Equalizing Access to Electronic Networked Resources: A Model for Rural Libraries in the United States

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ABSTRACT
RURAL LIBRARIES AND PATRONS have always suffered more because of limited access to information than their metropolitan counterparts. Libraries in rural settings have had to deal with the difficulties of working with more limited budgets and smaller collections serving populations distributed over larger areas. With the rapid development of networked resources and access tools available over the Internet, which are most easily accessible in metropolitan areas, disparities in access to information are growing even larger. Instead of widening the rift between metropolitan and rural library users, the new telecommunications technologies could bridge the distance, providing more equalized access to the wealth of human knowledge to rural library communities. This article provides an overview of the current state of networking technology in rural libraries and describes a model for educating rural librarians in the new technologies that will enhance library service to rural communities.

INTRODUCTION
The recent explosive increase in the development and availability of information resources and access tools over the worldwide network of networks known as the Internet promises to bring great change in the way individuals search for, and are able to access, remote information resources. This accessibility, however, is currently limited to perhaps 10 million users worldwide who are largely associated

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with academic, research, government, and commercial institutions in urban areas. These enhancements in library service are already evident in many academic libraries which have been early adopters of this technology due to easy access through campus computing services. Special libraries have also enjoyed similar privileged access (Tillman & Ladner, 1992). Rural libraries, however, have always been disadvantaged in the number and types of services they are able to provide to their patrons. Serving relatively small populations over large geographic areas, rural libraries must contend with limited resources and access to services taken for granted by urban library users. Economics dictates the size of the collections of the libraries based on the size of the population served. For this reason, rural libraries are traditionally smaller than urban counterparts. Access to larger libraries by rural librarians and patrons is often not feasible due to large distances.

Computer networks provide access to thousands of resources distributed among numerous sites. The availability of these resources via current telecommunication technologies could be the “great equalizer” that would allow rural libraries to access the same online resources available to the largest urban libraries and would enhance the type of services they provide. Access to electronic networks for rural libraries and their communities can help address the growing trend cited in the library literature (e.g., Doctor, 1992; Marien, 1991; Dougherty, 1991; Scheppke, 1990), that is, toward a nation divided between information “haves” and “have-nots”—with attendant disparities in education, income potential, and opportunities. Rural residents, like urban dwellers, need timely access to an array of information in order to make decisions that affect their lives and work and in order to compete successfully in a global marketplace. Although both opinion and research reported in the literature occasionally convey conflicting views on the status of rural libraries and their communities, a careful review of the literature shows reason to be concerned. This conclusion is supported by Doctor's (1992) broader overview of the role of information technology in social equity in the United States which demonstrates that, “existing data provide warning signals about significant disparities in the distribution and use of information resources” (p. 80).

This article provides an overview of issues in rural librarianship concerned with implementing advanced telecommunications technologies in order to enhance library services. It also presents a model for educating rural librarians in accessing electronic networks and outlines how the model may be implemented in rural settings.

**Rural Libraries and Information Needs**

Rural communities (those with fewer than 25,000 inhabitants), and the libraries which serve them, are diverse; they are frequently
in geographically remote and sparsely settled areas, in economically declining towns, as well as in bedroom or commuter communities. In a broad overview of the problems and nature of rural communities, a 1991 study commissioned by the U.S. Congress Office of Technology Assessment reports that, despite their diversity, many rural areas share declining income levels, high unemployment, and population loss. In the past, rural areas have tended to be slower to adopt innovations than more urban communities (Dillman, 1991, p. 32), an additional problem in a time of rapid economic and social change. Being rural "implies [having] low population density and uneven access" to opportunities available in more densely populated areas (Heasley, 1992, p. 8). Wilkinson (1991) notes that ruralness not only impedes access which is essential for well-being, but also, in more recent times, has come to be associated with social isolation, a factor cited in a range of social ills (pp. 54-55).

