need accurate information about the outcomes of various procedures and interventions in order to judge their effectiveness. This information is becoming especially important in decision-making in managed care environments. Consumers, as well, could benefit from information on medical outcomes and on relative costs of care in order to make informed choices about the selection of providers and health plans.

More use of information technology could address some of these information needs. Information technology might improve patient care by freeing health professionals from the burden of clerical tasks and by allowing both clinical and administrative information to be communicated more quickly and accurately. Automation of administrative tasks might help health care providers and payers to monitor and control costs more. Data on the effectiveness of medical interventions could be collected and analyzed more easily using computer-based records with standard

formats or data elements, and appropriate information could be available to providers, payers, researchers, government agencies, and consumers.

While information technology may reduce costs or make some services more accessible, benefits might accrue only after large investments in infrastructure have been made. Further, there are barriers to implementing computer-based applications that may prevent their widespread use or may reduce the level of expected benefits.

Issues of IT Use

The information revolution offers great potential for improving the quality of and reducing the cost for health care. Health care expenditures reached $1-trillion in 1994 in the US, which were almost 15% of the Gross Domestic Product for the year. The annual rate of growth in this spending has exceeded 10 percent for the past eight years [Fitzmaurice, et al. 1994]. The average age, as well as the number of elderly individuals, is increasing in the US and other developed countries. This means an increasing demand for health care services, especially for those in chronic health care conditions. Statistics suggest that the management of chronic conditions alone will make health care unaffordable in its present form within the next decade [Nussey, 1992].

In addition to rapidly rising costs and increasing demands, "explosive" growth in new knowledge, new technology, and new methods characterizes the current practice of medicine. The result is that "the practice of medicine is dominated by how we process information, how we record information, how we retrieve information, and how we communicate information" [Barnett, 1990].

The administration of patient information provides many opportunities for the application of IT to improve efficiency. Currently, patient care information is mainly in paper form. This creates numerous re-entries of data and difficult retrival. This results in expensive inefficiency: "In this paper form, the patient record does not provide the basis

for efficient clinical management, quality control, cost allocation, accurate billing, or clinical or health services research" [Fitzmaurice, 1994].

The principle “better information makes for better decisions” describes the idea behind evidence-based medicine which encourages "...doctors to use treatments that have been shown to work in valid trials" [Vines, 1995]. The information age, with its capability of capturing and organizing vast amounts of data for analysis, can play a key role in determining which medical techniques work best.

Currently, physicians largely rely upon day-to-day experience to prescribe treatment. The sheer volume and current organization of medical information make a formidable challenge for a physician to find accurate and timely analyses were he or she to insist upon it. Vines documents analyses of randomized trials that have shown commonly accepted treatments to be harmful. He found a high correlation between common treatments and years of medical practice. Analysis of current treatments could identify wasteful and harmful procedures. Better information may also enable consumers to play a more active role in improving the quality of health care. Without access to information, consumers must rely on experts and the system to treat their illnesses. Better information enables them to intelligently practice prevention. It further allows them to ensure they do not seek excessive or inappropriate care.

Obviously, better information in itself does not naturally motivate changes in behavior. Informing a physician about a database that evaluates the procedures in his field, or a consumer about a free service that will help him eat better, is only part of the solution. The information must be tied to a feedback mechanism. One effective means is the demonstration of economic incentive. The doctor who practices evidence-based medicine increases his income. The consumer who practices the healthy life-style and strives to use health services efficiently pays less for care. Information technology has the capability to document these practices on an individual basis and provide the appropriate financial feedback.

Standards

A major challenge to effective IT deployment is the complexity of medical practice and its language. One specific project provides an excellent summary of the language issue:

> "The Unified Medical Language System project is designed to facilitate the retrieval and integration of information from many machine-readable sources... [it] is not an attempt to impose a single standard vocabulary; instead, the final produt will be a thesaurus or vocabulary and a set of computer programs that can be employed to compensate for differences in the vocabularies or coding systems used in different computer-based information sources" [Barnett, 1990].

In the US, several groups are working to develop a medical information standard. This effort is slow because it is voluntary, provides insufficient reward for individual firms to develop procedures independently, and suffers from a lack of resources [Fitzmaurice, 1994]. The conversion of medical records storage from paper to computer has also raised many concerns about an increased threat to patient privacy. Centralized databases will offer powerful methods of accessing and sorting information. Prevention of unauthorized access is a central issue. The Federal Government can provide a legal framework through legal definitions of authorized use, strict penalties for privacy violations, and a Federal privacy law to address interstate information flows [Fitzmaurice, 1994].

However, there is a contrary opinion that computer records do not significantly increase the threat to privacy. Its proponents argue that the computer can employ

security procedures to enhance privacy and control the amount of information released to a health-care provider. The technology exists to issue each health-care consumer a card with an embedded security device, allowing her to safeguard a copy of her record. The device's security features would prevent data tampering. Furthermore, there are documented cases of egregious paper-based privacy breaches to offset the concern for computer-based systems [Skolnick, 1995].

Patient Records

A recent article summarizes the current status of this category: "Despite increased use of computers in medicine, the continuing lack of computer-based patient record systems that approach completeness and universality remains a central concern" [Lindberg, et al. 1995]. The Medical Records Institute (MRI) has developed a refined definition for computer-based patient records: It comprises "... five distinct levels of computerization for patient information systems. Each of these levels reflects a particular stage of technological advancement and standards acceptance. It is important to note that at this point in time, Levels 1 and 2 have been achieved, but Levels 3 through 5 (electronic health records) will not be possible for some time."

This article defines the first level as "Automated medical records." In this stage, automation centers around the paper-based system in processes such as:

- Admission/Discharge/Transfer (A/D/T) Systems
- Improved Capture of Patient Information Through Digital Dictation Systems
- Patient Accounting and its Linkage to Clinical Information
- Departmental Systems (such as Radiology Information Systems, Laboratory Information Systems, Pharmacy Information Systems, etc.)

•Order Entry/Results Reporting

The second level introduces the "computerized medical record." Document imaging technology "scans" the paper-based records into a computerized digital format. Replacement of paper addresses the shortage of storage space and introduces database indexing features. The article notes that several hundred facilities have created these records, and successful implementations have increased substantially since 1993. Several vendors provide systems that digitize the records ["Industrial Engineer, 1995]. The MRI article does not expect arrival of the full electronic health record, "a computer-stored collection of health information about one person linked by a person identifier," until early in the next century, 2005 - 2025.

The Computer-based Patient Record Institute (CPRI) also promotes development of computer patient records in the US. It comprises representatives from all sectors of the health care industry. The Department of Veterans affairs has created a hospital information system, the Decentralized Hospital Computer Program (DHCP), which includes integration of patient-record functions. Moreover, the Mayo foundation in Minnesota and Kaiser Permanente in California have initiated programs to build nation-wide computer patient record systems [Fitzmaurice, 1994].

Databases

In the US, debate has occurred concerning one employment of health data called "outcomes research." This method holds that analyzing the current medical databases will provide significant useful information about which medical practices produce the best outcomes. In 1989, Congress created the Agency for Health Care Policy and Research (AHCPR) to investigate such research to help improve the efficiency of health care. After six years and over $700-million, the agency has little that health-care providers can use [Anderson, 1994]. This article concludes that outcomes research has

very limited use because its data are not collected properly. To be of greatest value, the purpose of the data collection must not distort data randomness. Much of the current data for outcomes research comes from sources that may naturally distort it to meet reporting requirements (insurance claims, doctor's bill, etc.).

The US Department of Veterans Affairs in 1982 began an amibitous project to build an electronic health care architecture called the Decentralized Hospital Computer Program (DHCP) which focused on the implementation of software modules that were easily integrated into a complete hospital information system. By 1990, the VHA had upgraded computer capacity at all medical centers and is now implementing software on a national scale that supports integrated healthcare delivery. Today, VA health care facilities can exchange health summaries containing relevant clinical data across the VA network. As VHA evolves into a managed care organization, the information network capabilities will provide support for health plan business elements in all operational and patient care support areas.

To encourage such development among private healthcare organizations, the Department of Commerce has awarded grants to community projects under its Telecommunications and Information Infrastructures Assistance Program (TIIAP) [*vide* "Government" section of this report]. The 1994 grants include the development of community health information networks. Additionally, several states have received funding from the John A. Hartford Foundation to establish community health networks. A typical network project aims to "...extract patient, provider, and service data from claims and encounters and store them in a shared community data repository...the repository may be enhanced to include condition-specific data and patient-centered surveys" [Fitzmaurice, 1994].

