Grassroots Partnering in Electronic Delivery

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SUMMARY

The primary goal of electronic delivery is to improve the quality, accessibility, and cost effectiveness of Federal services for Americans. This goal is not likely to be realized unless service recipients are involved at all stages—from planning and pilot-testing to implementation and evaluation of electronic delivery.

OTA site visits found that citizens are interested—in principle—in helping to improve service delivery and receiving at least some services electronically. But most find it difficult to learn about opportunities to participate and many lack the necessary time, training, and/or equipment. These barriers can be overcome through outreach, education, and adequate funding. If "electronic service to the citizens" is to succeed, grassroots citizen involvement will be needed and must be part of Federal electronic delivery projects. A mandatory set-aside from projector agency budgets may be needed to assure adequate resources for citizen participation.

Grassroots involvement in electronic delivery also is important to assure that the substantial gap between the information "haves" and "have-nets" is reduced, not widened. The distribution of computer resources, for example, is heavily skewed toward the more affluent, educated segments of U.S. society. Rural and inner city residents, persons with disabilities, and senior citizens are among those who might gain—or lose—from electronic delivery. Citizens with special needs can be "winners," but only if they are active participants with sufficient technical and financial support.

The local community infrastructure—schools, libraries, senior centers, town halls-can play a highly leveraged role in electronic delivery, especially in rural and small-town America, inner cities, and for citizens with special needs. The local community can

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provide leadership and training for its residents, and can assure "points of access" for those citizens who do not want or cannot afford home delivery. Such community involvement also is a necessary component of all Federal electronic delivery projects.

Another key to successful electronic service delivery is forging strategic partnerships among Federal, State, and local governments; user groups; and, where appropriate, the private sector-commercial, not-for-profit, philanthropic, and voluntary organizations. Effective partnering requires a true commitment from Federal agencies and a good match between program objectives, service providers, users, technologies, and expertise. Stronger incentives for partnering are needed, including performance awards and matching grants, The establishment of a Corporation for Electronic Service Delivery, modeled after the Corporation for Public Broadcasting, would foster strategic partnerships.

The private commercial sector is an essential partner in electronic service delivery. Private vendors supply the telecommunications equipment and services, computers, and vast array of peripheral equipment and software needed for electronic delivery. Private companies also can serve as systems integrators for electronic delivery systems, add further value to government services, and independently market enhanced services. Private firms, on occasion, underwrite joint development projects and pilot tests with government agencies and user groups, or provide discounted or donated equipment and services. And private companies are themselves recipients of many Federal services; electronic delivery should present companies with opportunities for cost savings and innovation, as well as for research, market development, and direct sales.

GRASSROOTS CITIZEN INVOLVEMENT IN ELECTRONIC DELIVERY

To be effective, any Federal electronic service delivery program—whether demonstration, preoperational, or operational-must emphasize accessible, user-friendly, affordable delivery. Pilot tests suggest that appropriately scaled, off-the-shelf, proven technology geared to the needs of the users general] y will work best. Grassroots innovators have been remarkably successful in providing electronic delivery on shoestring budgets, with minimal costs to agencies or recipients.] The Federal Government can learn from the grassroots experience, and avoid the tendency to design unnecessarily large, complex, and expensive technical solutions.

High complexity sometimes may be inevitable when expanding systems to a regional or national scale; but grassroots involvement will help ensure an appropriate and workable solution. Local people and organizations wish to be involved. This sentiment is widely expressed across the land, from small business entrepreneurs and community activists, to American Indians and Native Alaskans, to inner city leaders and students, to State and local government officials.[2] Their involvement likely would lead not only to better solutions, but to a greater sense of commitment and self-ownership in harnessing information technology to improve government at all levels of society.

To further ensure equitable access to electronic service delivery for rural, inner city, and local community residents, as well as disabled persons, Congress could require both a governmentwide review of current agency programs that provide funding for grassroots use of information technology, and a budget set-aside for "grass roots involvement." A fractional percentage of total agency budgets for information technology could

[1] For two examples of successful grassroots innovation in electronic delivery, see Frank Odasz, Big Sky Telegraph, "Computer Conference on Electronic Service Delivery to Rural/Small Town America," contractor report prepared for the Office of Technology Assessment, Jan. 8, 1993; and T.M. Grundner, National Public Telecomputing Network, "The OTA/NPTN Teleforum Project: An Experiment with a Multi-City 'Electronic Town Hall,'" contractor report prepared for the Office of Technology Assessment, January 1993.

[2] See Office of Technology Assessment, "Montana/Wyoming Trip Report," "Alaska Trip Report," and "California Trip Report," Nov. 10, 1992; and results oft wo computer conferences sponsored by OTA reported in Odasz, ibid., and Grundner, ibid.

be reserved for use by agency clients and service recipients at the local, grassroots level. Set-asides also could be allocated from agency programmatic budgets, or from some combination of both technology and programmatic budgets. An appropriate Federal agency[3] could be designated to conduct a governmentwide survey, and then funded from set-asides to administer a grassroots grants program. A portion of the Federal grants could be matched with contributions from State/local government or private sector funding sources—including commercial companies, educational institutions, and philanthropies.[4]

The key is to provide at least a base level of funding for electronic delivery activities, As a percentage of the governmentwide information technology budget, even just one-quarter of 1 percent—about $65 million—would make a big difference when used by local community, volunteer, consumer, and self-help groups, However it might be accomplished, the objective would be to empower grassroots users as active participants in the demonstrations and tests leading up to operational decisions—before it is too late to assure that user needs are accounted for and met. The need for a grassroots program was strongly supported by the results of OTA's field visits, computer conferences, contract research, and community forums.[5]

Information technology can facilitate citizen access to government. Two OTA-sponsored computer conferences (conducted by Big Sky Telegraph (BST) headquartered in Dillon, Montana, and the National Public Telecomputing Network (NPTN) headquartered in Cleveland, Ohio[6]) confirmed that the citizens who participated view electronic delivery as potentially empowering. But they expressed concern that many people might be denied effective access because they lacked the necessary equipment, training, and/or financial resources. Participants were skeptical of centralized, national solutions to citizen access, and preferred decentralized, locally controlled use of information technology.

