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ACCESS: MAKING YOUR COMMUNITY INTERNET-READY

The prerequisite for electronic government is access to the Internet, for local government employees and for citizens. Access has many components, beginning with the physical infrastructure of computer hardware and wires and transmission equipment, and extending to usage policies and procedures, service pricing, and user aptitude.

This report was written to brief the local government manager on all the elements that determine whether citizens will be able to access online services. It first explains infrastructure and service pricing issues and then looks at the digital divide and ways to bring access to all segments of the population. It discusses how to work with the private sector to increase access and suggests new strategies for providing employee access to the Internet.

Several models for local government provision of telecommunications infrastructure are discussed and illustrated with examples, both successful and unsuccessful. The Tacoma, Washington, Click! Network and LaGrange, Georgia's initiative to provide free Internet access to all citizens are described. Based on current practice, the author suggests six secrets to success for building network infrastructure.

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Publishing and Data Services
Barbara H. Moore, *Director*
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Heather Block, *Layout*

Author Contact Information:
John O'Looney
Public Service Associate
Carl Vinson Institute of Government
201 N. Milledge Ave.
Athens, Ga. 30602
Phone: 706.542.9404/Fax: 706.542.9301
E-mail: olooney@cviog.uga.edu

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Access: Making Your Community Internet-Ready

John O'Looney, Ed.D., Ph.D., is a public service associate with the Carl Vinson Institute of Government at the University of Georgia and the director of the Internet Education Project at the Carl Vinson Institute, which teaches government officials to become leaders in Internet-facilitated business operations, civic education, and citizen participation. Dr. O'Looney is the author of two books published by ICMA—Beyond Maps: GIS and Decision Making in Local Government *(1997) and* Local Government On-Line: Putting the Internet to Work *(2000).*

Citizens are making their opinion clear: they want to conduct their government business on the Internet. Governments as diverse as the state of Utah and the Home Office of Great Britain report that citizens want access to public services, information, fee payments, and application processing 24 hours a day, seven days a week.[1]

Convenient and continuous electronic access to government information, services, application processing, and tax and fee payments should lead to better, more flexible services. And as they gain digital access to government, citizens become smarter producers, partners, and consumers in the new economy. For this reason, governments that are developing digital services face a special challenge: making sure that all their citizens can take advantage of the new ways of conducting government business.

Unfortunately, meeting the access challenge is more difficult than simply putting information on the Web. Access involves a number of competing issues and interests: market choice versus universal service, public versus private provision of network infrastructure, and privacy and property versus freedom of information and connectivity. Experts also disagree about the wisdom of investing in information technology and the proper role of government in addressing the digital divide.

This report explores these conflicts in three areas:

- Infrastructure and service pricing
- The digital divide
- Network capabilities and procedures for public access.

The report also describes several business models and discusses financing and leadership for government-owned telecommunication networks. The report focuses on information infrastructure issues because these are currently the focus of work for many local governments. As infrastructure is created and matures, issues in other areas will grow in importance.

This report also focuses on local government initiatives. However, sufficient public access to broadband network services may require new state policies in the areas of purchasing, regulation, access and taxation, and service pricing.

THE CASE FOR PROMOTING ELECTRONIC SERVICES

The most powerful argument for government support of electronic networks is that the usefulness of a network increases exponentially as the number of users increases.[2] The implications for government support of electronic service delivery are fairly clear: policies that expand access to the network to a broad base of users provide an increasingly positive return on investment.

Some of the potential positive effects of near universal electronic service delivery include:

- A reduction in trips and in the associated costs for transportation infrastructure, vehicles, and pollution.
- A more effective and efficient operation of distance education, online business transactions, telemedicine, and telecommuting. All of these possibilities in turn can make the overall economy more efficient.
- An increase in the ability of governments to provide more services and to move to a more efficient paperless operation.
- An increase in the ability of citizens to participate in government decision making online.

INFRASTRUCTURE AND SERVICE PRICING: THE ECONOMICS OF ACCESS

Network infrastructure is essentially an economic issue: A large enough investment will give every American the ability to access the Internet at high speed. For this reason, the focus of this section is on identifying economic models and approaches that will allow local governments to build networks to support digital government and electronic commerce.

The specific policies that could be employed to decrease the prices of online services and remove barriers to their access and use are discussed. The underlying assumption is that as prices and barriers decrease, overall demand for electronic services will increase. With increased demand, greater economies of scale are possible. Economies of scale lead in turn to even lower prices for service access and delivery.

Models of Access Development: Policy Issues

Historically, the U.S. government has used three different methods to provide access to what was considered to be an essential or important service. First, to create citizen access to roads and to affordable postal services, the government undertook the task of building roads and operating a postal service. Second, to provide access to railroads, it used land grants to induce railroad companies to expand the railroad network quickly. Third, to provide universal access to telephone services, the federal government first created a regulated monopoly (and then regulated competition), which forced private providers of telecommunication services to establish lower pricing for residential users than for business users and lower or subsidized pricing for rural or remote users.

Another approach to providing a service is to pay for the facility (e.g., build or purchase a parking deck) but allow a private firm to operate it. Finally, sometimes government chooses not to get involved in the provision of a service even though the service is important. For example, in some cities the sanitation or water service is provided by private providers competing for market share.

The key question is which of these models to follow to ensure citizen access to the Internet. A review of the historical literature does not provide a clear answer, but does suggests advantages and disadvantages of different approaches to building or providing for the building of a network. To provide infrastructure for digital services, states and localities have tried each of the approaches described in the accompanying sidebar.

In most communities, access is provided by a telecommunications or cable company, but some cities like LaGrange and Newnan, Georgia; Blacksburg, Virginia; and Tacoma, Washington, have used public resources to develop a higher level of local network capacity and citizen access. These communities see public provision of network capacity as both an economic development magnet and as a catalyst for more online government, education, and intra-community business transactions.

Citizen access and use of networks depend not only on public- and private-sector networks, but also on the availability of public kiosks and community computer centers, employees' access to the Internet at work, and on government policies that keep the price of online services competitive with traditional service delivery.

In promoting greater access and use of electronic services, the local government has decisions to make regarding 1) purchasing and promotion, 2) taxation and access charges, 3) and direct pricing of (or fees for) online services. Regulation at the state level can also be an important policy tool.

INFRASTRUCTURE: PURCHASING AND PROMOTION

Efficient and effective electronic service delivery and electronic government will only occur when access to the Internet is available to persons of all income classes, and when access is nearly ubiquitous. Workstations at employees' desks, Internet kiosks in waiting rooms and cafeterias, and Web-connected terminals in libraries and schools will all be part of the electronic service delivery/e-business landscape of the future. State and local governments will be major actors in moving toward ubiquitous e-government/electronic service delivery because they are large employers, responsible for numerous public spaces, and administrators of public schools and libraries. Making Internet access ubiquitous involves both building infrastructure and setting policy.

Infrastructure serves either government-owned facilities and offices or citizens and businesses in the community (or both).

Government Infrastructure

As owners of public facilities and offices, state and local governments are among the largest purchasers of broadband network services. As large purchasers, they can use two basic strategies related to infrastructure for improving access at government operated facilities: 1) joint purchasing, partnerships, and bandwidth sharing, and 2) efficient use of bandwidth.

Joint purchasing, partnerships, and sharing bandwidth. More and more local governments are working with their local public schools, colleges, libraries, and hospitals to jointly purchase bandwidth or network services, in many cases, by building a public network. However, in other cases, cooperatives are developed chiefly for purchasing privately owned network services.

For example, the city of Garden City, Kansas, Garden City Community College, St. Catherine Hospital,

and Finney County have formed the Garden City Information Technologies Cooperative with the short-term goal of developing a variety of technology-oriented goods and services. The cooperative will hire technology support personnel and employ them in a shared, cost efficient manner. In the medium term, the cooperative also hopes to be able to take the cost savings from the aggregation of telecommunication needs of the cooperative members and invest these savings in community improvement. The cooperative's long-term vision is to develop an integrated community network that allows at least the cooperative members to share information in an efficient and effective manner.[3]

Pooled purchasing of Internet bandwidth capacity can substantially reduce the price of access and can allow partners to purchase more bandwidth. Although the best bulk purchasing deals are made through statewide aggregation of demand,[4] local governments can establish partnerships with schools, hospitals, libraries, and other public institutions that are or will be heavy users of network capacity.