Recent literature strongly suggests that the varying information needs of rural communities are not adequately met and that rural libraries have an important role in addressing those needs. These are recurring themes in the published papers from two conferences focusing on small and rural public libraries: the 1990 H. W. Wilson Symposium on the Future of Public Libraries (Wilson Library Bulletin, 65[9]) and a conference jointly sponsored by the Center for the Study of Regional Librarianship, the National Agricultural Library, and the Northeast Regional Center for Rural Development, in cooperation with the Department of Library Science at Clarion University of Pennsylvania and the State Library of Maine (Rural Libraries, 12[2], 1992). Dillman (1991), for example, asserts that, "rural communities have some very serious information needs quite different from those of the past, and no one is meeting them..." (p. 31); Heasley (1991, 1992) also describes unmet information needs and the role of rural libraries in meeting them. Consumers, including rural residents, are becoming both more demanding and more sophisticated in their expectations of information service (Vavrek, 1991, p. 26).

Vavrek, in national studies of the information needs of rural Americans (1990) and of the role of the rural public library (1993), found a troubling disparity between identified information needs of rural residents and the capacity of the local library in addressing those needs. Vavrek's (1990) studies found that libraries were not regarded as resources for timely information, leading him to speculate that, "rural library staff continue to be in a book oriented world while the multiplicity of resources has grown because of the information explosion" (pp. 27-28). This problem is compounded by the fact that the great majority of personnel in libraries serving fewer than 25,000
people (80 percent of all public libraries) do not have an M.L.S. degree. Vavrek's findings (1990, 1993) point to a critical need to provide specialized training to rural librarians in order to bring rural libraries into the electronic age.

A recent report by McClure, Ryan, Lauterbach, and Moen (1992), examining the present and future of public libraries and the Internet/NREN (National Research and Education Network), recommends that public libraries play a vital role in providing access for the public to networked information resources. The study identified a pressing need, not only for programs to increase librarians' awareness and understanding of the Internet, but also for a massive effort to provide educational opportunities for public librarians related to the Internet/NREN (pp. 22-23). Again, as Vavrek (1990, 1993) has pointed out, this need is particularly acute for rural librarians who have little formal training and very limited access to continuing education. McClure also found that public librarians, including rural librarians, were less likely than others to be aware of the Internet and its potential uses. Other recent works (McClure et al., 1993; McCook, 1993) also call for leadership and a strong role for libraries, including both public and school, in the development and implementation of future electronic network resources, and cite the need for training in the use of electronic resources for public and school librarians. McCook (1993) posits the idea that the service ideal of the library profession makes it the most viable group to ensure the provision of equal access to information for all (pp. 9, 14).

A number of writers describe the rural library as a potentially key point of access to remote information for rural residents and envision the librarian as serving as an effective change agent in the rural community (Parker, 1991; Heasley, 1991, 1992; Godwin, 1991; Wilkinson, 1991). For example, Heasley (1991) recommends that the librarian actively help the rural community cope with change in adopting new technologies by playing one or more "change agent" roles—e.g., resource linker, process helper, solution giver, and catalyst (p. 34). Heasley sees all of these roles as natural to the library profession.

**TELECOMMUNICATIONS TECHNOLOGY ACCESS IN RURAL AREAS**

Studies suggest telecommunications technology use and policy in rural areas may have profound effects on the ways in which rural libraries will be able to implement information technology and provide services. Residents of rural areas traditionally have not adopted innovations in information technologies as quickly as urban dwellers (LaRose & Mettler, 1989, pp. 48-49). However, this does not mean that rural residents do not have access to telecommunications. The
existing telephone network, designed to handle primarily analog voice communication, represents a readily available data highway for gaining access to networked information resources by means of microcomputers, modems, and communication software. However, limitations in the transmission medium (usually consisting of twisted pair wires), particularly at the local loop level (the wiring that extends from the user's residence to the central telephone office that connects users to the rest of the world), restrict users to low bandwidth capabilities. Access difficulties for rural users then may not be due primarily to lack of physical access to data communication networks; the difficulties may exist because available linkages are underpowered with low bandwidth. Current telephone lines will support a maximum of 9.6 Kbps to 14.4 Kbps, whereas direct network users typically will have at least 64Kbps. Reliability of data transmission also may be problematic, particularly in rural areas (Hudson & Parker, 1990, p. 200; Egan, 1992, p. 32). Another important factor that has restricted rural access to networks is economics. Because network access is rarely available locally through a network node, rural users must also absorb long-distance telephone charges.