The Big Sky Telegraph conference concluded that:

> . . . [C]itizens need opportunities to acquire the skills and concepts relating to how they might benefit from a national information infrastructure. Direct, individual citizen participation is potentially available through scalable low-end systems . . . Citizens want to have more of a feeling of understanding, connectivity, and control of events in Washington that affect their lives . . . Federal promotion of the creation of community systems and advocacy of their use should steer clear of mandating how they will and will not be used, Maximum national benefit is most likely to result if citizens are given the tools and training and tasked to demonstrate what innovations best meet their local needs.
>
> Involving citizens in information sharing and citizen teleliteracy training programs

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[3] "Service to the citizen" or "grassroots community involvement" offices could be located at the Office of Management and Budget and General Services Administration, perhaps with comparable offices at the National Science Foundation, National Telecommunications and Information Administration, and various mission agencies. These offices could help coordinate electronic delivery initiatives with other Federal programs that include grassroots involvement in some form. For example, H.R. 1757, the National Information Infrastructure Act of 1993, approved by the House on July 26, 1993, and S. 2 Title VI, the Information Technology Applications Act of 1993, reported out of committee on May 25, 1993, include funding for the involvement of local schools, libraries, arrd governments, among others, in computer networking projects. Also see Information Infrastructure Task Force, "The National Information Infrastructure: Agenda for Action," National Telecommunications and Information Administration, Washington, DC, Sept. 15, 1993.

[4] See later discussion of strategic partnering.

[5] See earlier discussion and Office of *Technology* Assessment, Montana/Wyoming; Alaska; Olympia/Seattle, Washington; and Cali fomia Trip Reports, Nov. 10, 1992. See also Odasz, op. cit., footnote I; Grundner, op. cit., footnote 1; and William H. Dutton, "Electronic Service Delivery and the Inner City: Community Workshop Summary," contractor report prepared for the Office of Technolog y Assessment, December 1992, Also see Steve Cisler, "Community Computer Networks: Building Electronic Greenbelts," Howard Rheingold (cd,), *Virtual Communities (New* York, NY: Addison-Wesley, forthcoming).

[6] See Odasz, op. cit., footnote 1, and Grundner, op. cit., footnote 1. About 35 persons participated in the Big Sky computer conference; about 250 persons participated in the NFTN conference.

> would create local experts, versed in the local culture, to mentor local citizens through their introduction to the new electronic systems . . . Opportunities for leveraging local innovation in service delivery . . . should be aggressively encouraged, rewarded, and publicized . . . Facilitating bottom-up innovations will create the diversity, and attention to local differences that centralized planning cannot provide.[7]

The BST and NPTN experience to date has resulted in important knowledge and insights about grassroots computer networking with direct implications for electronic service delivery (see box 5-A). These findings are generally consistent with the results of other OTA-commissioned research.

The Environmental Protection Agency's (EPA's) Toxic Release Inventory (TRI) is illustrative. Congress included a "community right to know" provision in the Superfund Amendments and Reauthorization Act of 1986 that required facilities that manufacture, store, or use certain hazardous materials to report information on such activities to EPA. Congress required that EPA maintain this information in a database known as the TRI, and make this information available to the public in electronic form. The TRI experience to date indicates that:

- The Federal Government is often the only source from which grassroots groups with limited resources can obtain the information they need to effectively participate in policymaking.
- The right to know is meaningless without easy and affordable access—$25 per hour for on-line access or $50 per computer diskette is too expensive for many citizens.
- Not-for-profit community and philanthropic groups can play a key role in facilitating low-cost, user-friendly grassroots access (see box 5-Bon RTK Net).
- Information needs to be available in flexible, easy-to-manipulate electronic formats that can meet a wide range of needs---citizens may use the same information in quite different ways from Federal and State regulatory officials or industry.
- Electronic formats make possible a wide range of analyses that provide new insights into program implementation and impacts—for example by cross-correlating TRI data with health and census data.
- Electronic access to regulatory information can help further the overall objectives of Federal programs—monitoring and reducing public exposure to hazardous substances in the case of TRI.[8]

Without grassroots initiatives such as BST, NPTN, and RTK Net—multiplied many times over—the gap between the information "haves" and "have-nets" likely will widen, and Federal electronic service delivery probably will fall well short of its potential. The gap is illustrated by the disparity in ownership of home computers—ranging from less than 5 percent of senior citizens or inner city residents, to 20 to 30 percent of middle-class homes, to upwards of 40 to 50 percent of homes in more affluent, high tech, or university communities.[9]

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[7] Odasz, op. cit., footnote 1, pp. 1, 24, 25, 36.

[8] For further discussion, see Susan G. Hadden and W. James Hadden, Jr., "Government Electronic Services and the Environ merit," contractor report prepared for the Office of Technology Assessment, November 1992.

[9] Senior citizens and inner-city residents frequently have at least one thing in common when it comes to computers—limited financial resources to buy PCs and pay for software and on-line time. The experience of SeniorNet (a computer conferencing network geared to senior citizen issues and programs) and the results of OTA'S Los Angeles inner-city conference suggest that both senior and inner-city citizens can use computers much more than at present-given adequate facilitators and training, access to PCs, and free or very low-cost on-line time. For general discussion of equity considerations, see Ronald D. Doctor, "The National Information Infrastructure Social Equity Considerations," School of Library and Information Studies, University of Alabama at Tuscaloosa, Apr. 13, 1993; Richard Civille, "A Vision for Change: Civic Promise of the National Information Infrastructure," Center for Civic Networking, Washington, DC, draft policy agenda paper, July 1993; and U.S. Congress, Office of Technology Assessment, *Adult Literacy and New Technologies: Tools for a Lifetime*, OTA-SET-550 (Washington, DC: U.S. Government Printing Office, July 1993).

Box 5-A-Grassroots Computer Networking: Lessons Learned

OTA commissioned two grassroots computer networks to conduct computer conferences on the topic of electronic service delivery. Big Sky Telegraph (BST), headquartered in Dillon, MT, and the National Public Telecomputing Network (NPTN), headquartered in Cleveland, OH, conducted the conferences during late summer and fall 1992. Lessons learned include:

1. *The costs to users of grassroots computer networking can be minimized.* **Almost any personal computer** (PC) and modem will suffice; high-end, high-speed equipment is not necessary. On-line telecommunication charges can be reduced by copying messages to a PC and preparing responses with the telecommunications line turned off, and by using fractional rates and bulk purchase discounts. Use of equipment that transmits messages faster will reduce on-line charges further.
2. *Any* **local** *community can have* a *community computer bulletin board.* BST has, in effect, created six "Little Skys" where people can dial in with a local call--further reducing on-line costs. BST is a rural equivalent of the NPTN of "FreeNets." BST is a rural FreeNet. All you need is a PC, modem, telephone line, and inexpensive bulletin board software. And to further reduce costs, the "Little Sky or "FreeNet" can dial up a host computer once a night at off-peak rates to copy or add bulletin board items,
3. *Community computer bulletin boards really extend a sense of community.* BST and NPTN, like CompuServe and Minitel, found that users participate as much for sociability as for content. Users seek a comfort level and degree of intimacy that is not always prevalent in the community-at-large. Computer conferencing also greatly reduces any biases due to sex, physique, disabilities, speaking ability, etc. It is a leveling technology in this sense.
4. *Community computer networks usually get only limited support from the established government and business community.* The BST and NPTN approach is low-cost and decentralized; the State and Federal bureaucracies tend to favor higher cost, more centralized, or at least more controllable, approaches. Plus the "not invented here" syndrome is evident. Each organization has a tendency to invent its own solution or approach.
5. *Grassroots computer network utilities like BST and NPTN can facilitate local access to national computer networks that might not be otherwise technically feasible or affordable.* If local residents find computer networks such as Internet expensive or difficult to access directly, computer utilities can provide low-cost, user-friendly connections.
6. *Grassroots computer conferencing works for children.* Children as young as the third grade can use computer conferencing to learn keyboarding, e-mail, and the concept of communicating among a group electronically (some first-graders can handle it).
7. *Grassroots computer conferencing has significant potential for government service delivery.* For example: a) agricultural extension services, b) small business assistance, c) international trade--global trade networks offer tremendous potential for locally based global entrepreneurial networking, d) Indian reservation services, especially for the Indian schools and hospitals, e) vocational education for displaced homemakers, f) job opportunities-potential for computerized catalogs of jobs and skill requirements, and g) public access to the legislative process.
8. *Training is essential to computer conferencing success.* It is important for first experiences to be positive in order to develop self-confidence. Help lines work, rather than forcing users to struggle through manuals, As confidence builds, users can do more themselves and handle more complex functions. Initially many people are not ready for searching databases; but eventually users will want to and can do searches.
9. *Federal programs largely miss the potential of grassroots computing.* The government does not have good mechanisms to support small, local innovators lacking a major institutional affiliation. Suggestions: mini-grants of up to $5,000 or so to local innovators; more flexibility in the National Science Foundation and other Federal grant programs to support individuals and small, grassroots organizations; inclusion of grassroots representatives on Federal advisory and peer review panels; technology showcases and demonstrations (e.g., fiber-to-the-school demonstrations in rural, economically disadvantaged areas).

SOURCE: Big *Sky* Telegraph, National Public Telecomputing Network, and Office of Technology Assessment, 1993.

Box 5-B-The RTK NET: Grassroots Access to the Toxic Release Inventory

The RTK Net ("Right To Know" Network) is operated by the Unison Institute and OMB Watch, and funded largely by foundation grants. RTK Net is intended to provide a less costly, more user-friendly way for citizens and others to electronically access the Environmental Protection Agency's (EPA's) Toxic Release Inventory (TRI) database. It also offers derivative databases, computer conferences, and bulletin boards on hazardous waste and related topics.

TRI data also are available on-line from the National Library of Medicine and on computer diskette from the National Technical information Service. But grassroots users typically found these sources too expensive and/or too cumbersome, which led to creation of RTK Net.

During fiscal year 1992, RTK Net users included:

- *230* public interest group members,
- *87* business or industrial officials,
- *67* governmental staff (including 25 from EPA),
- 43 researchers,
- 34 members of the press, and
- 29 other individuals.

SOURCE: Susan G. Hadden and W. James Hadden, Jr., "Government Electronic Services and the Environment," contractor report prepared for the Office of Technology Assessment, November 1992.

MEETING DIVERSE CITIZEN NEEDS

Inner City Residents

Local involvement in planning for electronic delivery also would help ensure that the needs of minority groups in inner cities are met, Information technology is highly leveraged because computers have become very user-friendly, and special technical or software skills are no longer needed for many applications. Computers and software are increasingly available in multiple languages, thus opening up access to the millions of Americans who speak English as a second language. Several of the pilot kiosk programs, for example in California and Hawaii, have demonstrated that multilingual electronic service delivery works.[10]

OTA sponsored a community workshop at the University of Southern California to discuss electronic service delivery and the inner city.11 Workshop participants included a cross-section of community activists, innovators, researchers, entrepreneurs, and government officials concerned with revitalization of distressed inner city areas such as South Central Los Angeles. Participants emphasized that the key to energizing inner city use of electronic technology is to find ways for the technology to be part of and controlled by inner city residents and organizations. The inner city needs to develop its own applications and a sense of ownership in the technology.

The inner city is generally perceived as technically deficient and consumer-oriented, not techni-

[10] See William H. Dutton and K. Kendall Guthrie, "State and Local Government Innovations in Electronic Services: The Case in the Western and Northeastern United States," contractor report prepared for the Office of Technology Assessment, Dec. 12, 1991; and Office of Technology Assessment, "California Trip Report," op. cit., footnote 2.

[11] The Sept 15 1992, workshop was organized and conducted by the Annenberg School for Communication and the School of Public Administration at the University of Southern California. Professor William H. Dutton served as principal investigator. For further details on the workshop results, see Dutton, "Electronic Service Delivery and the Inner City," op. cit., footnote 5; and Office of Technology Assessment, "California Trip Report," op. cit., footnote 2.

cally skilled and producer-oriented. The emphasis of Federal (and State/local) programs, grants, and loans, etc., needs to be shifted to developing local inner city expertise, innovation, and infrastructure. Otherwise the disparity between inner cities and more affluent suburbs will continue to widen because of the slower diffusion of information technology into distressed areas. Participants concluded that the inner city cannot afford not to have information technology, lest it fall further behind in education, social services, and economic development.