Just as important as lowered cost, however, is the added benefit that comes from sharing bandwidth. Sharing bandwidth enables most users to have very high-speed access most of the time, because individual users require bandwidth for only a small part of the total time they are online (for example, while a page or file is actually being downloaded, but not while they are simply reading the page). For example, if two users share a 128 Kbps (kilobits per second) access line, they will each enjoy 128 Kbps access speed most of the time. Only when both users attempt to download pages or files at the same instant will they experience access delays. The benefits of sharing grow as the partnership is extended and when an organization shares bandwidth with another organization that uses the Internet during a different time of the day (or night).

Efficient use of bandwidth. The first step toward an efficient design of network services is a network use audit. This audit identifies users who need high-speed access and choke-points in the network. Based on the audit, a network engineer designs a plan for the most effective purchase and routing of bandwidth.

Two examples illustrate some of the issues involved in designing a network to use bandwidth efficiently. In the first example, a local court is setting up video arraignments for persons held in a jail a number of miles away. Because video demands a great deal of bandwidth, if other government employees share the same network loop the court is using, the access speed for these other units of government will probably drop substantially. In this case, the court may need to establish a separate Internet access.

In a second example, a group of people in one building are using a geographic information system (GIS) and exchanging large digital map files that demand a lot of bandwidth. If the GIS users are sharing the same network loop as the rest of the government, the access speed experienced by other government workers will suffer. Since the GIS users are all in a single building, a router can be installed that sends the traffic among the GIS users directly from local computer to local computer, without clogging up the rest of the network.

Government support for networks

Direct Support

Examples Public lands provided in exchange for development of the railroads; subsidies given to companies that bring network service to remote areas or to non-affluent customers

Advantages Can lead to accelerated growth in all areas and can be used to promote competition (e.g., if support is distributed among providers)

Disadvantages Can lead to unwarranted payments and unnecessary (or uneconomic) development. Difficult to identify the point where a basic level of access ends and luxury-level access begins.

Privatization

Examples Private provision of sanitation or garbage pick-up services; toll roads

Advantages Can ensure professional management of a mature network

Disadvantages Network growth determined by profit, possibly leaving poorer, more rural areas of a community with second-class access; high transaction fees for users crossing networks

Government Provision or Regulated Monopoly

Examples Public road networks; "Ma Bell" phone system

Advantages Can extend network to all areas, increasing the value of the network

Disadvantages Network maintenance may be uneven since maintenance support is less politically valuable than new projects; can constrain growth and innovation in cases where new or enhanced services threaten existing organizations

Regulated Competition

Example Provision of telecommunications after 1996

Advantages Greater price and product competition

Disadvantages Tends to provide affluent areas and geographically concentrated groups with high quality services while providing remote and poor areas with minimal or no service; diversity of new digital services makes it difficult for regulators to establish a clear and enduring definition of "universal service."

Community-Level Infrastructure

Increasingly communities compete with one another for new economy businesses on the basis of their digital communication capabilities. Local governments across the nation are developing Internet network capacity at the general community level in order to meet this competitive challenge. These governments are using a variety of mechanisms to increase capacity and/or to achieve universal access.

Providing the infrastructure. The incentives for municipal utilities to enter into the business of providing digital infrastructure are particularly strong because utility operations already have a certain level of network infrastructure. Because installation and maintenance costs make up the major part of the price of a network, these municipal utilities have identified a strong business opportunity in purchasing optical fiber and cables with more capacity than they themselves need. Once the network is in place, these utility departments may choose to operate their own network services (including services for telephone, cable TV, and Internet access) or they may choose to lease the "dark fiber" to existing telecommunications, cable, and Internet service providers. ("Dark fiber" is fiber optic cable not lighted by lasers or other electronic equipment.)

Not every state allows local government agencies to enter the telecommunications business. In these states, the incentives and the legislative authority to build a community network may be missing or only partially in place. Virginia, for example, has traditionally prohibited local governments from entering the telecommunication business. However, in 1999 the state code was changed to allow a locality, electric commission or board, industrial development authority, or economic development authority to lease dark fiber to other entities if they meet certain qualifications.[5]

In states like Virginia, even though a local government may not be able to compete directly with telecommunication firms, it can induce more competition among telecommunication firms by laying more optical fiber than it needs for its own operations. Telecommunication firms may then find it better to bid on use of the existing fiber (and compete with each other for the privilege) than to lay their own fiber.

When the government does not develop a dark fiber capacity, competition among telecommunication providers is less likely to occur, particularly in small towns. For example, if one cable company has built a broadband network of sufficient capacity to serve the projected needs of a small town for a number of years, there is little incentive for a second cable company or a telephone company to enter the market. In larger communities the size of the customer base may justify a competitor's investment, but this is not typically the case in smaller communities.

When a local government creates dark fiber capacity, however, competition for that capacity will occur at least at the various leasing or contract renewal points, even if the competition is not continuous. Descriptions of several business models for government-owned networks can be found later in this report (see pages 13–18).

While most local governments that decide to provide the infrastructure do so in order to influence the market or even compete in the market, some also want to protect their right-of-way. The city of Anaheim, California, cites this as one reason for building a network with enhanced capacity. By installing one excess-capacity network that can be sub-divided and leased to multiple competitors, the city hopes to reduce the amount of bothersome and expensive street openings and repairs that would be needed were multiple networks installed.

Some communities, even fairly small ones, have been successful in providing improved community-level information infrastructure. Newnan, Georgia, for example, reports that the city will have no trouble paying off its bonded indebtedness for a full-service city telecommunications network within the required time period. Anaheim, California, reports revenues of $1 million during the first year of its expanded network's operation. Furthermore, Anaheim credits the network with directly bringing 2,000 living-wage jobs to the city and indirectly creating 2,400 jobs through regional multiplier effects. These revenues and jobs were the results of an initial investment of $6 million to install a 50-mile loop of 96-fiber cable.

While most community efforts to date appear to have equaled or exceeded their projected revenues at the beginning of the project, not every community will experience similar success. The business case for investment must be clearly compelling rather than simply attractive.

Short of building the infrastructure themselves, local governments can take a number of other steps to promote the development of information infrastructure, either in conjunction with network creation and enhancement or as a separate action. The following approaches range from loose-knit associations to use of contract power to implementation of concrete projects.

Forming promotional and purchasing alliances. A number of groups have sprung up across the country for the purpose of helping business, citizen, and government consumers of bandwidth get better access to network services and better deals. These alliances are very similar to the Garden City Information Technologies Cooperative described above. What distinguishes them is the inclusion of major business partners in the purchasing coalition. These alliances tend to be voluntary membership organizations that charge nominal fees. While the objectives of the groups tend to be consumer focused, some include service providers as well.

The activities of these groups vary based on the immediate need. For example, Berkshire Connect was first organized to bring connectivity to rural western Massachusetts. Telecommunication costs in the area

were as much as four times higher than in the more wired eastern part of the state. This cost difference was reported to be driving some firms to relocate. Berkshire Connect gathered data, developed revenue projections, and wrote business plans for investment in technology infrastructure. Next, the group organized potential customers and then advertised a contract for a new regionwide network. Because of the scale of the contract, a number of competent providers responded, and a sophisticated network is nearly completed.

Another promotional and purchasing alliance, the West Georgia Telecommunications Alliance (WGTA), is a nonprofit coalition of schools, businesses, and local and state agencies in a three-county area west of Atlanta. Like Berkshire Connect, WGTA hopes to leverage individual consumer needs to build a regional fiber optic network. However, WGTA's objectives are somewhat broader and include:

- Lowering the cost of access to advanced digital communication services
- Bringing competition in telecommunication services to the area
- Making the area more attractive to industry and information-age businesses
- Fostering creative applications of telecommunications within the community through sharing ideas and information
- Using modern telecommunications technology to extend the reach and effectiveness of area educational institutions.

WGTA has held conferences and workshops, promoted wiring projects for schools and service organizations, and generally supported the network development projects of the members. Major partners in WGTA's effort to build a fiber optic network are Carroll County and the city of Carrollton.

Creating development funds. While some local governments increase access by lowering consumer prices or, as in the case of LaGrange, Georgia (see page 15), by offering free services, others have taken a less direct course to promoting access. For example, Anaheim created two development funds to promote access, one to support access by low-income residents, the other to promote information technology activities that support economic development.

Contracting for service quality, expanded access, or excess capacity. Using the value of their right-of-ways as a bargaining chip, local governments can demand a certain level and quality of service, or network connection access for areas that might otherwise be underserved. Obviously, local governments' bargaining strength is limited both by federal law (see below) and by the willingness of provider firms to apply to use the right-of-ways or other government resources.

Some governments use their contractual power to provide for both community and government Internet access. For example, following a competitive bid process, the state of Minnesota entered a contract with a private firm that granted exclusive access to certain freeways for installing fiber optic cables. In return, the firm is providing the state with active fiber and a certain amount of reserved bandwidth that can be activated in the future. Because the contract requires the vendor to install fiber that is owned by third parties and to make the capacity available for lease to all interested telecommunication firms, the contract is likely to meet FCC guidelines regarding the creation of a level playing field for telecommunication providers.