Telepresence

The term “telepresence” broadly covers the concept of providing health-care services without the requirement of having the patient, provider, and facilities together in the same location at the same time. It therefore improves the efficiency of health care by reducing the logistical burden of its delivery. The Federal Government first investigated the idea of using telecommunications to practice medicine in rural areas between 1965 and 1973 through the Regional Medical Program. A thoughtful commentary found the analysis too narrow, evaluating this concept purely as technology. It further states that beyond the technology and services considerations are the liability, licensing, patient eligibility, specialty coverage, etc. issues that are actually the most critical in determining telemedicine's success [Lindberg, et al. 1992]. Another study, prepared by the Western Governor's Association describes many of these issues from a practical, public-policy standpoint [Telemedicine Research Center, 1995].

The US Navy medical center in San Diego practices"teleradiology" with deployed ships. The ship transmits a digitized form of the medical image to the medical center for analysis. This enables the direct participation of specialist in spite of the vast distances involved. Los Alamos National Laboratory serves as a repository for radiological images and offers sophisticated image analysis. The laboratory provides sophisticated image analysis techniques that aide in diagnosis. It also provides radiological data for research.

Decision Support Systems (DDS) and Expert Systems (ES) allow the health-care provider to access the "electronic expertise" of the specialist. These systems can analyze information at the time of examination and return recommendations on potential diagnoses and treatments. Of course, the actual course of action depends upon the judgment of the human provider. This information can be especially invaluable in the treatment of chronic conditions such as diabetes, in which the quality of the care highly correlates with the life expectancy of the patient [Nussey, 1992]. This type of care often requires vigilant monitoring of the patient to control the illness. DDS and ES systems

can provide the most efficient means to accomplish this. Small, personal devices can even provide the patient himself with the capability to monitor his or her own condition.

Medical education has employed virtual reality (VR) to provide training in surgical techniques. A computer generates a model of a patient's anatomy and the surgeon's tools. Synthetic feedback to the surgeon's motions allow him or her to practice surgical techniques. The technology has become a tool for learning innovative techniques, such as laparoscopy, in which the surgeon makes a tiny incision and performs the operation through the use of elongated tools inserted into the small aperture. The technology also provides potential for performing telesurgery. Manufacturers have demonstrated prototype systems that are fully capable of performing such procedures [Chinnock, 1995].

Business and Industry

The private sector's vision of a "Smart Community" is to create an advanced information infrastructure and develop the collective ability to use it. The goal is to facilitate the construction of a pervasive, high speed communications system and information services that will benefit all sectors of the community: education, healthcare, local government, business and the home. The infrastructure implemented will help transform the way people work, live and learn.

The United States is an ideal location for this activity since the nation enjoys world class research universities, national laboratories and high technology industries. Many communities are technically literate, using computers on the job and in their homes. The technologies needed to get started are already on the market. California, in particular, has hosts of businesses working on applications such as telecommuting, geographic information systems, distance learning, networked classrooms and community information services. The technologies and products developed to build and take advantage of the infrastructure will be marketable around the world as more and more communities move into the information age and connect themselves electronically. At least four trends are creating this opportunity:

- The cost of powerful computers has dropped to within reach of most households.
- Computer power is enabling easier to use software and applications.
- Telecommunications and broadcasting are moving to digital technologies, merging data communications, telecommunications and entertainment.
- The nation's leadership is extending beyond its investment in research for high performance computers and communications to applications that will leverage a privately constructed national information infrastructure.

The infrastructure created will make contributions to the business environment and will support collaborations between suppliers and vendors and allow businesses, healthcare providers and local governments to be more responsive to their customers. It will contribute to quality of life by allowing more workers to telecommute or to advance job skills by taking interactive or cross continent classes in their homes.

As businesses depend increasingly on partnerships to control costs and speed time to market, they need a high quality communications infrastructure to support distributed teams. High-speed networks could allow two-way videoconferencing on the desktop, rapid delivery of part designs to fabrication shops, and simulation of circuit designs on remote super computers. Electronic commerce services can reduce the costs of placing and processing orders, publishing product catalogs and delivering software to customers. The network would make it easier for people to work at home or at local telecommuting centers. This would get cars off the road and increase employee job satisfaction, thereby reducing the turnover of valuable workers.

As broadband interactive technologies become pervasive, communities would need people to install the new wires, fiber and communications equipment. As demand grows, electronics companies would hire people to increase production of computers and networking equipment. Software engineers would be needed to develop new communications services and tools to manage the network. Entrepreneurs will develop and market new information services; information brokers, editors and librarians might emerge to help people navigate the wealth of information services. Job openings and resumes could be listed on-line, amid a rich set of new products are expected that will take advantage of this new information-rich environment.

Implementations

Back-Office Operations: The deployment of advanced telecommunication infrastructure in rural areas allows some type of firms, particularly those known as "back-office firms" to be footloose, able to locate anywhere. Industries driving the trend in moving back-office operations off-site include finance/insurance/real estate, business services, mail-order houses, direct-selling firms, publishing, membership organizations, administrative offices for construction, manufacturing, transportation, communications, wholesale trade, retail trade, and services. Numerous examples exist of small, rural communities that have attracted back-office firms. For example:

- Citicorp has operated a site in Sioux Falls, South Dakota for credit card processing since 1981. South Dakota offered lower land, labor, and operating costs. In addition, the state removed its usury ceiling, allowing Citicorp to set credit-card interest rates unhampered by state regulations.

- LaVerne, Minnesota, population 4,800, is the headquarters for Tri-State Insurance serving 70,000 policy holders. Tri-State has 120 employees.

- Northstar Mutual Insurance Company manages 120,000 policies with 100 employees at its corporate headquarters in Cottonwood, Minnesota, a city of only 900 people.

- Church Mutual Insurance is headquartered in Merrill, Wisconsin, population 9,600. Church Mutual has 50,000 policies in 31 states.

- Universal Pensions is headquartered in Brainard, Minnesota, a town of 12,000 people.

- State Bond manages $ 1 billion in several mutual funds for clients in twenty-three states; 100 employees provide this service from a back-office in New Ulm. Minnesota, population 13,700.

- Loughrea, a small city in Ireland, has successfully attracted two U.S. corporations and an advanced telecommunications system helped clinch the deals. Loughrea's population of 3,000 was apparently a beneficiary of the $ 3.5 billion invested by Ireland in the 1980s to upgrade the country's telecommunications network.

Electronic Cafe's: The Electronic Cafe in Santa Monica, California, serves not only food but also live multimedia cultural events with participants at remote sites. Using affordable technology such as slow-scan television over voice-grade telephone lines, Kit Galloway and Sherry Rabinowitz have hosted a multitude of real-time encounters. Most notable perhaps was their 1984 linking of family-owned restaurants in the Los Angeles area into a shared video, audio, text, and "sketch" space. This cultural exploration was widely enjoyed by community residents and was a pioneer "groupware" application. Other cafes have been set up at the Telluride IDEAS festival (July 1993) and at CPSR's annual meeting in Seattle (Oct. 1993). The Electronic Cafe's explorations into multimedia, cultural diversity, international communications, and aesthetics serve as excellent reminders of creative opportunities that transcend conventional text and discussion-based approaches.

EU Telematics: Promoting teleworking in all its forms is one of the main priorities of the European Union: ambitious targets were set in the Bangemann Report, including:

- To create pilot teleworking networks in 20 European cities by the end of 1995 involving at least 20,000 workers

- To have 2% of white collar workers in recognised telework schemes by 1996
- To have 10 million people in such schemes by the year 2000

The thinking is that early adopters of the new ways of doing business will reap big rewards; late starters will suffer a lack of investment and will have a very difficult job to catch up. Such ideas are predicated on an outlook on the role of governmental agencies in kick-starting new initiatives, with appropriate allocation of resources. But there are processes at work in the UK, which mean that the UK will be closer to the 2% target for white-collar workers by 1996 than ot her European countries.

Flexible working practices have taken root and appear to be here to stay. The most recent survey of businesses' long term employment strategies, undertaken by the Institute of Management and Manpower PLC, indicates that there is no let up in the pace of change: almost 90% of employers surveyed use part-time and temporary workers; 70% contract out non-core operations; teleworking and homeworking have been adopted by around a quarter of employers; over the next four years, 80% predict an increase in flexible working; 68% predict an increase in the use of teleworking.

FSN: Users on Time Warner's Full Service Network (FSN) trial in Orlando, Florida, can navigate their way through a range of interactive, multimedia services using a graphic interface known as the carousel. This 3D wheel is a gateway to a video-on-demand service with 62 movie titles, more than half a dozen home shopping services, US postal services, an interactive programme guide, tutorials, advertising interactive games. By the end of 1995, 4000 subscribers will be linked to the network, which is described as 'the world's first digital, switched, interactive broadband communications network'.