The workshop results suggest that an inner city information technology development strategy to support electronic delivery needs to:

1. *Reinforce inner city community values about computers.* Some inner city communities currently may not place much value on information technology. Community "gatekeepers" are critical to community acceptance of the technology. Gatekeepers—formal and informal—provide links between the inner city and the broader outside community. Technology and service providers need to work with the community gatekeepers to legitimize the technology. Most of the ethnic and cultural groups in the Los Angeles area (e.g., Hispanic, African-American, American Indian, Korean, and Chinese, among others, participating in this workshop) have gatekeepers ready to help in this process.
2. *Identify and support inner city innovators, especially small businesses and community activists.* Innovators need to be mobilized to work on information technology applications for the inner city. Many minority-owned small businesses are not technically proficient; they need help in getting up to speed to compete for high-tech work—work that inevitably depends on the skilled use of telecommunications and computer tools. Innovators among minority-owned small businesses should have a large role in controlling the development and deployment of information technology in the inner city, as should local community organizations. Several Los Angeles area community groups are trying a variety of technology-enhanced innovations for meeting inner city needs, but they too need help with training and funding,
3. *Focus on information technologies that are affordable and usable by the inner city community.* Videoconferencing, for example, may not be affordable or really needed right now, but bulletin boards and computer networking cost less, are easier to implement, and have a higher payoff. Experience to date suggests that community electronic bulletin boards are cheap, cost effective, readily available, and usable. Bulletin boards can provide interoperability among systems, since virtually anyone with a personal computer and modem using Ascii text can access bulletin boards.
4. *Learn how to use inner city community resources more effectively to support information technology.* The public schools, for example, typically have space available evenings and weekends that could be used for


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Community workshop members discuss how information technology and electronic service delivery can help the inner city. The workshop was held at the Annenberg School for Communication at the University of Southern California, and included participants with diverse ethnic and cultural backgrounds.

computer-based adult education and training. Public computer terminals or kiosks could be located in churches, libraries, homeless shelters, and community centers, as well as schools. The barriers to locating technology are primarily cultural not technical; the ideal institutional locations are well respected in the community, provide some level of user support and encouragement, and are easily accessible by local residents. Community colleges, universities, and high-tech companies located in or near inner cities provide other sources of support— including equipment access, education, and training, not necessarily direct dollars—for inner city computing projects.

5. *Encourage development of computer software applications for minority users.* Inner cities need software and applications that are user--friendly for minority users and for those with English as a second language. Pacific Bell estimates, for example, that it has about 6.5 million customers statewide in California who speak English as a second language.

Workshop participants stressed the need for more active government support of inner c it y electronic delivery initiatives. Local governments can bring legitimacy to these initiatives, and can help involve local community groups that are essential to success. This would require that: 1) local governments take a much broader view of their role in electronic initiatives—a proactive rather than reactive role; 2) the Federal and State Governments support a more active local government role; and 3) funding mechanisms be established to pay for local government initiatives.

Participants concluded that the Federal Government needs more flexibility in supporting innovations in electronic service delivery, Not all innovations will succeed. Making progress means taking risks and accepting some failures. The government needs a much more robust mix of partnerships with local public and private organizations involved with information technology for the inner city. The government needs to be sensitive to: 1) the widespread skepticism of centralized or national solutions to local problems; 2) the desirability of a bottoms-up perspective to better ensure local involvement and success; and 3) the importance of technical flexibility, since no single technology is likely to address all needs (e.g., computer networking may be effective for inner city specialists and advocates, but kiosks may be better suited for inner city residents-at-large).

Citizens With Disabilities

Electronic service delivery should offer substantial advantages to persons with disabilities who now find it difficult or impossible to deal with delivery mechanisms that involve a lot of paper documents and/or physical travel. Computer and telephone attachments are now available that permit persons with sight, hearing, speech, or mobility impairments to use these technologies, and the costs are declining.[12]

OTA identified several opportunities and challenges that need attention to assure equitable access to electronic delivery for persons with disabilities:

- kiosks or multimedia work stations—need wheelchair accessibility for persons with lower limb mobility impairments, a standard interface that can communicate with customized computers and specialized input devices for persons with upper limb mobility impairments, redundant input and output modes (e.g., touchscreen, braille or symbol keyboard, voice synthesis) for persons with vision or hearing impairments, and directional and locational cues (to help users identify input and output devices and capabilities);

12 For detailed discussion, see U.S. General Services Administration, Information Resources Management Service, *Managing Information Resources for Accessibility* (Washington, DC: GSA/IRMS, December 1991); Johns Hopkins University, Applied Physics Laboratory, *Johns Hopkins National Search for Computing Applications To Assist Persons With Disabilities, Proceedings* (Los Alamitos, CA: IEEE Computer Society Press, February 1992); Carl Brown, "Assistive Technology Computers and Persons with Disabilities," Communications *of the* ACM, vol. 35, No. 5, May 1992, pp. 36-45.

- computers with telecommunications interfaces—wheelchair accessibility is usually not a problem, and specialized input devices and redundant input and output modes are well developed; the major challenge is adapting specialized equipment to handle rapidly advancing software, graphics, and net working options, and including standard interfaces and functions in the design and manufacture of information technology to accommodate persons with disabilities;
- magnetic stripe or smart cards—terminals must be accessible to persons with wheelchairs or other mobility aids; the major challenge will be accommodating persons with upper limb mobility or vision impairments through the use of visual and aural cues, directional and locational cues, redundant instructions, and specialized cards or input devices (e.g., cards with physical markers and encoded instructions);

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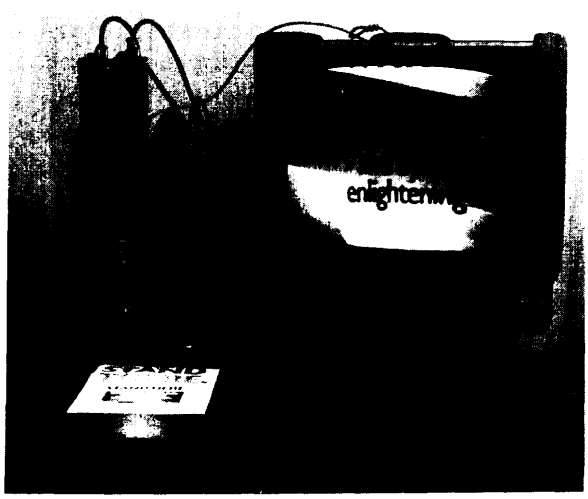

Low-vision reading equipment for users with vision impairments, located at the high-tech laboratory for students with disabilities, California State University at Sacramento.