The city of Seattle, Washington, issued a request for proposals for development of a "city-wide information highway" to serve internal needs and to ensure service to all residents and businesses. Seattle used a number of inducements to get the level and scope of services it wanted, including its own use of services, its existing right-of-ways and infrastructure (utility poles, conduits, etc.), and its cable franchise.

Wiring government-owned buildings. Local and state governments can support specific wiring projects or network extensions. The extension of high-speed network services can be compared to the provision of water and sewage capacity as a quid pro quo for a new plant locating in the community. For example, the local government can wire or rewire government-owned (or industrial development authority-owned) facilities,

Open access litigation

Some local governments have tried to increase the competitiveness of broadband services provided by cable companies. Currently, access to the Internet through a cable modem is typically a bundled service. That is, the subscriber pays for both the cable wire bandwidth and for a particular Internet service provider, or ISP, such as America On Line. Any subscriber who wants to use a different ISP must pay an additional service charge. A number of local communities—from Broward County, Florida, to Fairfax, Virginia, to Portland, Oregon—have required cable systems to allow "open access" so that subscribers can contract with the ISP of their choice, without paying double fees.

The Federal Communications Commission has not yet made a final statement on the issue. In July 1999, a federal judge in Portland, Oregon, ruled that Portland could require the AT&T cable system to open its lines to competitors. AT&T eventually agreed to work to open up its cable lines to competing ISPs, but it is unclear whether an appeals court would have ruled in favor of the right of AT&T to keep the service bundled.

For updated information on the Portland case, visit http://www.mhcrc.org.

and install Internet-ready wiring in speculative buildings that are used to attract new businesses.

Renegotiating cable franchise agreements. Cable television lines can be a major part of a high-speed digital network, and many cable systems have been upgraded to establish this capacity. Cable franchise renewals provide an opportunity for the local government to increase the community's access to high-speed networks. Franchise agreement requests might include:

- A "state-of-the-art" clause in the franchise agreement that obligates the cable company to upgrade its network whenever any other of the company's networks is upgraded to include new capacities or services. Pittsburgh, Pennsylvania, included a state-of-the-art clause in its new franchise agreement with AT&T.
- An increase in the number of public access channels when a network is upgraded, to be used for a variety of purposes including staff training, education, court services, public hearings, and traffic monitoring.
- A set amount of reserved bandwidth (instead of a specific number of TV signal channels) that can supply Internet services to public facilities or even to the public at large.
- Equipment and services for areas of the community that are under served. In Tucson, Arizona, for example, Cox Communications is providing free equipment and service to a low-income housing project.

Lobbying for state action. While many local communities will need to address the problem of unequal access on their own, some will want to lobby their state legislature and executive to address the problem at the state level. The state of North Carolina, for example, has forged an agreement with the state's three major communication companies to bring high-speed Internet access to the entire state by 2002. The companies, BellSouth, Sprint, and GTE, will work with key stakeholders such as Internet service providers, telephone cooperatives, and the state government to reach the goal. In most areas of the state, the companies will pay to build the high-speed network. However, the state will provide tax incentives or low-interest loans to finance the extension of the network to areas where the market can't support its cost. The agreement includes the provision of dial-up Internet access from every phone exchange within one year and the establishment of two pilot telework centers in the poorest areas of the state.

Promoting employee access. The issue of planning for the hardware and software infrastructure needed to provide staff access to advanced network services is larger than can be adequately addressed in this report. However, public managers should be aware of new strategic alternatives to the traditional practices of in-house budgeting and provisioning. For hardware, software, and network infrastructure the key alternative is called seat management, or desktop outsourcing.

Seat management refers to the practice of turning over the procurement and management of an organization's desktop environment to an outside contractor. The seat management concept has its parallel in telecommunications. The idea is that the computer and associated networks are like the phone system: as such, the key components should be transparent and can be managed by a company specializing in this utility-like service.

The benefits and costs of outsourcing information technology (IT) hardware and software are open to debate, mainly because to craft a satisfactory service contract, local government staff must have almost the same skills and knowledge required to manage the direct provision of the services.

Good seat management (whether in-house or outsourced) includes

E-rate partnerships

The federal government is subsidizing Internet access for schools, libraries, and health facilities. The subsidy program, called E-rate, provides an opportunity for local governments to partner with those agencies. Specifically, if a school or library does not have the basic funding needed to participate in the E-rate plan, other governmental units can help.

Careful planning and attention to E-rate restrictions, however, are needed. For example, government-developed networks and network services (such as billing, help-desk support, or service integration) may not be eligible for E-rate discounts because the FCC has decreed that schools can receive discounts only for service components provided directly to the network by private telecommunication companies. In addition, the E-rate probably can't be used to purchase Internet access directly from a government-owned network without competitive bidding.

While FCC rulings have decreased the value of Internet partnerships between local government and E-rate recipients when the local government is the service provider, most observers believe that the overall benefits of such partnerships can still be substantial. In Dublin, Georgia, for example, the school system helped pay for a network that can serve both the schools and the local government, while reserving large amounts of bandwidth for future use by schools, governments, and local businesses.

Sources: William Thomas, *What's an E-Rate? Do you have an E-Rate? Should you care?*, Southern Regional Education Board, found at http://www.sreb.org/Main/LatestReports/tech/Erate/E-Rate_Report.html (no date); Louisa Shepard, "E-Rate: Crossing the Digital Divide," *Civic.Com* (April 1998).

- Creating an inventory of the IT environment before awarding a contract
- Understanding how IT relates to the organization's mission and vision for the future
- Identifying the configuration of IT services that are needed to support the mission
- Identifying hidden IT costs and hidden sources of support
- Identifying the cost of the "shadow armies" of technical support (i.e., the cost of the time of individuals to whom employees turn for help with problems rather than calling a systems support person)
- Identifying needed response levels for break/fix situations (e.g., a low response level for noncritical functions, a standard level for most situations, and a rapid response for mission-critical functions).
- Identifying standards or metrics for expected system functioning (e.g., minimum percentage of time that desktop computers should be up and running).

Application service providers (ASPs) offer organizations a component of seat management: consistent, up-to-date software tools for all employees. Employees who use software provided by an ASP must be continuously connected to the Internet. Employees essentially load applications that reside on Web servers and can also save their work product on Web servers. ASPs facilitate document sharing and access from any Web-connected computer and promote online conferencing and collaboration through the use of collaboration tools such as white boards, on-line polling, and inter-office instant messaging and chat.

Public managers must also foster appropriate use of the Internet by employees through training and appropriate use policies. Hard-line approaches to inappropriate use, for example, prohibiting any use unrelated to a government business operation, are difficult to enforce and create an unnecessary barrier to the expansion of electronic service delivery and e-government operations. Policies should allow reasonable used of government computers by both employees (e.g., for personal use during lunch and break times, for conducting any citizen-level government transaction, etc.) and citizens who are visiting government offices.

TAXATION AND ACCESS CHARGES

Taxes and access charges can affect community access to information networks by raising the price of network services. Higher prices in turn discourage use of the Internet by low-income residents.[6] Two types of taxes and access charges currently affect the price of access to the Internet and other digital networks: charges on Internet access and taxes on telecommunications in general.

The cost of broadband Internet access will play a major role in determining how soon the necessary infrastructure for universal electronic service delivery will be in place. Citizens who might be willing to pay $30 a month for access to a service may not be willing to pay $40 or $50 a month.

Only a handful of states and localities were charging for Internet access when the Internet Tax Freedom Act, which placed a three-year moratorium on further access charges or taxes, was passed in 1998. Some communities that had implemented access charges repealed them to avoid discouraging economic growth. Tacoma, Washington, for example, exempted Internet service providers from the local telephone business tax. Whether or not the Internet Tax Freedom Act's moratorium on Internet access charges is allowed to expire, it is unlikely that many local governments will institute or expand access charges since such an action would signal unfriendliness to new economy business prospects and growth.

The second category of charges—taxes on telecommunications in general—may represent a more substantial barrier to access because they can price a portion of the population out of the market. The structure and level of taxation of telecommunication services can add to the price of Internet access both directly, when companies pass taxes on to consumers, and indirectly, when the administrative overhead of conforming to tax laws raises the cost of doing business.