With a significant amount of fibre already in place in Time Warner's cable network in Orlando, upgrading to FSN is said to have been cost-effective. The test area covers suburban Orlando, including south-west Seminole County and parts of Orange

County. All the fibre is now operational, and a network operations centre houses video servers, operating software, and an ATM switch supplied by AT&T. Graphics and computing technology for the venture has been provided by Silicon Graphics, and FSN uses Scientific Atlanta's home communications terminal at its customers' premises. The operating system has been developed by Digital Solutions, a joint venture between Silicon Graphics, Time Warner and AT&T.

Planned future services include news-on-demand; education services, with connection to local public libraries and access to interactive educational programming; music services for the purchase of music products; and a health status assessment service. Voice recognition is under development in order to access FSN by speech command. Under the Florida Statutes, Time Warner is precluded from supplying a local telephone service, although a change to the law may be imminent. In the meantime, multinational business customers, will be offered direct voice, data and broadband video connection between sites, using Time Warner's 'alternate access vendor' status to provide direct connection to long-distance carriers. Additional business services, such as LAN-to-LAN connection, will be available later this year.

KANSAI SCIENCE CITY: In Japan, government and private industry are cooperating to support the Science City project in the Kansai region, south-west of Tokyo. The project is trialling a new generation of communications technologies applications for business and domestic users, offering a range of services including video-on-demand, high-definition television (HDTV), and broadband business communications. Residential subscribers have access to two video-on-demand services, operated via a remote control, simply by following screen instructions on their domestic television sets. A central key station on receives requests, and sets the videotapes automatically.

As well as HDTV, a TV-phone and video game service is offered. A home shopping service is also being trialed, which features both still and moving images, with

additional information on products available via a touch screen system. Plans for new services include postal. services covering home shopping and mail; postal savings services that will allow users to check balances and make remittances via their terminal; home karaoke services; and news-on-demand.

Businesses participating in the Kansai project are served by a broadband ISDN network, which supports a number of multimedia applications. One of these, a design and consultation service using computer graphics, allows architects to interact with their clients in the design of domestic dwellings. Changes to the layout and design of a building can be made on screen, and a 'walk through' facility allows the client to review the design in progress. When the design is agreed, a colour print out of the final plan is produced.

The credibility of Science City has been further enhanced by the participation of organizations involved in high-technology initiatives in the region. The Prefectural Government in Hyogo is developing a B-ISDN network for joint research between the Himeji Institute of Technology, Osaka University and Kyoto University. Operational know-how gained from the Science City B-ISDN trial will be used to construct an ATM network that will carry high-speed, large volume data on research into protein structure analysis.

ParcBIT: The island of Majorca, off the east coast of Spain, has been flirting with environmental catastrophe as seven million tourists each year visit the gorgeous beaches and enjoy the handsome scenery. What feasible alternatives to tourism does an island economy have? In the late 1980's, the local government spotted an interesting trend: A growing number of Germans were spending more and more of the year working out of their Majorcan vacation homes, jetting back to Germany and their offices only occasionally. After doing further research, it was learned that a number of high technology companies were investigating the possibility of sending their executives away

to work in more affable climes during the long winter months, including Silicon Graphics, P.T.T. Telefonico, and AT&T. The result is a project called the Balearic Park for Telematic Innovation (ParcBIT) that links residential and work areas with the island's university and main airport. The technology is based upon cellular and satellite connections and underground fiber-optic cables.

RED-Line: One group formulating plans for a smart city project is located in Eindhoven, in the region of North Brabant in the Netherlands. The Board of the Regio Eindhoven Digitaal (RED) Foundation is made up of 40 companies, institutions, educational institutes government agencies. While uncompromising about the intention to create a "world-class multimedia region", the intention of RED-line is to develop services, not infrastructure. Readily available technology -- telephone, TV, and PCs -- will use the existing fibre infrastructure, owned by PTT Telecom and the local CATV operators. By connecting the PTT's fibre-optic cable to the CATV operators' co-axial cable network, 300,000 households could potentially be served. The hope is eventually to link Eindhoven to other European information highway projects.

The Eindhoven region has much in common with other smart city locations, and judged against a similar set of criteria, was reckoned to have the potential to become a location for the development of high technology multimedia services. The area is home to a concentration of research and educational institutes (including Philips Research and the Technical University of Eindhoven), sitting alongside a group of high-tech companies (SIMAC/Tron, Philips, W&G Group), with a well-developed communications infrastructure, and a consumer base ready to accept new technologies and to invest in peripherals and software.

Silicon Alley: Without any city government campaign to bring them here, and without the tax incentives used to tie other businesses to the city, high-technology multimedia

companies have been turning up in lower Manhattan. "Silicon Alley", as it is called, stretches from the Flatiron district along Broadway to the New York University campus and into Soho. The games, entertainment, and computer arts firms are small - most have fewer than 20 employees - but eager to take advantage of New York's concentration of clientele. The clientele-base includes book publishers, record companies, television studios, advertising agencies and comic-book producers.

The old industrial lofts that once held toy making, cigar rolling and hat trimming - light manufacturing long gone from the city - are full of flexible work spaces that make good homes for companies. Several organizations encourage industry socializing, including the New York New Media Association, which hosts monthly "Cybersuds" parties that are open to the public as well. Exchange of ideas - and people - also goes on around the New York University Center for Digital Multimedia near Soho, where some 1,500 students attend.

Vancouver, Canada: Fiber optic communications will help Concord Pacific Place achieve its goal to become Vancouver's premier residential and business community. A "city of the future", development of the Concord Pacific Place project began in 1991, when plans were presented for building on the site of the Expo '86 World's Fair, just south of the downtown business core. Located on the waterfront of False Creek, an inlet of Vancouver's English Bay, Concord Pacific Place will transform now-vacant land into a miniature "city within the city" of 20,000 residents within the next 10 or 15 years--at a cost of $ 3 billion (Canadian). The scope of this development is staggering, covering 204 acres with 50 high-rise buildings that contain 7600 residences, two hotels and 3 million square feet of commercial space. The site also will encompass shops, schools, parks, recreation facilities and marinas.

For the project--which represents BC Telecom's first stage of deploying information superhighway technology across its network--the company will invest up to

$18 million (Canadian) over the next 10 years to deploy the fiber and communications equipment throughout the site. For residents, the capabilities provided by these communication services include: home entertainment, home automation, security and business communications. Concord Pacific Place enjoys a private satellite TV system with 36 channels of cable programming. In the future, this system may be used to offer video-on-demand, pay-per-view programs, home banking and shopping, interactive education and multimedia programs.

WebChat Broadcasting System (WBS): As chatting becomes an ever-increasing component of the Internet's World Wide Web, one company has firmly established itself as the Web's leading center for real-time communication. The Internet Roundtable Society's WebChat Broadcasting System (WBS), with over 100 channels for live conversation on topics from dating to entertainment, is now attracting over 19 million hits per month, making it the largest chatting hub on the World Wide Web.

WBS also hosts special live events and a weekly newsmaker interview show. Celebrity guests have included the former president of the Public Broadcasting System and NBC News Lawrence Grossman, U. S. Senator Arlen Specter, and feminist Gloria Steinem. With over 10 million advertising views a month, sponsors of WBS are tapping into one of the most traveled sites on the Web today. WBS is powered by the highly acclaimed WebChat(TM) server application, developed by The Society. WebChat, an AOL-GNN 1995 "Best of the Net" Nominee, is the only multimedia chatting software for the Web that does not require special software to be downloaded by the user. Anyone using an ordinary Web browser can easily access the many WBS channels, to participate in an online event or chat with fellow Netizens. WebChat allows users to quickly incorporate images, video, and audio clips -- as well as "hotlinks" to other World-Wide-Web sites --into a live conversation over the Internet. Most Web pages are only information sites: files, hotlists, databases. These are HIT and RUN sites, because

once visitors have HIT the information they came for, they usually RUN. At WBS, however, visitors come to meet, socialize, become part of an ongoing community.

Chapter 3

Community Networking

Introduction

Communities are increasingly shaped by the continuous and real-time transactions enabled through new information technologies. Because the variety and scope of these transactions are not constrained by space and time, technology has an ever expanding impact on California's communities. This phenomenon may ultimately lead to new growth for some communities and decline for others. The leveraging of both hard infrastructure (fiber optic cable, microwave towers, digital switches, etc.) and soft infrastructure (resident experts, non-profit organizations, civic programs, etc.) will bring new opportunities to communities in the post-industrial era.