- videoconferencing--conference rooms must be accessible to persons with mobility aids; the major challenge is accommodating persons with severe vision or hearing impairments through screen augmentation and sound amplification systems, and using visual and aural cues or interpretations.[13]

In most cases, electronic delivery should be accessible to persons with disabilities if the technology is developed and applied appropriately. This presumes continued progress in developing open systems and technical standards that support a variety of hardware, software, and input/output devices, and further development of the market for assistive technology so that opportunities for economies of scale can be realized. It is much cheaper to build assistive capabilities into the electronic delivery systems and equipment (including software) up front than to retrofit at a later time. The participation of persons with disabilities and their advocates is essential to assure that such systems and equipment are user-friendly and affordable. Some persons have disabilities that prevent meaningful access, even with the best available technology (e.g., persons who cannot hold or manipulate a magnetic stripe or smart card). In these cases, alternative access options will be needed, including the use of technical substitutes and human attendants .[14]

Current Federal law can reasonably be interpreted to require that Federal services be accessible to persons with disabilities—regardless of the format in which the services are delivered. Section 504 of the Rehabilitation Act states that:

> No otherwise qualified handicapped individual in the United States . . . shall, solely by reason of his handicap, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance or under any program

13 For the complete discussion, see J, Scott Hauger, Virginia Technology Associates, Ltd., "Ensuring the Accessibility of New Technologies for the Electronic Delivery of Federal Services for Persons with Disabilities," contractor report prepared for the Office of Technology Assessment, Jan. 20, 1993.

14 Ibid.

or activity conducted by any executive agency. . . .[15]

The Federal commitment to accessible Federal programs and services, and to accessible State/local and private sector activities as well, is reflected in several other statutes.[16] OTA field visits and interviews found a growing awareness of the possible implications of electronic delivery for persons with disabilities, but as yet no coherent strategy or program for addressing this topic. Congress and the administration could reaffirm existing law and regulations[17] and require that, in developing electronic delivery strategies, agencies address the needs of employees and citizens with disabilities, Existing Federal technical assistance centers could assist in this process.[18]

Senior Citizens

Senior citizens comprise one of the fastest growing groups in the United States, but one with relatively little exposure to computers. Most senior citizens do not own a personal computer (PC) and have limited, if any, experience with PCs. Computers as we know them today did not exist when the current generation of senior citizens went to school. Most retired before the advent of PCs in the office. Many must live on fixed incomes with limited funds for discretionary expenditures such as computers, software, and on-line time. Yet most need or could benefit from a variety of government services, and could, in principle, take advantage of electronic delivery.

SeniorNet is a good example of what it takes to effectively reach senior citizens.[19] SeniorNet is a not-for-profit organization dedicated to providing accessible, affordable computer services to senior citizens. It currently has about 8,000 members who pay $25 per year for educational materials, discounted computer equipment and services, and the opportunity to take computer classes (at no additional cost) at the 55 SeniorNet learning centers located at senior centers in 23 States. Its computer classes are geared to the needs of many senior citizens for a modestly paced curriculum with ample time for hands-on practice and personalized instruction.

About 2,000 members use the SeniorNet on-line computer conferencing and bulletin board service available over a commercial value-added telecommunications vendor, at the discounted rate of $9.95 per month for unlimited use during nonpeak hours. SeniorNet has negotiated deep discounts not only with the telecommunications vendor for computer conferencing, but with vari-

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IS Rehabilitation Act of 1973, Public Law 93-112, as amended by Public Law 99-506 and Public Law 102-569 (see footnote 16).

16 See Sec. 508, Electronic Equipment Accessibility, of Public Law 99-506, An Act to extend and improve the Rehabilitation Act of 1973; the Technology Related Assistance to Individuals with Disabilities Act of 1988, Public Law 100-407; the Telecommunications Accessibility Enhancement Act of 1988, Public Law 100-542; the Americans With Disabilities Act of 1990, Public Law 101-336; and the Rehabilitation Act Amendments of 1992, Public Law 102-569. Also, H.R. 1757, the **National Information Infrastructure Act of 1993, approved by the House on** July 26, 1993, requires that computer networking applications "be accessible and usable by . . . historically underserved populations and individuals with disabilities."

17 41 CFR 201 of the Federal Information Resources Management Regulations (FIRMR) specifies that agency acquisition of information-processing resources must be conducted in a manner that ensures access by persons with disabilities,

18 These centers include the GSA's Clearinghouse on Computer Accommodation, Department of Veterans Affairs' Computer Training Program for Persons with Disabilities, and Department of Defense's Computer/Electronics Accommodations Program. Also, the Architectural and Transportation Barriers Compliance Board, established by section 502 of the Rehabilitation Act of 1973, is responsible for promoting accessibility for individuals with disabilities, The Board is tasked by the Americans With Disabilities Act of 1990 to help assure accessibility to buildings and facilities covered by the Act. The Board's mandate includes automated teller and fare vending machines, for example, that are directly relevant to electronic service delivery. See, for example, Architectural and Transportation Compliance Board and Department of Transportation, "Americans With Disabilities Act Accessibility Guidelines: Accessible Automated Teller Machines and Fare Vending Machines," *Federal Register*, vol. *58, No. 134,* July 15, 1993, pp. 38204-38211.

19 See Mary Furlong and Greg Kearsley, *Computers for Kids Over 60* (San Francisco, CA: SeniorNet, 1993); Marcie Schwarz and Joanne Taeuffer (eds.), *The SeniorNet Sourcebook: A Collection of Creative Computing Projects* (San Francisco, CA: SeniorNet, 1993); and Marcie Schwarz and Jamie Sullivan (eds.), *Portraits of Computer-Using Seniors (San* Francisco, CA: SeniorNet, 1991). Also see Susan Koch, *Realizing the Benefits of New Computer and Telecommunication Technologies for Older Americans* (Washington, DC: National Association of Area Agencies on Aging, 1993).

ous equipment and software suppliers, SeniorNet computer classes are free, after the annual fee, due to private foundation and corporate funding. SeniorNet has found that both mobile and homebound senior citizens can benefit from computer-based services, and that many participating senior citizens use computer conferencing for social as well as educational or informational purposes. It also is encouraging the use of computer conferencing for intergenerational activities, for example between senior citizens and elementary and secondary students. SeniorNet has demonstrated, overall, that user-friendly, low-cost training and access make it possible for senior citizens to benefit from computer-based services.

The SeniorNet concept could be expanded to many more senior citizen centers in areas with high concentrations of older Americans, and to community centers, libraries, and information and referral (I&R) offices. Few community centers at present offer computer-based services, but the potential is great, Community centers are prime locations for electronic kiosks. The majority of public libraries now provide at least some microcomputer and compact optical disk services for patrons. Libraries generally do not charge for in-house computer activities, but do assess fees to recover costs of searching on-line databases. University and public libraries that are members of the Federal Depository Library Program have additional responsibilities to make Federal information (including information on Federal services) available to all citizens who walk in the door—including senior citizens.