Telecommunications Act of 1996

The Telecommunications Act of 1996 lays out the conditions under which local and state governments are allowed to regulate, contract, or partner with telecommunication firms. The Act is intended to remove barriers to market entry, including such things as governments preventing companies from erecting towers for the purposes of providing cellular telephone services or collecting taxes or fees from firms that provide direct-to-home satellite access. Under the Telecommunications Act of 1996, local and state governments

- Can manage right-of-ways and receive compensation for the use of those right-of-ways
- Can provide telecommunication services, whether with other utilities or on a stand-alone basis, providing they do not give preferential treatment to their own utility units
- Can act to preserve and advance universal service, protect the public safety and welfare, ensure the continued quality of telecommunication services, and safeguard the rights of consumers—as long as they do so on a nondiscriminatory and competitively neutral basis.

FEES FOR E-GOVERNMENT SERVICES

In addition to the barrier represented by the cost of basic network connectivity, citizens' access can also be limited by the price that governments place on premium online services such as taking payment of taxes or fees via credit card or providing electronic copies of expensive-to-produce data files. The lower priced these services are, the more people will choose to conduct business online.

Private vs. Public Pricing Strategies

Most businesses in the forefront of electronic service delivery provide electronic transaction services for free, and in some cases these businesses even subsidize or reward use of these services.

There are two reasons for these neutral or subsidized pricing policies. For business-to-business services, it makes little sense to charge for a transaction that contributes to efficiency. (The majority of electronic service delivery services are business-to-business.) For customer transactions, Internet-based providers of electronic service delivery applications have discovered a new business model: "outsourcing to the customer."[7]

Outsourcing to the customer means having the customer perform many of the functions that had been carried out by customer service representatives, data clerks, product design experts, purchase order managers, and product configuration specialists. By encouraging customers to order online, providing them with ways to customize services, and giving them opportunities to provide feedback on products or services, many of the quality improvement efforts that typically cost hundreds of thousands of dollars to implement are actually provided by the customer. Moreover, the customers are generally using their own phone lines, equipment, space, and electricity. Customers, of course, benefit from more immediate and 24-hour service, better record keeping, fewer hassles, and less travel time.

While many businesses are making the necessary up-front investments to entice and motivate customers to use online services rather than on-site services, most governments implementing e-government services are requiring that citizens pay an extra fee for the privilege of being able to complete online transactions. For instance, citizens may be charged an extra $4 to apply and pay for fishing or hunting licenses online. Typically, the transaction fee will add between $2 and $8 over the other fees, especially when the local government has contracted with a private-sector partner to provide the online service. Unfortunately, this pay-as-you-go model will likely delay consumer use of online service delivery and transactions.

Government Constraints

At the root of this short-sighted strategy are three factors. First, most local governments don't have the funds to invest in a new service in hopes of a return from future increases in efficiency.

Second, many government information technology staffs lack the time, expertise, and access to proprietary source code needed to set up and maintain integrated e-government services. Without the ability to invest for the long term or to provide for in-house e-government services, governments that want to move toward digital service delivery must contract with private-sector entrepreneurs to achieve their electronic service delivery goals. Typically, the private contractor invests in the e-government infrastructure in return for both exclusive rights to conduct the service transaction and the right to charge a fee for the service. Although contracting out gets e-government services online, the long-term consequence of this strategy may be to delay the improvements in efficiency that might be gained from transforming the service delivery system.

This pay-as-you-go model will likely delay consumer use of online service delivery and transactions.

The third constraint is that if a local government accepts payment by credit card, it must pay a percentage of the funds being transferred, somewhere between .5 and 3 percent. Unfortunately, if only a small group of citizens use the credit card system, the benefits of additional government efficiency may be minimal. Moreover, if the few credit card users use the system to pay a few large bills such as property tax bills, the fees the government must pay per transaction will be quite high.

The transaction fee rate will be lower when overall transaction amounts are large (e.g., for total revenues in the million dollar range, the transaction fee rate may drop to 1 percent). Thus, a local government that enables fee and tax payments through credit card transactions will want to ensure that a wide variety of fees can be paid through the credit card system. Moreover, if the government wants to test to see if enabling this capacity represents a net benefit, it will want to begin the system with low-cost, high-usage services such as recreation fees and water bills, rather than once-a-year, high-value payments such as property taxes. In this way, a larger number of citizens experience the benefits of the system on multiple occasions while the per transaction cost to the government remains low.

Policies to Address Pricing

Before implementing charges for e-government services, managers need to be sure a pricing policy is in place. The experience of Fulton County, Georgia, is instructive. A few years ago Fulton County entered into an informal relationship with a commercial software company to supply Web users with access to selected governmental records via a Web database search en-

gine. There was an unwritten understanding that the software company would be allowed to charge some unspecified amount for an enhanced level of service at some future date. When the service charge appeared on the Web site, commission members objected to citizens being charged for public data, and the relationship (and the online service) had to be discontinued.

In contrast, Indianapolis, Indiana, addressed the issue of commercial use of government data at a policy level early on. A public-private partnership board was appointed to oversee the implementation of the adopted policies. As a result, citizens of Indianapolis can now search from an ever-increasing variety of governmental databases, and there is a long-term plan to lower fees. Although the Indianapolis policies may not represent the optimum, they do define a policy structure under which e-government can develop smoothly.

ACCESS AND THE DIGITAL DIVIDE

The Dimensions of the Digital Divide

One of the concerns many people have about e-government is the widening gap between advantaged and not-so-advantaged populations. Infrastructure contributes to the digital divide, but so do socio-economic factors, users' exposure to the Web and education, and content accessibility.

Socio-economic factors. The most salient facts about the digital divide relate to income, ethnicity, and geography. According to a November 1999 study by the National Telecommunications and Information Administration (NTIA):[8]

- Households with incomes of $75,000 and higher are more than 20 times more likely to have access to the Internet than those at the lowest income levels.
- Black and Hispanic households are roughly two-fifths as likely as white households to have home Internet access, and regardless of income level, Americans living in rural areas are lagging behind in Internet access.

Ability to pay is obviously a major factor in the digital divide. However, even after controlling for income, race appears to have an independent impact on digital connectivity, with poor black Americans being less likely than poor white Americans to be connected.

Exposure and experience. Internet connectivity at the individual level can often occur through exposure at work or at places of leisure, training, and education. Here, the kind of work, the quality of local libraries, and the technology available in the schools and technical institutes is important. People in knowledge jobs (e.g., lawyers, architects, journalists, scientists) are much more likely to have Internet access at work, and despite corporate limits on employee use of the Internet, many employees receive substantial benefits from this access. As with home access, high-speed Internet access at work is also related to business location, with urban area businesses being more likely to be connected.

In most of the country, basic school and library connectivity to the Internet has been achieved in all or nearly all districts. With respect to wiring and Internet access charges, poorer school districts have been able to close the gap through federal programs such as E-rate and the Technology Literacy Challenge Fund. E-rate subsidizes up to 90 percent of Internet access charges for the poorest districts.

Higher education in general is related to computer ownership and Internet access. On the NTIA survey, households with a college degree or higher were more than eight times as likely to have a computer at home (68.7 percent versus 7.9 percent) and were nearly sixteen times as likely to have home Internet access (48.9 percent versus 3.1 percent) as those with an elementary school education. Local governments that govern communities where general educational levels are low will need to address this factor as part of any effort to improve public access.

Content accessibility. People need basic computer skills to be able to explore the Internet. However, once they reach cyberspace, Web content needs to be accessible, relevant, and useful. According to the Children's Partnership, a Washington, D.C.-based non-profit, most content on the Internet is not useful for low-income people or for people with poor reading skills.[9] The authors of the study (which focused on jobs and housing) found that only 6 percent of sites included information that could be deemed useful to low-income users, and that only about 1 percent included information on local jobs and housing—areas deemed most important by the study respondents. Additionally, the study found that only 1 percent of the sites studied could be read easily by the estimated 44 million Americans who read below the average literacy level, and only 2 percent of the sites targeted Americans whose primary language is not English.

One implication of this study is that public sector producers of Web content, particularly those involved in social service delivery, will need to take the following steps:

- Analyze the materials on their Web sites for reading level and readability.
- Consider the use of multiple visual cues, meaningful color schemes, and icons and cartoons for conveying messages.
- Provide customized translations of the most important materials and easy links to automated translation sites for supplementary materials.
- Urge, organize, and assist other local providers of Web content to go through a similar process to improve readability.

Non-Network Solutions

Putting in place networks and network services is the first and essential step in communities attempting to close the Internet access gap, but communities aiming at universal access must also consider socio-economic factors, exposure and experience of all segments of the population, and the accessibility of content to all segments of the population.

Community access centers. While a few communities are pioneering provision of free or very low-cost access for every household (or almost every household—see LaGrange, Georgia example on page 15), many more communities are establishing community access centers to bring Internet access to people in the community who can't afford home access.