By letting activity be physically farther apart, yet functionally very close, technology such as trains, electric trolleys, cars, and trucks helped shape the first industrial city and later helped create the first mass production metropolis. Today, information technologies are playing a similar role. However, as much as technology enables work to be done anywhere, large- and medium-sized communities continue to provide advantages for industry. One important advantage is that communities offer an environment conducive to innovation and learning. Second, larger communities enjoy a more diverse labor supply, larger consumer markets, more frequent air transportation, and availability of repair and technical services. Finally, the advantages for people include higher-quality medical care, cultural and educational institutions, and a larger employment base.

In contrast, cities that will not or cannot adapt run the risk of being left behind or face stagnation or decline. Adaptation of people, institutions, and the build environment are important to community survival. In particular, new local and regional strategies are even more critical if communities are expected to respond to these fundamental changes.

Efforts to better integrate the social and economic prospects of distressed communities and the lives of disadvantaged people are an amalgram of disjointed activities, usually with very little overlap, cooperation, or coordination. These programs are often bureaucratic, content with supplying general information rather than real services, passive in orientation, and uncertain in how to develop working relationships with private firms. The best programs are customer-oriented, focused on continuous interaction with all community leaders, and flexible to respond to changing user demands. Non-governmental organizations and public-private partnerships often do this best. Efforts are underway in a number of locations to develop partnerships that build closer ties among industry, education, healthcare and local government. These partnerships have played a key role in bringing community leaders together and marshalling the resources in the region. What follows is a review of such projects, first from the larger community-wide perspective and later from a macro-analytical perspective, examining in detail what education, government and industry has accomplished to nurture their own telecommunications initiatives.

Emergence and Evolution of Community Networking

Starting in the mid-1980's, early pioneers in community networking established community bulletin board services, sometimes with very narrow content focus, such as "St. Silicon's Hospital," founded in Cleveland by the "father of community networking", Thomas Grundner, which evolved into the first Free-Net. The National Public Telecomputing Network was founded by Dr. Grundner to facilitate national development of community networks. By the beginning of the 1990's, five more Free-Nets had been established, as well as Big Sky Telegraph in Montana, and Santa Monica's city-run bulletin board service, PEN. In the early 1990's, three effective and energetic organizations became involved in community network development - the Center for

Civic Networking (CCN), formed by Miles Fidelman, John Altobello, and Richard Civille, the Computer Professionals for Social Responsibility, and the Alliance for Community Media (arising out of the public access cable television movement). Three other factors have contributed to the legitimization and literal explosion in community network efforts from 1993-1995: 1) Federal funding programs such as the "National Information Infrastructure" initiative of the National Telecommunications and Information Administration, the National Science Foundation's Networking Infrastructure for Education program, and special programs of the Department of Education; 2) growth of and media interest in the Internet and maturation of software (particularly development of World Wide Web clients); and 3)private and public funding initiatives for community networking, including grant programs sponsored by Ameritech grant program, the Corporation for Public Broadcasting, and the CPB/U.S. West Community Wide Information Systems (Morino, 1994).

The growth in what has been called variously "The Net" or "the Matrix" - a term for the global web of connected computer networks and conferencing systems whose largest component is the Internet - has been likened to the explosive growth in suburban housing in postwar American. The housing growth, from 114,000 in 1944 to 1.7 million in 1950, was attributed to innovations in mass-produced housing and boom in demand. Likewise, the growth in use of "the Net", from hundreds of thousands of users to an estimated 29 million users in 1993, has been attributed to increasing ease of use and mass marketing. (Godwin, 1994)

These factors have resulted in an accelerated rate of growth and the creation of over 50 Free-Nets, and literally hundreds of other types of community networks, and related projects. By 1995, many of the community networking efforts which started out as commercial network services, city-run bulletin boards, or community networks using proprietary software have evolved into a community network that utilized community-based, open systems with Internet standard services.

However, now that Internet services have become a commodity, community networks are facing a new evolutionary phase, and are exploring (with their counterparts and sometime partners in the public access cable television arena) the potential of becoming community communications centers. The role of a community center goes beyond that of providing training and access to technology tools such as electronic mail and world-wide web services, to that of consulting with community organizations on their communication and information needs, and providing bundled toolkits that combine voice, video and data technologies to address those needs. (Community Networking Conference, Coalition for Networked Information, Fall, 1995).

Types of Community Networks

Definition of community network

A community network is most often defined as a two-way community communication tool with services and information for:

- individual € individual communication (electronic mail)
- affinity group € individual communication (electronic mailing lists, newsgroups)
- community organization € individual communication (electronic mail, world wide web)
- information dissemination and publication (gopher, world wide web)

Goals of community networks and general benefits to community/Differentiation from other on-line services

Given the definition of a community network, it follows that the benefits it brings to community are communication and information-based. Community networks are generally differentiated from commercial on-line services by their goals of: 1)supporting

open public access to electronic communication and information, to ensure that all members of the community have access to the resources of the Information Age; 2)building and strengthening community by increasing communication between the residents, and between the residents and local government and institutions; and 3)emphasizing a local focus of information and discussion to facilitate the provision and exchange of locally-oriented information. (Beamish, 1995) Community networks differ from other on-line services in two other ways. In general, they rely on volunteers for everything from marketing to system administration; and they are not self-financing, but are often subsidized by public and foundation funding.

Types of community networks/bulletin boards

A City of Davis staff report to the City Council identified four approaches which can be taken in setting up community/city networks (Maynard, October, 1994). They are: 1)information services provided through a commercial network services provider such as Prodigy; 2)a city-run bulletin board service based on proprietary software; 3)a community-based network based on proprietary software; and 4)a community-based network based on open systems and Internet standards. A fifth type of community network is the "Wired City."

The issues associated with each type of community network are summarized below:

Type 1: Commercial Network Services Provider

The start-up costs for this approach are lower, and there is potential for revenue back from the service provider. However, the database software is proprietary, which means that the information must be provided in a centralized way (difficult to de-centralize), and the information provider is completely dependent on an ongoing relationship with the network services provider. Further, the commercial services' interest in supporting the information service depends on ongoing attraction of new memberships to the commercial service; and the city/community organization is expected

to actively recruit new members on behalf of the commercial service, which means that an investment of public funds would have to be made in marketing the commercial service. Examples of California communities which have used this approach are Modesto and Sacramento. Other commercial networks which focus on public discussion are ECHO in New York City, the WELL in San Francisco, and Channel One in Boston (Beamish, 1995).

Type 2: City-Run Bulletin Board Service

The start-up and maintenance costs for this approach can be quite high, depending on whether the software is developed in-house (as it was for Santa Monica's PEN), or purchased from a software vendor (such as FirstClass). The disadvantages of any proprietary software are present in either case - maintenance, upgrades, and ongoing development on dependent on the original developer, and not in the control of the city/community organization. Further, there are significant disadvantages in the loss of a single point of access for the community members, who would have to connect to a different bulletin board service (and phone number, and user interface) depending on whether they wanted City Council information, school schedule, or information on a local business. Eugene Leong of the Association of Bay Area Governments characterized the disadvantages of this approach, which was used by Cupertino, as follows: "CityNet is pretty much a fancy dial-in for Cupertino. If everyone took the Cupertino approach, it would be like having thousands of little telephone systems. You'd have to dial into each bulletin board for information and have the right software and protocols."

Type 3: Community-Based Network, Proprietary Software

The disadvantages of separate bulletin board systems for different community organizations can be overcome by a community-wide bulletin board; however, the disadvantages of proprietary software still apply. In particular, there tends to be a problem with scaling (there exists no proprietary software which would support very

large communities with many users), and with the need for development and maintenance of special gateways and translators to connect to the Internet.

Some of these bulletin board systems are small, neighborhood-based systems. Examples of this approach are the MUSIC network (Multi-User Sessions in Community), funded in the 1995 round of NTIA TIIAP funding.

Type 4: Community-Based Network, Open Systems and Internet Standards (or some subset of these)

This is the most common approach for community network development, as it is scaleable, and fits well with the ongoing development of the Internet. No special software is developed - public domain and freely available software is used, and as a consequence the pool of expertise for support and problem resolution is quite large. In addition, there is no dependence on one particular software vendor. This approach is also compatible with a distributed information provider infrastructure - that is, it helps bring about the situation where everyone in the community can be both an information consumer and an information provider, which has the potential to quickly, effectively, and cheaply create a very robust, customized, and representative local information resource. Using this approach, the individual information resources and technology investments of the community network partners (whether from government, education, business, media or non-profits) can be designed and implemented according to world-wide standards, and thus all be connected to create a stable and rich community resource. From the point of view of the community member, there is greater convenience (and educational value) in using the common Internet interfaces. In addition, improvements can be made in smaller or larger increments, depending on the budget constraints of the community network partner.