Many communities also have I&R offices or 1-800 numbers that help citizens in need locate government or private sector services, and refer citizens to the appropriate service. Many I&R offices are jointly funded by local voluntary organizations and Federal or State/local governments. Most I&R offices already serve senior citizens, and some are beginning to explore greater use of information technology—including search and retrieval software and computer conferencing or networking among providers,

The key to meeting senior citizen computing needs is effective partnering among: 1) government agencies that provide *or* fund services for senior citizens; 2) voluntary and not-for-profit organizations that help senior citizens locate and use these services; and 3) commercial vendors of equipment and services that are willing to offer senior citizens, and organizations that serve them, deeply discounted rates.

STRATEGIC PARTNERING FOR ELECTRONIC SERVICE DELIVERY

Another potential component of electronic service delivery with high leverage is the forging of strategic partnerships among Federal, State, and local governments; user groups; and, where appropriate, the private sector (including not-for-profit, philanthropic, and voluntary as well as commercial organizations). Many State and local governments are beginning to view and use information technology as a catalyst for rethinking their own mechanisms for service delivery.[20] And a wide array of Federal services already involve significant State/local participation.[21] Partnerships in

[20] See David Osborne and Ted Gaebler, *Reinventing Government: How the Entrepreneur'u[Spirit Is Transforming the Public Sector* (Reading, MA: Addison Wesley, 1992); David Osborne, *Laboratories of Democracy: A New Breed of Governors Creates Models for Economic Growth* (Boston, MA: Harvard Business School Press, 1990). Also see State Information Policy Consortium, "National Information and Service Delivery System: A Vision for Restructuring Government in the Information Age," 1992, available from the National Governors' Association, National Conference of State Legislatures, and Council of State Governments; and Patricia T. Fletcher, Stuart 1. Bretschneider, and Donald A, Marchand, *Managing Information Tec hnology: Transforming County Governments in the 1990s* (Syracuse, NY: Syracuse University School of Information Studies, August 1992).

[21] See Council of Governors Policy Advisors, *New Alliances in Innovation: A Guide to Encouraging Innovative Applications of New Communication Technologies To Address State Problems* (Washington, DC: National Governors Association, 1992). Also see Charles M. McClure, Rolf T. Wigand, John Carlo Bertot, Mary McKenna, William E. Moen, Joe Ryan, and Stacy B. Veeder, Syracuse University School of Information Studies, "Federal Information Policy and Management for Electronic Services Delivery," contractor report prepared for the Office of Technology Assessment, Dec. 21, 1992.

electronic delivery, however, are only in the formative stages.

Effective partnering likely will require a true commitment from agencies to aggressively seek partnering opportunities and to make them work. A systematic exploration of partnering possibilities should include:

1. other Federal agencies delivering similar or related services;
2. State/local agencies that participate in delivering these or related Federal services;
3. private not-for-profit organizations such as colleges, hospitals, and community development groups that do or could participate;
4. voluntary consumer, community, youth, senior citizen, and related groups that could assist with service delivery;[22]
5. foundations and other philanthropic organizations that could provide seed money or matching grants; and
6. private commercial companies that make or sell the electronic equipment, systems, and Sei-vices needed for electronic delivery, or that deliver substantive services similar to those provided by the government.

While Federal agencies could be required to at least explore these possibilities, the specific partnering arrangements will vary widely from case to case. Partnering may not be appropriate in some situations, and indeed can be harmful if the match between partners and services is not comfortable (i.e., a "forced fit"). Successful partnering requires a good match between program objectives, service providers, users, and appropriate technologies and expertise.

Partnering could offer several benefits. It should provide a way for Federal and State/local agencies to share the costs and risks of innovation in electronic delivery. The fiscal crises facing the Federal and most State Governments provide further impetus for partnering. At the same time, partnering should increase the chances of success by encouraging better understanding of the needs of users and providers, and stimulating creative thinking about new or improved service delivery strategies. It also could be a constructive catalyst for change that leads to more productive, efficient, and responsive service delivery. Strategic partnerships flourish and succeed when the partners realize that by working together, they can accomplish what they could not do alone. Partnerships could help agencies break through or work around the bureaucratic and political inertia that often confronts new ideas for service delivery.

Electronic delivery partnerships examined by OTA (e.g., WyoCard and InfoCal[23]) typically began with an exploration of project feasibility, followed by a pre-operational or demonstration activity, and then moved to full implementation (see box 5-C for keys to the WyoCard success). The results of OTA's field visits and contractor research suggest that successful partnerships are likely to include many of the steps or activities shown in table 5-1.

Congress or the administration could assign a lead Federal agency (or agencies) the task of fleshing out the table 5-1 framework and preparing a "Guidelines or Checklist for Successful Electronic Partnering," perhaps as one of a series of papers on general strategies for electronic delivery. The partnering checklist could readily build on similar State/local government initiatives.[24] The Federal Government also could establish an incentive program for partnering, including:

1. recognition and performance awards,
2. an annual conference,
3. partnership set-asides (as a percentage of program budgets or agency information technology budgets, e.g., one-half of one percent),

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22 See John Harris and Alan F. Westin, "Non-Refit and Academic Applications of Computer and Telecommunication Technologies," contractor report prepared for the Office of Technology Assessment, December 1991.

23 WyoCard is evolving into a multiprogram, multiagency electronic benefit transfer card, See ch. 4 for discussion. InfoCal is evolving into a multi program, multiagency information and service kiosk. See ch. 2.

24 See Council of Governors Policy Advisors, op. cit., footnote 21.

Box 5-C--WyoCard: Keys to Success

The State of Wyoming's WyoCard project tested the use of off-line smart cards for delivering Women, Infants, and Children (WIC) benefits to recipients in Natrona County (Casper area), A smart card called the WyoCard was used as a substitute for the traditional paper voucher system for delivering benefits. Here are some of the reasons the test worked well:

- The Wyoming State WIC director articulated a clear vision of WyoCard, and provided strong leadership and guidance.
- The WIC director helped change the State government's mindset regarding service delivery and the role of information technology.
- The WyoCard project staff reached out to recipients, retailers, banks, local voluntary organizations, and technology vendors-as well as Federal/State agency officials-from start to finish.
- The WyoCard staff held a planning retreat with participants early in the project.
- The WyoCard staff developed project plans that described how technology could deliver WIC services more cost effectively, and that outlined the key issues and options.
- WyoCard staff built technology flexibility into the plan and sought nonproprietary technical solutions to the extent possible, in order to reduce costs and simplify procurement and operations.
- WyoCard staff setup an advisory panel of participants and experts to help ensure effective communication during the life of the project.
- Staff developed training materials-including a short, inexpensive videotape for use at the nutrition clinics where the WIC program is locally administered-and made sure that local retailers, clinic staff and volunteers, and recipients received adequate training.
- Staff set up a technology demonstration in a local clinic to test participant understanding and help assure a user-friendly system.
- Staff tested the technology both on- and off-site to validate the system design prior to procurement.
- Recipients, retailers, banks, and government staff were uniformly pleased with the WyoCard project results (see box 4-B, ch. 4 for details).