The origin and settings for these centers are quite diverse. Some are opened to help disadvantaged youth prepare for work, others to help seniors get connected. Some are started by librarians, others by churches, local governments, or civic and community development groups. Some of these centers provide a high level of technology training, while others simply provide a bank of computers for Internet access.

In 1998, the Community Technology Centers' Network (CTCNet) surveyed users of a sample of its affiliates. Affiliates included libraries, youth organizations, multi-service agencies, stand-alone computing centers, cable access centers, housing development centers, settlement houses, and various other nonprofit organizations. These affiliates all provide access to computers and related technologies, typically (but not entirely) to under-served or otherwise disadvantaged populations.

The survey found that:

- Community technology centers are an important resource for women and girls, people of all ages, and members of racial or ethnic minorities.
- Community technology centers are a valuable resource for obtaining job skills and learning about employment opportunities.
- 65 percent of respondents took classes at a technology center to improve their job skills.
- 30 percent of respondents used the Internet at their center to look for a job, and using the Internet to look for a job appeared to be associated with successful outcomes.
- Community technology centers had a positive effect on participants' educational goals and experiences.
- 51 percent of respondents felt much more positive about themselves as learners as a result of participation in classes and other activities offered by centers. An additional 34 percent felt somewhat more positive.

The authors of the report on survey findings reported anecdotal evidence that centers improved some users' job performance and increased some users' ability to earn income. Some respondents, for example, said they learned of new career options, upgraded their job skills, prepared résumés, and searched for jobs at centers. Others indicated that they used the centers for gathering ideas for starting a new business.[10]

A community access center's mission

The Grand Rapids (Michigan) Community Media Center represents an example of a computer center with a comprehensive mission that includes:

- Community education, face to face and online, about the creation and dissemination of media
- Sharing media equipment, hardware, and software with the public in easily accessible locations
- Sharing modes of information transmission with the public by using the 5 percent rule (commercial communication companies that want to use public rights of way must make available 5 percent of bandwidth for public access and provide 5 percent of revenues to accommodate citizen access to that bandwidth)
- Storing local media (voice, video, and data) for public access and retrieval
- Communicating with local, state, and federal officials regarding the importance of community communication in a democratic society
- Reaching out to global citizens to share information training, tools, and transmission options.

Source: http://www.grcmc.net/

Regulatory bodies, in return for approving a rate hike, can demand that telecommunication companies take action to reduce the digital divide.

Community access centers use a variety of funding strategies, from grant funding to donations to volunteer efforts. Increasingly, however, they look for financial support from both local governments and state regulatory agencies. At the local level, advocates use right-of-way contract negotiation or re-negotiation to establish an on-going source of funds from right-of-way users or cable franchise owners. The goal is often some version of the 5 percent rule (5 percent of bandwidth for public access plus 5 percent of revenues to support accommodations for public access).

Using regulatory precedents from Vermont, Ohio, California, and Illinois, community access center advocates are currently urging that policy makers accept

an expanded definition of public access (i.e., one that would include access to additional bandwidth—rather than channel—capacity). In Vermont, for example, advocates are asking that the cable networks providing Internet services be obliged to provide free Internet drops and modems at specified public, educational, and municipal locations. Some advocates are trying to get local governments to work together to achieve economies of scale in the development of the tools of public interest technology—public access, basic hardware and dialup access, training and technical assistance, online conferencing, community Web publishing, Web and listserv hosting.

Statewide funding pools such as the Missouri Express, the New York State Diffusion Fund, the Texas Telecommunications Infrastructure Fund, and the Ohio Community Computing Center Network will make it possible to sustain public interest technology over the long run. Some community computer centers have petitioned state utility commissions to provide support, generally when a telecommunications firm files a rate change application. Because telecommunication companies generally have to act in the public interest, regulatory bodies, in return for approving a rate hike, can demand that they take action to reduce the digital divide. Under a settlement of this sort in Ohio in 1994, Ameritech spent $2.2 million to open 14 computer centers around the state. Municipal representatives from the seven cities and towns that joined in the original negotiations were charged with managing the funds and overseeing the centers.

Kiosks. Kiosks can be used to provide access to local government services via the Internet. Kiosks are freestanding terminals that may provide a range of services, from simple access to a short menu of government in-

Community access centers

Fairfax City, Virginia. Fairfax City residents receive free access to computers, printers, and the Internet through the City-Tech Center project at a telecommuting center operated by a local university and funded by the U.S. General Services Administration to serve as a suburban workplace for federal employees.

At the City-Tech Center, residents (other than the telecommuting federal employees) can take advantage of the latest information technologies—including Internet access, e-mail, and fax machines—but may use the center for noncommercial purposes only. Training and assistance are available. The center is open to residents from 6 to 10 p.m. weekdays and from 8 a.m. to 5 p.m. Saturdays.

Compton, California. Blue Line Televillage, a project of the city of Compton and the Los Angeles Metropolitan Transit Authority, is a model of a community access center developed specifically to serve a disadvantaged population. It has computers, Internet connections, videoconferencing facilities, and training classes for its roughly 2,000 members, mostly African American, who pay $10 a year for adults and $5 annually for students and seniors.

Blue Line Televillage is situated next to a public transit hub in Compton. In addition to various other facilities for business and public activities, it includes an 800-square foot-room equipped with 12 Pentium computers and Internet access. It provides public access computing, classes, contract training for local organizations such as day care providers, and facility rental to other organizations interested in conducting their own computer training programs for employees.

Kiosks for access

Fairfax, Virginia. As part of a broad strategy of enabling citizens and others to transact business with the county from remote locations, Fairfax County, Virginia, employs kiosks located in public libraries, county buildings, shopping malls, and a transit station. Each kiosk has the following features:

- Touch screen activation
- Audio and full-motion video and color graphics
- Laser printer
- Information "story pages"
- Interactive transactions
- Telephone handset
- User survey
- "How do I . . ." search query, index, and Help.

The kiosks host information for 24 county agencies, several non-county government agencies (Washington Metro bus and rail, Virginia Railway Express, Virginia DMV, Metropolitan Washington Council of Governments, the city of Fairfax, and the town of Warrenton). Each kiosk allows users to print forms and information, apply for county or school jobs, pay taxes using a credit card, renew vehicle registrations, pay traffic tickets using a credit card, and locate public transportation routes and check on road conditions.

In their first three years of operation, the system's 18 kiosks recorded more than 2.6 million "screen touches."

Springfield, Missouri. Seven touch screen kiosks let citizens access the Internet at community locations in Springfield, Missouri. Through the kiosks, users connect to the Internet in about 30 seconds. From there users have five minutes to browse community sites or venture out to other sites. A recorded voice counts down time remaining. Usage figures show that users go back to the Internet after their initial five minutes are up. Users can and often do print any of the information presented for later reference. The kiosks are mobile and have been placed at council meetings, seminars, legislative meetings, schools, and the regional fair.

formation to the ability to print out maps, complete financial transactions, and explore the Internet.

The first generation of kiosks, which did not use the Internet, were a nuisance to update, and have been abandoned in many communities. However, kiosks connected to the government's Web server can be updated remotely and simultaneously. If the server provides real-time access to governmental databases, the kiosk user can always access up-to-date information. Kiosk makers such as North Communications, Inc., are building browsers that are optimized for touch-screen technology and for kiosk media that will enable content developed for the Internet to be delivered to the kiosk.

Capacity building. Building the capacity of disadvantaged populations to use computer technology is one of the primary missions of many community access centers. Montgomery County, Maryland, provides training to seniors through the public libraries so that they can use the Internet to get health information. Other initiatives, such as telementoring, have also been tried to improve the community's capacity to use the Internet for a variety of purposes. See http://www.ctcnet.org/telement.html for case examples in K-12 education.

NETWORK CAPABILITIES AND PROCEDURES FOR PUBLIC ACCESS

Citizen access can be achieved under any number of network architectures. The term "architecture" is used as shorthand for the set of application and communication capabilities and procedures that are part of a network or network service. Architectures channel access by governing the type, extent, time, and manner of connectivity. Capabilities and procedures at the application level might define such variables as:

- The number of people allowed in a government sponsored chat room
- Whether the network will facilitate communication among citizens who have similar interests or similar prejudices
- Whether citizens can personalize the information they get from a local government Web site
- Whether the local governments will filter information to network consumers or government employees
- Whether local government officials will monitor or moderate online communications among network users
- Whether network users can easily encrypt information or create a virtual private network
- Whether citizens can use all, some, or none of the network anonymously
- Whether government officials and/or citizens and other consumers will be able to create and answer polls online or identify poll takers.