Examples of Type 4 networks include most community networks today, and can range in geographic scope from a small rural community (such as the Telluride

InfoZone), to an entire state (Hawaii's community network). "Free-Nets" are one specific subgroup of Type 4, with a rapidly changing definition. As defined by the National Public Telecomputing Network (NPTN), which is the charter organization for Free-Nets, Free-Nets are community-based, volunteer-managed electronic network services which provide local and global information sharing and discussion. NPTN is a non-profit corporation which operates as a "loose-knit, grassroots alliance", and is presently under very rapid change with the resignation of its founder, Thomas Grundner, and its executive director as well. There are fifty operational Free-Net systems and 120 organizing committees (organizing committees are groups of volunteers who develop local Free-Nets). (Schuler, 1995)

Originally, as the name implies, "free-nets" provided community networking without charge to their users; however, several Free-Nets now have subscriber charges. In addition, most of the original Free-Nets utilized the text menu-based, terminal-host software developed for the Cleveland Free-Net, FreePort. Many of these community networks are now migrating to graphical user interface world wide web clients as their user interface (ongoing discussions, Free-Net Technical Newsgroup).

A new generation of Free-Nets are rurally-based. These use the FirstClass BBS software developed by SoftArc.

An additional type of community networking project, the so-called "Wired City", is an even more expanded concept, and more closely approximates the "Smart" community concept in scope.

Type 5: "Wired" Cities

A "wired" city has a city-wide scope involving all sectors of the community, focuses on physical infrastructure, is most often sponsored by a public-private partnership, and has much more developed participation by business than the typical

community network (Dutton, 1987). Examples of a "wired" community projects include the Blacksburg Electronic Village in Blacksburg, Virginia,

Most community networks of Types 1 through 3 have a somewhat limited scope for the purpose of the "Smart" communities literature review; therefore this literature review will concentrate on Types 4 and 5.

GENERAL ISSUES IN COMMUNITY NETWORKING

Controversial Assumptions

Most of the issues in community networking arise out of the assumptions that have driven the movement. In the last three years, the assumptions that are implicit in strategies that include development or encouragement of development of community networks by government have especially become controversial. Arguments about these assumptions have raged in public forums, whether on-line or in the media. For example, a recent Wall Street Journal article attacked the entire TIIAP program as an anti-competitive government subsidy. On the other hand, the book Wired Cities, based on one of the authoritative international telecommunications research projects of the 1980's, provides another perspective that supports government involvement:

> There are fundamental assumptions about communications technology and society that underpin interest in the wired city concept. They are:
> 1) that the new communications technologies will be increasingly important to the economy and society of modern information societies;
> 2) that there are inherent biases in the newer electronic media that reinforce more democratic and decentralized modes of communications;
> 3) that new media provide the capability for telecommunications to reinforce face-to-face patterns of communication;

4) that telecommunications infrastructure are a public utility rather than a private commodity; and

5) that long-range, rational-comprehensive developments in communications remain practical and desirable despite rapidly changing technologies and policies. (Dutton et al. 1987)

Another related set of assumptions in the community networking movement is that there is an inherent value to information, that the technology of community networks makes information more available to members of the community, that this information equals knowledge, and ultimately that knowledge equals power.

Because the ultimate goal of community networks is community-building and social change, the companion issues are not neutral in nature, and include "equity, economic development, community development, social responsibility, politics, governance, institution building, democracy, participation and social issues" (Beamish, 1995)

As noted by the National Community Building Network (NCBN), "the goals of community networks are clear, but the path to achieving them is not: How can universal access and community empowerment be promoted in the context of what the administration has determined will be an essentially market-driven implementation of the information infrastructure?" (NCBN, 1995)

Social & Cultural Issues

Some social critics, Neil Postman primary among them, argue that the modern hunger for more and more information is a disease. He challenges the information=knowledge=power assumption, maintaining the "there are very few political, social and especially personal problems that arise because of insufficient

information". Postman even has a name for this new social disease, "technopoly," and relates it to a kind of cultural AIDS (Anti-Information Deficiency Syndrome), stating that "in Technopoly, there can be no transcendent sense of purpose or meaning, no culture coherence. Information is dangerous when it has no place to go, when there is no theory to which it applies, no pattern which it fits, when there is no higher purpose that it serves." (Postman, 1992)

On the other hand, concerned activist Doug Schuler, chair of Computer Professionals for Social Responsibility and a member of the Seattle Community Network board, argues that:

> Communities can be thought of as living systems. And just as a human body has a skeletal system, circulatory system, and other systems that sustain its life, a community has several systems that keep it alive. These six systems - culture and conviviality, education, strong democracy, health and social welfare, economic equity and opportunity, and information and communication - are essential to the life of the community.
>
> Although the possibilities are nearly endless, some examples of these systems include information on arts and crafts fairs and classes, writing workshops, local dance and theater events (culture and conviviality), homework hotlines, parents' forums, on-line curricula and lesson plans (education), e-mail to local government agencies, city council agendas and public meeting schedules, legal documents on-line (strong democracy), social services information, environmental information (health and social welfare), job listings, forums for unemployed workers (economic equity and opportunity), library catalogs on-line, ethnic and alternative newspapers, letters to the editors of newspapers, and civic journalism projects (information and communication). (Schuler, 1995)

Some participants in the community network discussion are concerned about the potential of electronic communication for exacerbating the isolation and sense of powerlessness that seems to be a phenomenon of modern life. Others maintain that "Telecommunications technology has enormous potential to empower individuals and nonprofits. It can shift the balance of power between grassroots groups and corporations, connect isolated individuals and strengthen democracy by linking citizens with local and national officials" (Leslie, 1995). Examples of this activity include use by local community environmental activists of the Right-To-Know Network (a network that disseminates data the federal government collects on toxic substances) in changing the balance of power between environmentalists and industry. These individuals also argue that it out of a combination of access to information and development of new relationships that new solutions to social problems arise: "The old model was that everyone who was interested in the environment or the arts would have some giant database in the sky where everybody reads each other's newsletters and press releases, and this would make something

happen. . . But it turns out that it's not really the information that makes things happen. It's the relationships. The real power of this technology is that people are talking to each other, they're having juicy conversations about what's important to them. It is out of this rich pool of conversation that ideas that are greater than the sum of their parts have emerged" (Leslie, 1995).

Barriers to Access

Finally, those who embrace the ideal of equal access are worried that community networks, like other technological developments, may disenfranchise segments of the population who, because of fear of technology or lack of access to it, may be left out of the new "electronic democracy." Of great concern to the community networking effort is

an apparent trend toward widening of the gap between those who have access to electronic information and communications technologies, and those who do not. As was discussed in a recent RAND Corporation study, "access to computers and computer networks is not evenly distributed throughout the population. Specifically, computer access and use is positively related to higher levels of education and income. Also, race is independently related to computer and network access -- whites being significantly more likely to have access to both than blacks and Hispanics." (Anderson, 1995) Groups with high risk of exclusion include the illiterate, the disabled, the poor, non-English speakers, seniors and females (Beamish, 1995).

Because public access is one of the goals of community networking, clear identification and mitigation of the barriers to access has been a primary theme of discussion. The potential barriers which have been identified include cost, physical access, technical training, attitude/culture, content, methods of communication, and bandwidth (Beamish, 1995). Additional barriers identified by the National Community Building Network include outmoded or low-capacity hardware, poor location of access points, and applications inconsistent with the needs of the community (NCBN, 1995).

The areas where public access (as defined as "universal access") may become critical have been identified as: "1)voter registration and voting itself; 2)capacity to research and access municipal services as well as to communicate directly with public officials in local, state and federal agencies; 3)ability to obtain information about (and register for) current employment opportunities, education and training programs, and financial aid; 4)capacity to register opinions on community issues or participate in electronic town meetings." (Roberts, 1995). In addition, equal access to electronic communication and information tools may become essential to preservation of the American ideal of equality of access to public education, as education is transformed by and becomes dependent on use of these tools.

Policy Issues

Censorship - Many community networks grapple with the issue of censorship, both with regard to information that is posted on the community network, and with regard to managing defamatory and otherwise inappropriate messages. In the second case, most community network system administrators seem to have adopted a self- or peer-monitoring mechanism (Anderson, 1995). Others, especially those with strong university ties, operate with "acceptable use policies" that have been developed and adopted in the university environment. In the case of information content, considerations that are technical and volume-based limit the ability of the community network administrators to do much beyond control what is posted in the "official" sections of the community network directory of information - what individuals post is difficult to monitor, even if the community network administrators wish to do so. With regard to children and information content, most community networks work with local schools to educate parents about the relevant issues and concerns, and require that parents approve minors' accounts. In general, the model for access to information is similar to the non-interference model of the library.