As noted earlier, the research literature provides conflicting evidence as to the plight of rural residents. In a study of information technology use, LaRose and Mettler (1989) examined use of a variety of information technologies in seven rural counties in the United States and residents' willingness to adopt these technologies. The study found no significant differences between rural residents' and nonrural residents' willingness to use information technologies, including networking technologies (electronic mail, online databases, computer modems, private computer networks). It is interesting to note that there were also no significant differences observed in use between rural and nonrural counterparts. The authors also suggest that rural residents are not technologically disadvantaged members of the information society. However, the study's nonrural segment used for comparison represented regions bordering rural areas and was not truly urban.

Another study, specifically of rural libraries, by Mumma (1991) concludes that most rural libraries do not have the same technological advances as urban libraries. Of the ninety-seven respondents in the study of a random sample of rural libraries throughout the United States (except Hawaii), only ten libraries had an automated catalog while twenty reported an automated circulation system and thirty-three reported using some type of computer program to assist in cataloging. Twenty-one of the respondents offered online database searches, either in house or elsewhere, and eight libraries offered CD-ROM searches (pp. 8-10). Mumma (1991) found that most rural
librarians would like to offer these services and cite lack of funds as the key deterrent (p. 12). Vavrek (1993) found that while 55 percent of rural adults were interested or somewhat interested in "computerized information" as a library service, fewer than 6 percent of the libraries surveyed had computerized information (pp. 25-26). A new survey on the use of Internet technology in public libraries begun in Fall 1993 by McClure and Zweizig for the U. S. National Commission on Libraries and Information Science (NCLIS News Release, November 17,1993) will yield additional insights on this topic.

A 1990 national poll by the Louis Harris organization (Westin & Finger, 1991) found a high level of interest among the U. S. public (two-thirds of those adults polled, including low-income and minority individuals) in using computers for online information from public libraries or other nonprofit services (p. 4). Westin and Finger, in summarizing the key implications of the study's findings for the future of publicly funded libraries, urge the use of electronic resources to enhance library services in order to narrow the gap in access to information (pp. 4-6).

The 1991 U.S. Congress Office of Technology Assessment (OTA) study assesses the information technology needs of rural residents across the United States and explores the positive role that communication technologies can play in the future of rural development. It also touches on the challenges, political as well as logistical, of linking diverse remote areas to the National Information Infrastructure. Based on an examination of many rural areas and current technology availability, the investigators conclude that rural areas share many common problems, but local resources to help solve these problems can be very different. They believe that education of rural users is important for efficient use of available technologies and that it prepares them for future information technologies. Rural areas must have access to the necessary information infrastructure to inhibit further economic decline of these regions.

A range of technologies exists to facilitate network access to rural areas. Telephone access represents the most readily available technology, but limitations in bandwidth and lack of broadband capability make it undesirable for electronic networking. Current economic constraints prevent enclosed media with high bandwidth capability (such as fiber optics) to be readily available in most rural areas. Broadcast media in the form of microwave and satellite transmission could represent an economical way of reaching isolated communities because costs are less distance dependent than for enclosed media. These broadcast technologies have already been used to support communication and educational and entertainment needs in many areas of the world.
The OTA study (1991) proposes the development of Rural Area Networks (RANs) configured around geographic, rather than functional, boundaries and needs of communities—a ring architecture linking many types of users, ultimately connected statewide using government or education networks (p. 9). The investigators make a case for deploying broadband networks rather than taking a more cautious evolutionary approach on the basis that broadband technology facilitates sharing and will ultimately be more cost effective than upgrading narrowband technology. In addition to access, the OTA study outlines other problems facing rural communities in implementing new technologies. These include a lack of local expertise and experience, lack of attention from communication vendors (p. 11), and competition for turf and control that can hinder necessary cooperation (p. 17).

Telecommunications policy for rural areas has been an active area of investigation, focusing on the socioeconomic benefits associated with greater telecommunications access. Warnings have already been issued stating that, if rural America does not learn to use telecommunications technology, its decline will continue because it will not be able to compete with urban economies. Information-based industries in rural areas could help rural communities compete with urban counterparts since geographic proximity to urban centers becomes unnecessary once appropriate telecommunication connections have been established.