Even more than the shape of a room or the use of a loudspeaker currently affects democratic processes in physical space, the architecture of public-sector cyberspace will powerfully shape access to and participation in online democracy in the future.

In making decisions about network architecture, local governments will have to wrestle with interrelated but conflicting rights to property, privacy, and connectivity (or the online equivalent to assembly). In addition, they will need to consider how the logistics of knowledge management are affected by the architecture that is chosen. All of these rights and values are necessary for a knowledge-based society and economy. Privacy and exclusive rights to intellectual property are needed to induce participation and sharing. Without some protection against undesirable monitoring or the theft of intellectual property, citizens will not use a network to conduct their business.

At the same time, connectivity (or the ability to communicate effectively with other citizens) is needed to enable participation and sharing. Connectivity can be fostered by effective organization of information (e.g., online e-mail links and e-mail lists for people with particular interests or characteristics). It can also be undermined by mass e-mailings or by the use of filters (a filter is a program or section of code that is designed to examine each input or output request for certain qualifying criteria and then process or forward it accordingly). Mass e-mailings detract from connectivity because users have to spend too much time deleting unwanted communications. Filtering can make it difficult for users to identify or access resources.

> **The architecture of public-sector cyberspace will powerfully shape access to and participation in online democracy in the future.**

Local governments that own their own networks can protect online property, privacy, and connectivity values through the design of the network and associated applications. They can, for example, reduce or eliminate unwanted mass e-mailings by blocking them at the entrance to the network and through appropriate use policies for internal users. However, to avoid a free speech dispute, a local government should not advertise the network as a public forum space if it is going to exercise any control over content.

Filtering has generated on-going debate. On the one hand, a filter used to organize information into categories can help people find what they are looking for. On the other hand, the same filter can be used to block or censor information.

Because of the tension between privacy and connectivity, governments must examine each Internet function as an independent area for policy develop-

ment. For example, most citizens probably have no objection to the local government using information from a tax record or voter registration list to fill in basic age, address, and phone information on a Web application for recreational services. However, citizens probably do not want this information to be drawn from arrest records or mental health services records.

Privacy policies should be customized to each functional area, and they should be based on the desires of individual citizens. For example, the local government Web site can enable citizen users to set up any number of privacy profiles for use in different circumstances. These profiles could be stored on a database and used by the government or by fellow citizens or network users to facilitate automated access to some private information while ensuring the confidentiality of other information, based on the requester's characteristics. For example, a citizen might allow a specific school system employee to access a child's birth and vaccination records while denying the same information to a law enforcement or social service agency.

Because we are still in the first generation of citizen-government communication and transaction across electronic networks, we can expect continued experimentation with and refinement of the capabilities of systems used to support e-government. There is much that we still do not know about how alternative system designs, capabilities, and restrictions will impact democratic decision making, community institutions and culture, and citizen participation. Although the federal and state governments have taken the lead in network-mediated citizen-government relations, the impacts of e-government may be most substantial at the local level, where citizens have traditionally interacted with government in person. The citizen and the local government meet in the same physical space. This sharing of physical space offers many advantages that may be lost in online transactions.

GOVERNMENT-OWNED TELECOMMUNICATION NETWORKS

Local governments that are able to enter into the business of providing network services use a variety of business models. Three dimensions of these models can be identified: range of services, level of service, and the competitive approach. Local governments that want to enter the telecommunications marketplace as providers of network infrastructure must consider these dimensions, as well as financing, contract structure, and organization and leadership.

Range of Services

Greg Laudeman has examined a number of early efforts by small to moderate-sized towns in Georgia to develop their community's information infrastructure.[11] Most of the communities he studied were handicapped by their small size or remote location. Telecommunication firms find it more profitable to build advanced networks in larger, typically urban, markets.

Laudeman found that in the majority of the cases he studied, the community first focused on expanding point-to-point services. These are services that allow an existing or new business to achieve a level of communications capability not available through the common carrier networks open to the general public. For example, Marietta, Georgia's Board of Lights and Water (MBLW), a municipal utility provider, began in the early 1990s to install fiber optic cable between some of its major customers' locations so as to interconnect telephone and computer systems without having to lease capacity from the local phone company. MBLW was motivated to provide point-to-point network services for large customers by the need to expand its business services under deregulation of the electric industry. MBLW saw that a number of separate service areas would be converging.

> **Many local governments will find that simply leasing dark fiber to private providers is not as attractive as becoming a full-service provider.**

In LaGrange, Georgia, the idea for entering into the information infrastructure business came from a slightly different source, but had a similar effect. Specifically, the city leaders had chosen to focus their economic development efforts on attracting "back office" businesses such as call centers or data processing businesses. However, it soon became clear that LaGrange did not have the telecommunications infrastructure needed to recruit businesses in this field. The city lacked a digital telephone switch and a long-distance inter-exchange carrier point-of-presence. Therefore, like Marietta, LaGrange made its initial investments in new infrastructure in the provision of wholesale-level services to a limited number of business customers.

This beginning point is also the most common one for the large number of municipal utilities that have decided to get into the information infrastructure business because they have unused capacity on the fiber optic networks they have installed for their own use.

While public provision of information infrastructure typically begins with limited wholesale services or the leasing of dark fiber, the convergence of digital technologies makes it unlikely that it will stay there. In some cases, for example, local governments may discover that they must be registered as a telecommunications provider in order to be allowed to lay fiber in certain places. In other cases, the local government may react to citizen complaints about an incumbent provider of a service (e.g., cable or telephone) acting in a monopolistic manner or providing poor service. Or the local government may feel that if it is going to be in the business, it needs to spread its on-going costs across a number of complementary services. In other cases,

the local government will want to establish a new service (e.g., broadband Internet access) that the market providers have not chosen to offer in the area.

For any of these reasons, many local governments will find that simply leasing dark fiber to private providers is not as attractive as becoming a full-service provider. In many of the cases Laudeman studied, the provision of wholesale dark fiber has been followed by cable television, high-speed Internet, and telephone services. As is discussed below, the decision to enter into these services does not always mean that the local government will become the sole or even the primary provider or operator of the retail end of the service.

In larger markets, local governments may be less likely to provide telecommunication services themselves. The cities of Anaheim and Burbank, California, for example, have both installed extra fiber in their city communication systems. The cities are keeping a third to two-thirds of the fiber backbones for internal use, but are leasing the remaining fiber to service providers. While Anaheim does not plan to provide the full array of digital information services (i.e., cable, telephone, and Internet) itself, it has structured the lease contract to ensure that new private sector competitors will enter the local market for these services. Similarly, Tacoma, Washington, the site of the largest public broadband network, provides some of the spectrum of digital services itself, but it also allows private firms to use its network for at least one service (Internet access).

Only a few local governments have experimented with packaging various services. LaGrange Georgia, packages Internet access (for free) with cable television service, while in Tacoma, Washington, a customer can choose the package of services or can purchase one independent of the other. In the future, it is likely that municipal telecommunications service providers (both municipal and private) will give customers of multiple services (data, telephone, video) a discount for purchasing packages of more than one service.

Level of Service

Local governments can provide telecommunication services wholesale or retail. At the wholesale level, a local government can provide a basic network line (e.g., dark fiber) or lines that have been constructed or customized for a particular service such as cable TV, Internet access, or telephone (see table). For example, Burbank Water and Light leases dark fiber to Disney and Warner Bros. for their wide-area networks, while Tacoma Power provides customized data transfer networks (complete with routers, switches, etc.) for use by its wholesale customers.

Leasing the excess capacity of unenhanced network fiber (i.e., dark fiber) is the quickest, safest way for a government to capitalize on its investment in a network. This is particularly the case when a small public utility has already built a broadband network to meet its own needs, but is unequipped to turn this dark fiber into a serviceable network. One advantage of establishing partnerships with private firms to support the development of high-bandwidth telecommunication services is that the community can receive the service benefit without having to manage a business operation that has the potential for problems. Because Anaheim's network is an open system, other telecommunication carriers can buy capacity to provide services such as video programming, dedicated data links, or Internet services.