Privacy and Security - This medium which works so well for widespread communication and dispersal of information works just as well for the criminal as the law-abiding citizen. Community networks must be sensitive to protecting their members from privacy infringement; and for those projects which have consumer-based, transaction-based applications, from the usual consumer problems (scams, mail fraud and credit card theft). (Morino, 1995)

Information Technology "Redlining" and Infrastructure Development - Because of a common commitment by community networks to access, there is concern about "red-lining" of poor communities with regard to infrastructure development: "Currently, telephone companies, cable companies and software/hardware manufacturers are in control of the development of both the communications technologies and the

infrastructure that supports these technologies. In most communities, local phone companies are in charge of laying the fiber optic cabling necessary to support telecommunications applications such as distance learning. However, the phone companies lay fiber optic in neighborhoods where they can make a profit on their investment. There is evidence that poor communities are being red-lined -- the cable is not being laid in low-income neighborhoods. To access the beneficial uses that telecommunications allow, it is necessary that neighborhoods have the infrastructure in place to support the technologies. This kind of red-lining may happen without community knowledge and will require advocacy to ensure that poor communities have the same infrastructure in the ground that their more wealthy neighbors enjoy" (NCBN, 1995).

Balancing competition and the public interest - community networks may sometimes provide services (especially to the public sector) that the private sector also provides; almost every community network project has had to manage challenges from the private sector about their activities in these gray areas. Where this issue becomes even stickier is when the community network began providing the services in absence of a private sector provider, built the market, and then becomes dependent upon revenue from those services for ongoing sustainability (and subsidizing access for all) at the same time that the private sector begins entering the market. Many community networks which started out providing Internet accounts are now re-evaluating the provisioning of this particular service.

Legal Issues (intellectual property, copyright, ownership, definition of "place", malpractice issues) - Community networks, in their operation and management, must be aware of issues associated with ownership and copyrighted materials. The fact that the laws were defined for traditional media, such as broadcasting and publishing, and have not yet been refined and clarified for application to electronic media, make this a challenge. In addition, community networks also need to be aware of

malpractice issues (when professionals who are subject to such liabilities provide information on-line through the community network), legal issues involved with search warrants in crimes involving electronic communication across state or national boundaries (and cooperation with local law enforcement), and libel issues with regard to on-line forums. (Morino, 1995)

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Appendix A

Projects Selected for Further Review

The following community network projects have been selected for further review because they involve more than one community sector, and / or are the recipient of federal funding (NTIA / TIIAP). An initial pass of data collection against the suggested framework will be limited to what is available on-line or through already collected resources. Criteria will be developed for selecting a limited subset of these projects for more in-depth data collection (surveys of project managers, etc.), for the second phase of the situation analysis, the situation inventory.

ARIZONA

Tsaile, Arizona

CALIFORNIA

Cupertino, CA (CityNet)

Davis, California (Davis Community Network)

Diamond Bar, California (City On-Line)

Nevada County Community Network

Oakland (BayNET Project)

Sacramento, CA (Net at Two Rivers)

Santa Barbara (Regional Alliance for Information Networking)

COLORADO

Boulder, Colorado (Boulder Community Network)

Ignacio, CO (Southern UTE Indian tribe, NTIA))

Telluride, Colorado (Telluride InfoZone)

CONNECTICUT

Bridgeport, CT (Bridgeport Futures Initiative, NTIA)

HAWAII

Hawaii Statewide Network

IDAHO

Lewiston, ID (Lewis-Clark State College, NTIA)

ILLINOIS

Glenview / Northbrook, Illinois

INDIANA
Bloomington and Monroe County, Indiana (HoosierNet)
Harlan (Harlan Municipal Utilities, NTIA)

KENTUCY
Berea, KY (Forward in the Fifth, NTIA)

LOUISIANA
New Orleans, LA (University of New Orleans, NTIA)

MAINE
Augusta, ME (The University of Maine System, NTIA)

MICHIGAN
Greater Kalamazoo - TeleCity, USA (NTIA)

MINNESOTA
Grand Rapids (Independent School District 318, NTIA)
Minneapolis, MN (Twin Cities Free-Net)

MISSOURI
Columbia, Missouri (Columbia OnLine Information Network COIN)
Springfield, MO (Ozarks Regional Information Online Network, NTIA)

MONTANA
Dillon, Montana (Big Sky Telegraph)

NEVADA

NEW MEXICO
Albuquerque, New Mexico (New Mexico Community Development Network)
Taos, New Mexico (La Plaza Telecommunity Foundation, Inc, NTIA)

NEW YORK
Bronx, NY (Bronx Community College, NTIA)
Oneonta, NY (Otsego County Chamber of Commerce, NTIA)

NORTH CAROLINA
Asheville, NC (Land-of-Sky Regional Council, NTIA)
Charlotte, North Carolina (Charlotte's Web -)

PENNSYLVANIA
Philadelphia, PA (LibertyNet)
Philadelpha, PA (University City Science Center)

PORTLAND
Portland, OR (Portland Public Schools, NTIA)
Columbia River Inter-Tribal Fish Commission (NTIA)
Salem, OR (Salem Public Library, NTIA)
State-wide planning

SOUTH DAKOTA
Aberdeen, SD (City of Aberdeen, NTIA)
Rapid City, SD (Mni Sose Intertribal Water Rights Coalition, Inc, NTIA)

SOUTH CAROLINA
Statewide Planning

TENNESSEE
Jackson, Tennesse (Jackson Free-Net)
Jackson, TN (Southwest Tennessee Development District, NTIA)
Knoxville, TN (NTIA)

TEXAS
El Paso, TX (Region 19 Education Service Center, NTIA)

VIRGINIA
Blacksburg, Virginia (Blacksburg Electronic Village, NTIA)

WASHINGTON, DC
CapAccess

WEST VIRGINIA
Parkersburg, WV (West Virginia Community Action Directors Association, NTIA)

<u>International Community Networks</u>
Canada
    National Capital Free-Net
Holland
    Amsterdam, The Digital City

New Zealand

City Net, Wellington, New Zealand

Appendix B

CATALOG OF COMMUNITY NETWORK USES & APPLICATIONS

Many of the application categories below were suggested by John Niles, Ellen William and Associates, at a presentation to the Southern California Association of Governments Telecommunications Cluster Advisory Group meeting on 11/8/95. [NOTE: Some of these categories overlap with other researchers' assignments on the "Smart" Communities Research Project Team; however, only those that are implemented in a community network setting will be included in the final list. The first category, Electronic Democracy, is fully fleshed out as an example of how the others might be developed.]

Electronic Democracy

General Discussion: Promotion of electronic democracy is given as one of the most important potential applications for a community network. In a Macworld public-opinion surey, people were queried as to what they really wanted from the emerging "information superhighway"? The results of the survey - voting in elections was the most desired online capability (moderate to extremely high interest by half of the respondents); followed closely by participation in on-line public opinion polls (60% moderate to strong interest); participation in electronic town hall meetings (57%); and direct electronic communication with elected representatives (46%) (Piller, 1994).

1. Direct citizen lobbying of government decision/makers

Examples:

2. Mobilization of special interest groups (educate members in support or opposition to policies)

Examples:

3. Professional development and contact between public officials and government staff

Examples:

4. Electronic Voting

Examples:

E-Vote is software developed for UNIX-based platforms which allows any user of a computer network to design a vote on any subject (source for information which follows was message posted by W. Curtiss Priest on COMUNET discussion list, 12/1/94). The parameters which can be set include:

- "Yes/No" votes or "Numeric" votes.
- "Single" items or "Grouped" items, examples being "Vote for One of the Next Five" and "Distribute 20 Votes over the Next 10 Items".
- Public (where all can see how the others voted, or alternatively, if but not how others have voted)/Private (secret ballots)
- Dynamic vote changing until vote closes/monitoring of vote tally.
- Computer conferencing built-in for "Town Hall" style discussion.
- Ability to be embedded into BBSs, conferencing systems and news-readers.