SOURCE: Office of Technology Assessment, 1993.

Table 5-1—illustrative Checklist for Successful Partnering In Electronic Service Delivery

Exploratory/planning stage
• project planning task force
• community workshop or retreat
• technology demonstration or sharing center
• local advisory committee
Pre-operational stage
• cooperative development of operating rules (e. g., assignment of technical and programmatic responsibilities)
• early resolution of key issues (e.g., cost- and risk-sharing)
• creative use of requests for information (RFIs) and proposals (RFPs)
• pilot projects and demonstrations
Operational stage
• sealing up roles and resources
• Incorporating pilot-test results
• selecting lead agencies and participants
• firming up the commitments (and responsibilities) of all partners
• providing training and user support
• building in a periodic evaluation component

SOURCE: Office of Technology Assessment, 1993

4. innovative ways to share lessons learned, and
5. streamlining of Federal guidelines and procedures for cost reimbursement for the Federal share of strategic partnering.

Local Community Infrastructure

The involvement of the local community infrastructure in strategic partnerships can greatly facilitate electronic service delivery. Schools, libraries, community centers, town halls, and hospitals offer some of the most highly leveraged opportunities because these locations are typically heavily used and well respected, and provide a multiplier effect for technology investments. At the local level, technologies and locations suitable for multiple users offer the greatest return on investment.[25] The concept of the community communications center has considerable merit. Local high schools frequent] y serve this purpose in small towns and rural areas. Educational institutions in general—whether high schools, community colleges, or universities—are very interested in using information technology, tend to be more familiar with the technology than the community-at-large, and are well suited to the training needs likely to be associated with major electronic delivery initiatives.[26] Schools and hospitals already benefit from ongoing Federal and State computer, distance learning, and telemedicine programs. The key is to find synergies between these and the many other government programs that collectively can provide the building blocks for electronic service delivery.

Kotzebue, Alaska, is a case in point. Located just above the Arctic Circle with a population of about 3,000, this Native Alaskan village is accessible year round only by air, with no land access and sea access only during the ice-free months, In a small village like Kotzebue, the high school, hospital, and community center might collectively justify the installation of multimedia workstations and videoconferencing facilities at a village communication center, but not individually. The hospital needs the ability to have video interaction with medical specialists in Fairbanks, Anchorage, and sometimes even Seattle, Washington. The hospital cannot afford to have specialists on staff, and few specialists will fly to Kotzebue. The only option in serious cases is flying the patients out at great expense and family dislocation. The local schools could likewise benefit from distance education. And the community, including the village


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Chukchi College of the University of Alaska is home for the Kotzebue Public Library and provides microcomputer access for Kotzebue residents of all ages.

25 See Office of Technology Assessment, U.S. Congress, *Rural America at the Crossroads: Networking for the Future,* OTA-TCT-471 (Washington, DC: U.S. Government Printing Office, April 1991).

26 See generally Office of Technology Assessment, U.S. Congress, *Linking for Learning: A New Course for Education,* OTA-SET-430 (Washington, DC: U.S. Goverment Printing Office, November 1989).

government, could benefit from enhanced teleconferencing with State and Federal officials in Anchorage and Juneau, and potentially even in Washington, DC. Villages and towns like Kotzebue are ideally suited for implementation of "rural area networks" to share computer and telecommunications resources .[27]

OTA field trips identified numerous other examples of opportunities to develop the community information infrastructure that could support electronic service delivery. Community colleges and universities are particularly well suited (see box 5-D).

Partnering can help assure equitable access to electronic service delivery. Combining the grassroots involvement program discussed earlier with a local community infrastructure initiative, if backed up with funds (whether by set-asides or otherwise), would go a long way towards building up (and on) local expertise and access. A community infrastructure initiative for electronic delivery could be supported with funding from both mission agency demonstration and operational programs (e.g., Department of Agriculture for electronic benefit transfer) and Federal grant programs (e.g., National Science Foundation for campus computer networking, Department of Education for public school networking). The National Public Telecomputing Network, Big Sky Telegraph, and Institute for Global Communica-

Box 5-D-The Community Information Infrastructure: A Key Role for Colleges and Universities

- *Laramie Community College,* Laramie, WY-With about 2,500 students, the college has over 550 personal computers in 12 computer labs. The college keeps one lab open to any resident of the Cheyenne community at very nominal charges (e.g., $45/year, $1 5/semester, $2/hour). This appears to be a great asset for those who cannot afford or do not need their own computer. The college offers an extensive distance-learning program-using a public access cable TV channel and/or two-way audioconferencing--for homebound persons, farmers, ranchers, and others who find it difficult to come to the campus. The college has a videoconferencing facility-with one-way satellite video and two-way compressed video-that is also available for local community and State government use.
- *Rasmuson* Library, University of Alaska, Fairbanks-The library is strongly committed to open access. Anybody can use the on-site library resources; a student ID card is not required. Local high school students are among the heaviest users. The library's government documents collection, the largest in the State, gets extensive use. The library is philosophically oriented to the broader mission of information provider to the public-at-large, especially including public libraries and schools in rural Alaska, not just the university community. The library is addressing a range of cost, pricing, copyright, training, and networking issues to help provide affordable remote electronic access.
- Little Big *Horn Tribal College,* Crow Agency, MT—The college has made a major commitment to the use of computers in its educational program. The two fully equipped computer labs and one smaller lab-with a combined total of about 40 personal computers-are open 12 hours a day, 8 a.m. to 8 p.m., and available for use by any registered student on a virtually unlimited basis (except when computer lab classes are in progress). Student interest is high. The college has to scramble to find money for computers, relying largely on foundation and government grants, and makes only limited use of computer conferencing and distance learning-although the potential is great. The college's primary mission is to build up the local community; about 90 percent of the graduates stay in the Crow Reservation area.

SOURCE: Office of Technology Assessment, 1993.

[27] For discussion of rural area networks, see U.S Congress, Office of Technology Assessment, *Rural America at the Crossroads,* op. cit., footnote 25.

tion[28] are among those not-for-profit private organizations that provide grassroots computer networking services. These and similar organizations could be used for electronic delivery of Federal services, and this model could be tested with other technologies (e.g., kiosks).