Competitive Approach

A public (or quasi-public) provider of information infrastructure services can structure its relationship to other potential service providers such as incumbent providers or alternative providers in many different ways. For example, a local government may partner with a private telecommunications firm for one service (e.g., dial tone), while competing with the same firm in the market for another service (e.g., cable television). Among the roles the local government agency can play in the market are the following:

The competitive player. The government can become a competitive provider of a full range of services, including cable television, Internet access, and high-speed network access for businesses (Newnan Utilities in Newnan, Georgia, is an example). A competitive local government network service provider typically partners with schools, libraries, and businesses to develop a variety of access services and speeds. The network is constructed using revenue bonds issued by the

Table 1: Level of Service: Marketing Options for Network Services

	Basic Network or Dark Fiber	Service-Ready Network
Wholesale	Lease excess dark fiber to large firms who customize the network for their own purposes	Lease excess fiber and provide specific broadband services such as cable TV, Internet access, and telecommunications to large customers who may or may not resell to others
Retail	(Not applicable)	Provide specific broadband services to all residents

local government. The primary financial goal is to provide a quality service that will pay for itself through a combination of customer revenue streams, including in-house transfers of funds to pay for government use of the network.

A key benefit of this model is price competition between the city provider and one or more private providers. For example, when Newnan Utilities marketed all of its services at a competitive price (the cost of the network plus interest charges on the revenue bonds), the incumbent provider of cable television services was forced to lower its prices by a third (from approximately $30 to $20). Hence, cable TV customers who remained with the incumbent provider reaped a major part of the benefit of the city's entry into the market.

The single partner. The local government or public utility can form a partnership with an existing or new network service provider. While partnership terms may vary, the local government finances a new or upgraded network, while the private firm manages the service itself. Typically, the service package includes a combination of services (e.g., cable television and Internet access). Once the network is built, the local government will usually receive a percentage of the revenues generated for the various services.

This model is being used in LaGrange, Georgia, where the city bought out the existing cable network infrastructure, financed a major upgrade to the network with low cost industrial development authority revenue bonds, and then leased the network back to the cable company for day-to-day operations. LaGrange's decision to partner with the incumbent cable company was based on an analysis of the market that suggested that building and maintaining a second network would be economically risky if the government utility could not attract sufficient customers, and would undermine the viability of an existing business if it could attract the necessary customer base. The partnership was attractive to the cable company because the city could raise investment funds needed for the upgrade to the network infrastructure more cheaply than the cable company could. The operational cost for the upgraded network would be lower under city ownership than under cable company ownership.

Another attractive feature of the partnership from the cable company's point of view was an assured continued monopoly of its core video/television businesses.

The agreement between the city and the cable company split the new bandwidth into three parts: one part to be used by the cable company for providing its own services, one part to be used by the city to provide high-speed data and telecommunication services for its own use and for wholesale business customers, and one part to be dedicated to shared city-cable company information system ventures. The city agreed not to use its part of the network to enter into the cable firm's traditional video/television business. For use of the shared or remaining bandwidth, the city and the cable firm each agreed to give the other an opportunity to participate in whatever venture it finds attractive. Either can go forward with a venture or service once the other partner has said it is not interested. Currently, the partners share in a cable Internet access service (via a cable modem), while the city is providing set-top TV Internet access on its own.

Partnering agreements can be used to increase community access. Tacoma, Washington, for example, will provide TV Internet access via set-top box for a very low monthly service fee of $7.50. In LaGrange, cable television customers get the high-speed TV Internet access via a set-top box at no additional charge. The city has essentially made Internet access free to that segment of the population that subscribes to at least the basic cable service. If a customer wants Internet service to a computer, he or she must pay the fee for a cable modem ($39 a month). Because 90 percent of the households in LaGrange have at least basic cable service, this approach results in almost universal access.

The partnership was attractive to the cable company because the city could raise investment funds more cheaply.

The city is providing this free Internet service for a year beginning in the summer of 2000, but it hopes to be able to keep the service free or low cost beyond the first year. Fulfilling this hope will depend on the continued success of the other parts of the city's telecommunications infrastructure venture.

A possible problem with the type of single partner approach taken in LaGrange is that the cable company partner, which has been able to maintain its monopoly position with respect to TV services, might increase its rates for these services. Basic cable service is a prerequisite for set-top Internet access. However, Tom Hall, the city manager of LaGrange, says that an unjustified rise in basic cable rates would represent a breach in the shared vision of the partnership, which is centered around increasing the technology access and skills of all LaGrange citizens, and is therefore unlikely. Moreover, the city's subsidy of set-top boxes for Internet access benefits the cable company, because the company can use the boxes for delivery of other high-end services such as video on demand.

Hall hopes one of the results of free Internet access will be an improvement in citizen access to government information and services. One of the first screens a set-top Internet user will see will be a portal to city and community resources.

The multiple partner. The local government or public utility can form any number of partnerships with existing or new network service providers. The government may want to certify that a partner will meet certain standards for network reliability and maintenance. This model is being used in Tacoma to promote Internet service provision (see below).

The competition promoter. The local government can build a high-capacity, open-architecture network and then lease a large part of the network to one or more firms that provide a wide spectrum of services, as in Anaheim, California and Tacoma, Washington.

Some local governments lease the entire infrastructure to one firm but use contract provisions to ensure that that firm either competes with incumbent providers of services or allows other competitors to use the network. Other local governments manage the leasing of the network themselves to promote competition.

Anaheim, an example of the first approach, has leased 60 fibers of a 96-fiber ring to FirstWorld International, a private telecommunications firm. Under the terms of the lease contract, FirstWorld is obligated to use the leased fibers as the backbone of a universal telecommunication system. This broadband network system will ultimately provide voice, data, and video services to the entire Anaheim community. Through the contract, the city ensures that FirstWorld will operate an open-architecture, neutral network that other competitors can use at a low cost of entry.

Tacoma Power's Click! Network provides an example of the second way of promoting competition. Essentially, Tacoma leases parts of its network to as many Internet service providers (ISPs) as can meet certain financial and customer service standards and requirements. Customers of high-speed Internet services then contract with these ISPs to use the network.

The mixed model. The Tacoma Click! Network as a whole includes a variety of competitive, sole provision, and partnering elements. In the area of wholesale broadband services, Tacoma Power act as both a competitor and a partner with other telecommunication firms. In the area of cable Internet access, the public corporation promotes competition among private sector ISPs that apply to use the network, but it also acts to certify that an ISP has met certain quality standards before allowing it to use the network.

Tacoma Power's relationship with WorldGate, which provides the Internet access for the television-based Web services and the set-top box software is like a franchise because WorldGate receives a percentage of the fee for the service.

As do many other public providers of information infrastructure, Tacoma Power keeps its prices at the level of cost recuperation. As a result, the take-up rate for basic set-top TV access to the Internet at 128 Kbps had reached 15 percent in April 2000.

The free net provider. Community development efforts that provided free access to a limited set of network services such as bulletin boards, chat, or e-mail were especially popular in the 1980s and early 1990s. Now that the key free net service—basic e-mail—has become accessible and affordable for most Americans through free, private e-mail services, the free nets still in existence provide only limited service to customers who might not otherwise be able to pay. Few communities are establishing new free nets. Rather, they are focusing on low-cost access to more full-service, high-speed Internet connections.

Financing the Network

Local government information infrastructure projects that involve only public sector entities and that offer a comprehensive range of services (data, voice, and video), both wholesale and retail, are more likely to risk public funds. Projects of this type, which typically involve revenue bond funding, appear to be more frequently used in smaller communities where the private-sector telecommunication firms have less at stake.

Projects that are begun as part of a community-wide effort with broad private-sector representation tend to adopt more restrictive financing practices. For example, in Anaheim, where the first public fiber optic network was laid, the effort grew out of a city-wide task force that worked to achieve buy-in from businesses, civic organizations, schools, and other groups. The task force, for example, held discussions with 600 companies. From these discussions, a set of guiding principles was adopted. One of these principles was that the city should foster competition but not enter

Tacoma Power's Business Approach

Functional Area	Market Role
Retail cable TV	Competitive player
Wholesale broadband	Competitive player and partner with other wholesale broadband providers
TV Internet access	Partner with a single firm
Cable modem Internet service	Competition promoter (partner with multiple firms)
Data network for power regulation, city facilities	Sole provider

the market directly, and another was that it should not put its own funds at risk.

Fortunately for Anaheim, the city's public utility corporation needed to replace a 30-year-old twisted-pair communications network that was used to manage the electricity grid. Like a number of other municipalities with public utilities, Anaheim chose to finance the project by investing existing enterprise revenues (e.g., revenues from electric utility payments).

In other communities, the public utility itself invests in information infrastructure to diversify services in response to deregulation challenges. This strategy, depending on the nature of the public utility's financing, can avoid putting taxpayer-supported funds at risk.

When a project does involve some risk to the public, the risk may be assumed by a separate development authority that is authorized to issue low-cost revenue bonds backed up by general obligation funds. This approach is workable for smaller networks. For larger networks, funding often comes from a group of partners (e.g., from city and county governments, schools, hospitals, business partners, etc.)