5. Voter Education

Examples: Good source is "Telecommunications and Democracy" publication, Communications Policy Briefing #4 from the Benton Foundation.

a) Project Vote Smart is self-described as a non-partisan volunteer-based project, "a source of accurate information is being put directly into the hands of the people." (Source: e-mail message, 10/94, action@eff.org). Components of the project include a Voter's Research Hotline (providing voting records, performance evaluations, campaign financing information, contact information, position

statements, biographical details) on candidates and representatives; Voter's Self-Defense Manual and U.S. Government Owner's Manual; Research Services; Reporter's Resource Center; Reporter's Source Book. (Contact: pvs@neu.edu; 1-800-622-SMART (7627).

b) Minnesota e-Democracy Project (Twin Cities Free-Net) created an electronic meeting place for candidates and the public; over 40,000 information retrievals occurred (Fall, 1994; see 9/2/94 e-mail from telecomreg@relay.adp.wisc.edu)

c) 1994 California Online Voter Guide, a California Voter Foundation (CVF) Project. According to the CVF's findings in their report, "Democracy Online", which was an evaluation of the organization's 1994 California Online Voter Guide, "The guide was developed by CVF to promote voter education by utilizing the online medium. Statewide candidates were invited to contribute platforms, speeches, biographies, press releases, and endorsements. The guide alsoincluded job descriptions for each statewide office, California Journal magazine stories, newspaper endorsements, the "Easy Reader Voter Guide", and access to election night results and other voter education sites on the Internet."

Also according to the report:

> The California Online Voter Guide registered over 14,000 logins between October 4 and Election Day, and over 36,000 documents were retrieved.
>
> 32 statewide candidates contributed original material to the guide, representing a participation rate of 90 percent among major-party candidates and 70 percent among minor-party candidates.
>
> Nearly half of the identifiable users, or participants, accessed the guide through an educational institution; one-third logged in from commercia lsites; twelve percent logged in from networks; the remaining nine percent of identifiable users logged in from organization, government, or military sites.
>
> Participants preferred documents such as biographies, endorsement lists and platforms over press releases and speeches. Job descriptions and news analyses were also popular with participants.

d) Voter OnLine Information and Communication Exchange (VOICE), a project of the Public Information Exchange, League of Women Voters Education Fund, Project Vote Smart, and four public libraries (Columbus, Ohio; Evanston, Illinois; Oakland, California; and St. Petersburg, Florida) provided candidate profiles for local, state and national campaigns in addition to polling place information, voting information, candidate voting records, campaign contributions, and third-party ratings of candidates.

Other Government-Related Functions

1. Benefits application and distribution

2. On-line processing of forms (permits, licenses, etc.)

3. Electronic reporting

4. Public Safety

a) Videoconference arraignment of crime suspects

b) Interactive court services (electronic document filing, searching and retrieval)

c) On-line crime reporting

d) Public Safety information (crime alerts, wanted posters, etc.)

Education

1. Distance learning

a) Videoconferencing between classrooms

b) Accredited courses offered on-line

c) Intersegmental collaboration projects

d) Adult education offered (Single mode)

e) Adult education (multiple modes - one-way tv, videoconferencing, on-line, computer-aided)

2. Infrastructure Changes

a) Development and implementation of networking plan for network infrastructure development (office / classroom; school to school; school to district)

b) Collaborative network infrastructure development (schools, government, community network, etc.)

c) Curriculum development dependent on on-line resources

d) School computer labs (fully networked and connected to Internet)

e) Classrooms connected

f) Public access use of school labs

3. "Business" of Education

a) Class Registration and other forms processing by phone or computer

b) On-line School Board management

4. Student-Parent-Teacher-Community Communication

a) Implementation of use of e-mail and other electronic communication tools for parent-teacher-community communication

b) Use by teachers for curriculum development / professional development

Commerce

1. Teleshopping

a) Grocery Shopping

b) Gift Shopping

c) Automobile Shopping

d) Clothing Shopping

e) Consumer electronics and home appliances

f) Pizza and other fast food

g) Book Shopping

2. Other Business Transactions On-line

a) Ordering of event tickets

b)

3. Financial Services

a) Electronic home banking

b) On-Line Loan applications

c) On-Line investment services

d) "Electronic cash" services (First Virtual, etc.)

4. Economic Development

Telework

1. Telecommuting from home

2. Telecommuting from telework centers

3. Virtual office practices for sales, maintenance and other mobile professionals

4. Audio/videoconferencing

5. On-line design collaboration

6. **Telemetry monitoring of remote instrumentation**

Transportation

1. **On-line Ticketing Sales**
2. **On-line Travel information (static)**
3. **On-line Travel Information (dynamic - e.g., realtime highway monitoring)**

Entertainment

1. **On-line wagering**
2. **On-line, interactive chat services**
3. **On-line entertainment information (movies, plays, musical performances, etc.)**
4. **Movies on demand**

Medicine

1. **Electronic medical records (shared across segments of health community)**
2. **Remote consultation and diagnosis techniques between medical facilities**
3. **Home monitoring of medical patients**
4. **Medical image transmission**
5. **Teleconference meetings for support groups**
6. **Electronic support of home medical treatment (includes visiting nurse, etc.)**
7. **Electronic filing of claims forms**

Housing

1. **Real estate multiple listing databases with interior and exterior photos**
2. **On-line leases**
3. **High-speed networks connecting apartment complexes**
4. **Network infrastructure for new housing developments**

Media

1. **Electronic versions of newspapers and magazines (or of selected articles)**
2. **On-line posting of Letters to the Editor**
3. **Local newspaper on-line with regard to transactions (classified postings, billing, advertising,e tc.)**

Telelogistics

1. **Personal and business correspondence by e-mail**
2. **Electronic Data Interchange (EDI) for transactions between government agencies and companies**
3. **Electronic distribution of software and documentation**
4. **On-line Collaborative development of documents**
5. **Community Organizations on-line with regard to training, scheduling, and other organizational activities**

Libraries

1. **Catalogs on-line**
2. **Databases On-Line**
3. **Documents On-Line**
4. **Public access terminals in library**

Appendix C

DEVELOPMENT OF COMMUNITY NETWORKS - PROCESS MODELS

Factors in the development of community networks by local governments

K. Kendall Guthrie and William H. Dutton conducted a comparative case study of three California communities in which local government sponsored some form of community networking project (Santa Monica, Glendale, Pasadena) and one which did not (Irvine) (Guthrie, 1992). They identified several factors which they believe influenced adoption vs non-adoption, as well as the particular technological form of adoption. These factors included:

Dominant technological paradigms of community members and local government MIS staff

Political Culture (and Interest Group Politics)

Economic Factors

Organizational Factors

Principles in making virtual communities that work

Mike Godwin argues that there are nine principles for making virtual communities work (Godwin, 1994). Where the principles are violated, the "public cyberspace" is as poorly designed as the notorious original Levittown housing developments. The nine principles are:

Use of software that promotes good discussions.

No length limitation on postings.

System front-loaded with talkative, diverse people.

Users resolve their own disputes (non-centralized management).

Institutional memory is preserved.

Continuity is promoted.

System hosts particular interest group.

A place is provided for children.

Users have a shared crisis or passion that "jump-starts" a sense of belonging.

Collaborative Community Assessment

Funded by a 1994 NTIA TIIAP grant, the National Community Building Network has developed a "Community Builders Guide to Telecommunications Technology." The Guide describes a collaborative community assessment process which is described as "an exploration of resources rather than an exploration of need. Once discovered and developed, the existing community resources will guide the plan for technological supports." This process is based on the experiences of coordinators of over 20 community projects nationwide that involved telecommunications technology. (NCBN, 1995)

Building Electronic Community

In an on-line discussion in a HandsNet open Forum (National Information Superhighway Debate), Phillippa Gamse and Terry Grunwald propose seven steps to building electronic community. These include:

1)Develop a plan

a) define the community (defining the community of individuals, organizations or combination; common agenda? history of previous collaborative work? core group? connection to existing and planned online communities? similar projects with whom community can link?)

b) identify needs that electronic networking might address

c) survey potential users

d) determine resources needed

2)Select “platform” (system architecture)

3)Market to users

4)Develop training and technical support plans.

5)Set up and manage public on-line information forum.

6)Develop projects where the network is used for collaboration and community problem solving.

7)Create a spirit of community.

Lessons Learned in Telecommunications and Democracy Projects

In a Communications Policy Briefing white paper, the Benton Foundation summarized lessons which have been learned in Telecommunications and Democracy Projects (Benton Foundation, 1995). Successful projects have the following important characteristics:

1) Broad-based access is provided (location of public access points in public offices, shopping malls, as well as respected community locations like churches, the Salvation Army, boys’ and girls’ clubs, community youth centers, unemployment offices and homeless shelters)

2) Facilitate constructive interaction (especially in the beginning, structure the tone and demeanor, and use moderators extensively to ensure that the new interactions are constructive).

3) Develop partnerships (public interst groups should develop partnerships between public agencies, nonprofits, and interested private sector organizations).

4) Involve business community, but don’t become dependent upon it.