On a national scale, Congress and the President could establish a Corporation for Public Telecomputing or, perhaps more broadly, a Corporation for Electronic Service Delivery, as a parallel to the Corporation for Public Broadcasting (CPB).[29] This Corporation could provide grants, exchange innovative ideas, and sponsor demonstrations of grassroots public involvement in electronic delivery. CPB itself has embarked on a partnership with local public television stations and schools to provide a nationwide satellite-based videoconferencing and interactive data network. This network will be used for electronic delivery of educational services and could, in principle, serve as another vehicle for Federal service delivery.

Federal funding for local initiatives could be provided in part through the diverse array of existing or proposed Federal agency programs relevant to electronic delivery. These include: 1) the Public Telecommunications Facilities Program (administered by the National Telecommunications and Information Administration [NTIA]); 2) the proposed computer networking pilot project program (also to be administered by NTIA); 3) the U.S. Public Health Service's Community Services Network Project to develop user--friendly multimedia terminals for citizens and health care workers to access a wide range of health-related services and information; and 4) the Department of Agriculture's plan to use information technology to help county extension offices become part of the local electronic services and information infrastructure.[30] Whether through existing or new mechanisms, congressional and executive actions to support the grassroots community infrastructure would be highly leveraged in assuring the success of Federal electronic service delivery.[31]

Private Commercial Sector

The private commercial sector is another essential partner in electronic service delivery. Private vendors are the suppliers of the telecommunications equipment, computers, and vast array of peripheral equipment and software needed for electronic delivery, The Federal Government should use, to the maximum extent possible, the latest off-the-shelf technology obtained through standard competitive procurement procedures. Some private firms may, on occasion, wish to underwrite joint development projects and pilot tests, or provide discounted or donated equipment, as is done routinely with schools and colleges. This practice, if extended more vigorously to grassroots not-for-profit groups, could help assure equity of access to electronic service delivery.

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28 The Institute for Global Communications, headquartered in San Francisco, CA, operates the EcoNet and PeaceNet family of computer bulletin boards and conferences, and provides gateway access to numerous other public interest computer networks.

29 The Corporation for Public Telecomputing concept originated with Thomas Grundner, President, National Public Telecomputing Network. See T.M. Grundner, "The Fourth Scenario: On the Federal Development of Public Access Computerized Information and Communication Services," January 1993, and "Toward the Formation of a Corporation for Public Cybercasting," April 1993. Copies available from T.M. Grundner, Internet tmg@nptn.erg, phone 216-247-5800, fax 216247-3328. The State of Oregon has proposed creating a private, not-for-profit "Oregon Telecommunications Foundation" to serve as a catal yst and support pilot projects with matching funds to be raised from private and philanthropic sources. See State of Oregon, Department of Economic Development, "Oregon Connects: A Telecommunications Vision and Plan for the 21st Century," Salem, OR, September 1992.

30 See U.S Department of Agriculture, Extension Service, Communication and Information Technology Division, "Future Applications of Communication Technology: With Implementation Recommendations," July 1991, and "Future Applications of Communication Technology: Strategic Implementation Plan for the Cooperative Extension Service," November 1992.

31 For other ideas on community information infrastructure development, see Richard Civille, Computer Professionals for Social Responsibility, "Broadening the Research Community: Delivering Federal Services Using Information Technology," contractor report prepared for the Office of Technology Assessment, December 1992; John Harris, Alan F. Westin, and Anne L. Finger, "Innovations for Federal Service: A Study of Innovative Technologies for Federal Government Services to Older Americans and Consumers," contractor report prepared for the Office of Technology Assessment, February 1993; and Dutton, "Electronic Service Delivery and the Inner City," op. cit., footnote 5.

Private vendors also are the primary providers of the telecommunications and computer networks needed for electronic delivery. The Federal Government has opted to use private commercial networks, rather than build its own (except in rare cases of national security). FTS2000, for example, is not a physically separate telecommunications network built for the Federal Government, but is essentially a bulk purchase agreement for Federal use of commercially available telecommunications networks and services. A few States and educational systems, and many more private businesses, have opted to build their own private telecommunication networks.[32] But Federal electronic service delivery will be most cost effective for the largest number of recipients by using commercial offerings, including the public switched telephone network and other publicly available telecommunication and value-added networks. As with equipment, some private firms provide telecommunication and network services to schools and libraries at discounted rates, especially during off-peak hours of use. Other local community and grassroots organizations likewise would benefit from this discount program.

Private companies also can serve as systems integrators for electronic delivery systems, as has been the case for many large Federal (and State/local) agency automation programs over the last decade. They also add further value to government services and independent] y market these enhanced services. Direct involvement of the private commercial sector in the delivery of Federal services, beyond providing the equipment and networks, requires attention to issues that have proven to be sensitive and controversial in the past. These include providing for fair competition, avoiding conflicts of interest, assuring an appropriate level of Federal control over taxpayer-supported services, and guaranteeing equity of citizen and taxpayer access to services. Congress would need to review and update the relevant policy framework as needed, in order to have a smooth transition to electronic delivery (see ch. 7 discussion of contracting out/procurement).

Private sector motivations for partnering can extend beyond research, market development, and direct sales. Private companies are themselves recipients of many Federal services; electronic delivery should present companies with opportunities for cost savings and innovation. Technologies such as electronic data interchange and automated voice/fax/computer response could drastically reduce the Federal paperwork burden and accelerate electronic collection of information from businesses. Entrepreneurs large and small could access valuable trade, market, and technical leads faster and at lower costs. Government electronic delivery initiatives could help stimulate development of commercial market opportunities and strengthen the overall competitive posture of the U.S. financial industry.[33] Private companies increasingly recognize that, when it comes to electronic service delivery, what is good for government is also good for business.[34]

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32 The State of Iowa has purchased its own fiber optic network for educational, governmental, library, emergency, and other public uses. See Iowa Department of General Services, Communications Division, "ICN—Iowa Communications Network: Information Highway of the Future," n.d. Also see Interagency Information Resources Management Infrastructure Task Group, Iowa Communications Network Working Group, "Iowa Communications Network Study," General Services Administration, Washington, DC, Apr. 1, 1993, for discussion of Federal/State opportunities and issues.

33 See chs. 2 and 3.

34 For further discussion, see Office of Technology Assessment, U.S. Congress, *The Electronic Enterprise: Opportunities for American Business and Industry*, in progress.