Contracts

Network infrastructure contracts (or contract clauses) tend to fall into two categories: contracts for building the network and partnership contracts for operating the network services and receiving fees or sharing revenue. Contracts for building the network tend to be fairly straight-forward in that they do not involve long-term relationship risks. These contracts may be arranged as a number of separate contracts or as a single, comprehensive design, build, operate, and maintain contract. Dublin, Georgia, for example, chose to let out several separate contracts for network planning, communications equipment, line installation, and network maintenance and operation. Anaheim's contract with FirstWorld was more comprehensive.

The choice of contracting strategy may depend on whether the local government plans to be a network services provider or merely a major investor in infrastructure. Studies of contracting in other fields suggest that letting a private sector firm design and build the structures that it will then be responsible for operating is probably more efficient than having a firm design and build facilities or infrastructure to be operated by someone else. Dublin's strategy of contracting with the best consultants for each aspect of network building and operation is appropriate because the city plans to provide its own network services. While the city could have contracted for a comprehensive set of planning, equipment, line stringing, and network maintenance tasks, it was not likely to find a single firm with high levels of expertise in each of these areas. On the other hand, Anaheim chose a comprehensive contract because it wanted the firm that built the network to also manage the provision of services.

Partnership contracts offer the government more opportunity for profit-sharing, but they also create opportunities for the private partner to pursue profit at the expense of the public. Partnership contracts are more complicated to craft than contracts for network construction only. While the contract between the city of LaGrange and the private cable company represents an innovative approach to sharing the costs and benefits of an information network, the success of the contract depends on the fact that the partners share common goals and a somewhat stable technological and information services environment. The possibility that the city's partner might raise basic cable rates to capitalize on the city's subsidy of a bundled Internet service has already been mentioned.

In addition, however, changes in technology can muddy the line between the services that a partnership agreement assigns to the private partner (i.e., television programming) and those that the local government is allowed to enter. For example, television programming may become available across the Internet on demand. Unless a partnership contract has considered and addressed this possibility and clarified the two parties' respective rights in such a situation, the agreement may break down.

Changes in technology can muddy the line between the services that a partnership agreement assigns to the private partner and those that the local government is allowed to enter.

Anaheim's agreement with their private-sector partner, FirstWorld, illustrates this problem. The city and FirstWorld were each to invest $6 million in building a network; 63 percent of the bandwidth was to be available for use by FirstWorld. In return for the rights to lease and operate this excess bandwidth over a 30-year period, FirstWorld agreed to pay the city 5 percent of annual gross revenues and 35 percent of annual net revenues as well as maintenance fees and development fees for expansion of the network into nearby areas. In addition, FirstWorld agreed to create a development center to demonstrate the capabilities and benefits of the fiber optic network.

In March 2000, the city filed suit against FirstWorld for failing to meet its promised payments, financial reporting requirements, and its commitment to build the development center. According to the city's arbitration statement, FirstWorld, after a series of business management changes, redirected its resources toward positioning itself as a national Internet service provider rather than as a network operations company. FirstWorld, for its part, claims that the payments owed to the city are unenforceable under California code, which prohibits charging franchise fees to telephone companies.

The breakdown of the Anaheim-FirstWorld partnership suggests two things. First, in the rapidly changing world of telecommunications and information

technology, disruptive changes in business strategy are likely to occur. Local governments that are considering partnerships need to guard against contract failure, using pre-contracting bonding and early and periodic financial reporting, for example.

Second, because technologies are converging, local governments must have agreements reviewed by attorneys with expertise in all areas of telecommunications and governmental law.

Organization and Leadership

The following factors seem to contribute to success in a network infrastructure building effort.

- Building a vision and partnerships. Governments that included school, business, and nonprofit partners in the development of the service capacity were able to afford the professional and technical assistance needed to build a high-quality, high-capacity network.
- A focus on meeting immediate needs and recouping cost. If the effort involves creating a network with excess capacity, the excess should meet needs for the next five to ten years, but not open-ended future needs.
- Linking with other economic development strategies. If the community is committed to an economic development plan that emphasizes "back office" or "information technology" business recruitment, it is more likely that network development will foster economic development and vice versa.
- Knowledge of the competition. Efforts to establish services in an area without existing competition are at an obvious advantage, but efforts that result in an elimination of a monopoly can also bring direct benefits to both consumers of the public network service and consumers of the incumbent services.
- Spending time to map out strategic partnerships. The LaGrange partnership with an incumbent cable firm involves a healthy mix of flexibility and independence for both parties while also creating sufficient interdependence to ensure that neither partner has strong incentives to behave opportunistically.
- Giving managers the ability to be focused, swift, and nimble. Network services technologies and business strategies and opportunities change rapidly. An all-purpose economic development group or general purpose local government department responsible for managing the project may be unable to keep up with the changes and react quickly enough.

CONCLUSIONS

Simple solutions to improving access may be inadequate. In the near future, as satellite-based access becomes universal, it is unlikely that any area of the country will be without *any* high-speed network access. Cost of access, quality of access, and whether or not citizens have the skills needed for meaningful access and use of networked information will remain question marks, however. Many local governments will face the reality that market-based provision of service does not always level the playing field for economic development. Without a multi-pronged approach that includes more exposure and education as well as infrastructure enhancement, disadvantaged areas will always remain in the shadow of the more advantaged areas. And until disadvantaged areas are able to attract new knowledge-oriented businesses, it will be hard for them to close the digital divide.

Fortunately, the emergence of a networked and boundary-less economy provides an opportunity to bring many "second tier" communities into the "first tier" fold. Some local governments and some partnerships between local government and the private sector are taking a proactive approach by building networks and promoting broader citizen access to and knowledge of information technologies. In addition to intervening in the market by building network infrastructure, closing the digital divide may mean investment in schools and libraries and in their transformation into community access centers. With proper support, these centers can provide basic Internet training and assistance to the digitally disadvantaged and can help people use the Internet in productive ways (e.g., for jobs, job training, or education). Finally, cities, counties, and communities need to work together to develop local Internet content that is meaningful to and accessible by digitally disadvantaged populations.

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[1] *CIO NEWS*, http://www.cio.state.ut.us/Docs/CIONEWS/cionews799.htm; "Modernising Government," a Home Office Report presented to Parliament by the Prime Minister and the Minister for the Cabinet Office by Command of Her Majesty (London: March 1999), http://www.citu.gov.uk/moderngov/whitepaper/4310.htm.

[2] Studies of network economics have generally confirmed what is known as Metcalfe's Law. Robert Metcalfe, a designer of the Ethernet protocol for networks, remarked that the usefulness of a network is equal to the square of the number of users. See Larry Downes and Chunka Mui, *Unleashing the Killer App* (Boston, MA: Harvard Business School Press, 1998).

[3] Request for Proposal: Building a High Bandwidth Community Network in Garden City, Kansas (found at http://www.gcitc.org/fiberrfp.htm).

[4] Joint purchasing agreements at the state level can occur through agency initiatives or through legislative action. Examples of agency initiatives are the agreement between the Georgia Department of Administrative Services and the Board of Re-

gents to jointly contribute to new bandwidth and the state of Washington's Department of Information Services' contracts with many carriers to provide telecommunication services to state agencies, local governments, colleges, universities, schools libraries, and other public organizations. As a volume purchaser, DIS obtains lower prices from telecommunication carriers. An example of legislative action is Florida 's House Bill 2123, which creates the Information Services Technology Development Task Force and charges it with formulating state policy on the development of advanced communication networks and information technology.

[5] Official Code of Virginia, § 56-484.7:1. Dark fiber can also be leased to not-for-profit educational schools and institutions, hospitals, health clinics and medical facilities for use in serving their not-for-profit purposes.

[6] In a November 1999 survey of U.S. residents on the issue of the Digital Divide, the National Telecommunications and Information Administration reported that respondents making under $25,000 generally cited cost as the primary reason for not using the Internet at home, while those earning more than $25,000 were more likely to say they "don't want it."

[7] Larry Downes and Chunka Mui, *Unleashing the Killer App* (Boston, MA: Harvard Business School Press, 1998).

[8] *Falling Through the Net: Defining the Digital Divide*, National Telecommunications and Information Administration (Washington, D.C.: November 1999).

[9] Katie Hafner, "Study Finds Gaps in Internet Content," *New York Times*, Technology Section (March 23, 2000), http://www.nytimes.com/library/tech/00/03/circuits/articles/23divi.html.

[10] "National Survey of Users of Community Technology Centers," Community Technology Centers' Network (Newton, MA: July 1998).

[11] Gregg Laudeman, "Georgia's Small Town Telecomms: Approaches to Developing Community Infomation Infrastructure," unpublished paper (School of Public Policy, Georgia Tech).

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