5) Establish sustained funding base from fee-based services and local funding sources.

6) Share information with other projects about what works and what doesn’t.

UCD Model s- Testbed Implementation & Transformative Technology

Appendix D

COMMUNITY NETWORKING RESOURCES

Organizations

Alliance for Community Media
alliancecm@aol.com

Benton Foundation
E-Mail: benton@benton.org
WWW: http://cdinet.com/benton

Center for Civic Networking
E-Mail: ccn-info@civicnet.org
WWW: http://www.civic.net:2401/ccn.html

Computer Professionals for Social Responsibility
E-Mail: cpsr@cpsr.org
WWW: http://www.cpsr.org

Morino Institute
E-Mail: info@morino.org
WWW: http://www.morino.org

National Public Telecomputing Network
E-Mail: nptn@nptn.org
WWW: http://www.nptn.org

Telecommunications Policy Roundtable
E-Mail: cme@access.digex.net

On-Line Resources (Inventories, Databases and Community Network Resource Catalogues)

Community Networking Resources

WWW: http://sils.umich.edu/Community/Community.html

http://www.nlc-bnc.ca/ifla/services/commun.htm

WWW Guide to Community Networking
http://http2.sils.umich.edu/ILS/community.html

City Planning & Community Networks

http://www.civic.net:2401/cambridge_civic_network/cambridge_civic_network.html

Civic Practices Network

http://cpn.journalism.wisc.edu

Good on-line indexes to community networking topics & inventories of communitynetworks

http://galaxy.einet.net/galaxy/Community/Networking-and-Communication.html

http://www.usask.ca/~scottp/free.html

Research at National Capital Freenet

http://debra.dgbt.doc.ca/services-research/

Mailing lists

Comunet

Free-net admin

NII Awards

http://www.gii-awards.com

Appendix E

WORLD WIDE WEB SITES

CYBERCAFE'S

http://www.cyberyder.de/
CybeRyder - Frankfurt's first cybercafe in the heart of the city. Workstations, seminars, coffees, teas, soft drinks, light snacks and croissants.

http://www.irelands-web.ie/
Planet C@fe, The Cybercafe situated in the centre of Dublin.

http://www.telecall.co.uk/cafe/
Intercafe Telecall - Bristol's first cybercafe.

http://www.cityscape.co.uk/users/do77/index.htm
Peak Art CyberCafe - The North of England's electronic Cafe providing good Food & Drink, Internet access, and full Business services.

http://www.netropolis.co.uk/
Netropolis Cybercafe - Internet bar & cafe. The resturant's basement also contains Gadgetropolis - a shop selling computer hardware and other interesting gadgets.

http://www-edin.easynet.co.uk/
Cyberia Edinburgh - Scotland's first cybercafe

http://www.haus.net/
Infohaus - a dedicated Cybercafe commited to linking the Tampa Bay community to the global community of the Internet.

http://www.fn.net/~kschauf/
Hard Drive Cafe - Hack & Snack at the Hard Drive Cafe, Wichita's premier cybercafe

http://www.mynet.com/
Deisgns for Living - The Netcafe - a large range of coffee flavours, books, excellent food and relaxed decor. A bookstore cybercafe located in the Fenway area.

http://www.cityscape.co.uk/cc/index.html
Cybercafe aims to provide a focal point for the UK's electronic community.

Appendix F

Community Network URLs

COMMUNITY NETWORKS - CANADA

British Columbia

http://www.sunshine.net/sunshine.htmlSunshine Coast Community Net
http://freenet.vancouver.bc.ca/Vancouver Regional FreeNet (VanFNA)

Manitoba

http://www.freenet.mb.caBlue Sky Freenet

Nova Scotia

http://www.cfn.cs.dal.ca/Chebucto FreeNet (CFN)

Ontario

http://freenet.carleton.ca/Ottawa FreeNet

COMMUNITY NETWORKS - EUROPE

Finland

http://www.jkl.fiJyvaskyla Community Network

Germany

http://www.muenchen.deMunich Online

Holland

http://www.dds.nl(The Digital City, Amsterdam)

Russia

http://www.spb.suSt. Petersburg

COMMUNITY NETWORKS - UNITED STATES

Alaska

http://zorba.uafadm.alaska.edu:80/fairnetFairbanks Community Net

California

http://www.belmont.gov/belmont/Belmont -- Access for the Community
http://community.net/community/coco/index2.htmlContra Costa Community Net
http://www.bluebird.com/carlsbad/Carlsbad Community Net
http://www.dcn.davis.ca.us/Davis Community Network
http://www.coolsville.com/Laguna Beach Community
http://community.net/community/napa/index2.htmlNapa Community Network
http://www.freerun.com/Napa Valley Community Info
http://www.city.palo-alto.ca.us/home.htmlPalo Alto
http://white.nosc.mil/sandiego.htmlSan Diego
gopher://slonet.org/San Luis Obispo Network
http://www.coastside.net/COASTSIDE_LIVE/San Mateo's Coastside Live
http://community.net/community/solano/index2.htmlSolano Community Network
http://www.svpal.org/Silicon Valley Public Access Link (SV-PAL)

Colorado

http://www.aspenonline.com/aspenonlineAspen Online
http://bcn.boulder.co.us/Boulder Community Network (BCN)
http://www.cbinteractive.com/cbws/Crested Butte Community Guide
http://web.frontier.net/SCANDurango Information Center
http://www.csn.net/~arthurvb/Estes Park Community Info
http://www.fortnet.org/Fort Collins Community Net (FortNet)
http://www.4corners.com/Four Corners Regional Info
http://gn.mines.colorado.edu:3867/Golden Community Info
http://www.sccsi.com/LakeCity/lake.htmlLake City

http://www.iti2.net/mcedc/default.htmMesa County Community Profile
http://www.iti2.net/mccn/Mesa County Community Network
http://infozone.telluride.co.usTelluride InfoZone
http://www.csn.net/~mvkThe Longmont Hub
http://www.usa.net/pueblo/Pueblo On-Line
http://www.webcom.com/~macmedia/Steamboat A-Net
http://vail.netVailNet

Florida

http://www.freenet.ufl.eduAlachua County Freenet
http://www.naples.netNaples Free-net
http://freenet3.scri.fsu.edu:81/menus.htmlTallahassee FreeNet

Idaho

http://nssnet.com/tvlocal.htmTreasure Valley, Boise

Illinois

http://www.prairienet.org/Prairienet

Indiana

http://www.bloomington.in.us/Hoosiernet
http://dbowman.slip.indy.net/Indianapolis Community Net

Kansas

http://www.sunflower.orgKansas City Community Net

Massachusetts

http://www.civic.net:2401/cambridge_civic_networkCambridge Civic Network

Michigan

http://www.grfn.org/Grand Rapids Free-Net
http://www.hvcn.org/Huron Valley Community Network

Minnesota

http://freenet.msp.mn.usTwin Cities Freenet

Missouri

http://www.sunflower.orgKansas City Community Net

New Mexico

http://laplaza.taos.nm.us/La Plaza Telecommunity, Taos
http://www.nets.com/santafe.htmlSanta Fe Online
http:///www.vla.com/vla.htmlVirtual Los Alamos

New York

http://www.ithaca.ny.us/IthacaNet
http://www.soho.netSoho Net, NYC

North Carolina

http://www.wilmington.net/jervay/jervay.htmlRobert S. Jervay Place, Wilmington
http://www.wilmington.net/wo/Wilmington Online

Oklahoma

http://www.ionet.net/~okcpio/Oklahoma City Town Square

Oregon

http://www.efn.orgOregon Public Networking (Eugene Free-Net)

Pennsylvania

http://www.libertynet.org/LibertyNet, Philadelphia

South Carolina

http://city-info.com/Myrtle Beach Online

Texas

http://www.cs.utexas.edu/users/ubiquity/jewish.htmlAustin Jewish Community
http://www.tpoint.net/mainMetropolitan Austin Interactive Network
http://feenix.metronet.com/Texas Metronet

Virginia

http://crusher.bev.net/index.htmlBlacksburg Electronic Village
http://freenet.vcu.edu/cvanet.htmlCentral Virginia Net (CVaNet)

http://ns.gamewood.net/gds/gds.htmlDanville Community Net
http://www.seva.netSoutheastern Virginia Regional Freenet (SEVAnet)

Washington

http://www.seanet.com/Seattle/SeattleHome.htmlSeattle Network (SeaNet)

AUSTRALIA

Victoria

http://ghmac.lib.rmit.edu.au/mfn.htmlMelbourne Free-Net
http://ghmac.lib.rmit.edu.au/vicnet.htmlVictoria Network (VicNet)