Hudson and Parker (1990) examine the changes in the telecommunications environment based on economic changes in rural areas sparked by the growth of public and private services. The authors develop a list of indirect socioeconomic benefits of telecommunications, some of which, by implication, also will benefit libraries. These include improving the quality and accessibility of education and other social services; improving productivity, efficiency, and quality of services and a reduction of costs; and fostering of a sense of community and strengthening of cultural identity (p. 196). Specific goals the authors recommend cover both voice and data communications including “telephone facilities of sufficient quality to allow reliable transmission of facsimile documents...” and providing “rural telephone users with local access to value-added data networks” (p. 201). These ideas are expanded in a book compiled by the authors (Parker & Hudson, 1992).

Egan (1992) investigates factors influencing advanced voice and data telecommunications development in rural areas of the United States, technical difficulties associated with their implementation, current options, and costs of various technologies. Before advanced data communications services will be possible, upgraded digital services
will be necessary for rural subscribers. Egan provides estimates of costs for upgrading rural connections for baseband and broadband services. From Egan's comment that, "[t]oday's rural telecommunications infrastructure is a patchwork quilt of subnetworks with many owners and operators..." (p. 37), it is clear that network infrastructure for rural environments is largely lacking. He recommends that the best way to achieve rural objectives for a network infrastructure is to proceed at the state level.

SAMPLE SERVICES TO ENHANCE INFORMATION ACCESS

Rural environments have already begun to take advantage of advanced computing and telecommunication technologies. Libraries have played an important role in many of these projects.

Facsimile technology represents a readily available technology using standard telephone access for enhancing document request and delivery. The use of this technology in rural areas has been implemented in some settings (Nichols, 1990).

The Blacksburg Electronic Village in southwest Virginia represents a locally focused networking project using high-level information technology. The project was established as a partnership of a regional telecommunications company, Virginia Polytechnic Institute and State University, and local government to provide Blacksburg with a twenty-first century telecommunications infrastructure. The project, a prototype to test the success of a variety of information services, encompasses a range of applications for data access and transfer including video transmission. The network will allow students at all levels and teachers to communicate with one another and will permit access to the wider NREN. Business and professional uses will allow professional services to be offered to local clients. In addition to providing recreational and social services, the network is envisioned as an electronic town hall to facilitate discussion on a variety of local issues (Wiencko, 1993).

If proven viable, the Blacksburg model could be implemented in other communities. However, it must be noted that the project is being developed in a specialized environment with a large university to help establish and support the network and a technologically literate community. The community also has the support of its high-profile U. S. Congressman, Rick Boucher.

While the Blacksburg Electronic Village employs high technology for community-based information services, the Big Sky Telegraph project in Montana represents a successful rural community-based information system using lower level technology (Odasz, 1994). Based in western Montana, it is now accessible in several northern mountain states. This bulletin board service, established in the late 1980s with
the cooperation of Western Montana College, allows users to interact with resource people and librarians. Big Sky uses a variety of approaches to promote the adoption of this technology, including "circuit riders" or change agents who visit local communities to offer demonstrations and training (Odasz, 1993). The project offers a regional model for access to a wide variety of users across many towns using community bulletin board systems.

Project GAIN (Global Access Information Network), based in upstate New York, is examining the value of Internet connectivity for rural public libraries. The project will evaluate the effectiveness and tangible benefits of providing rural communities and libraries with access to electronic resources. The project takes a novel approach to supporting network access in rural areas. Network accessibility to rural areas is often viewed as a one-way benefit in which the rural areas are seen to profit from access to urban resources but provide no resources in return to the wider Internet. Project GAIN is also investigating how rural connections can provide access to local resources such as genealogical information, regional history, and recreational information for travel and tourism (Polly, 1994. See also Project GAIN press release on NYSERNet gopher at nysernet.org).

Regional and statewide projects have likewise been implemented in other parts of the country. In West Texas, an interactive telecommunications network called MEDNET has been established to provide physicians in remote areas with a variety of services to maintain contact with peers for consultation, diagnostic services, and continuing education (Moore & Hartman, 1992). Librarians act as information intermediaries in the preparation of information packets as well as in the support of educational programming.

North Carolina has established the North Carolina Information Network that relies on electronic mail and bulletin board services to act as gateways to a range of electronic information resources. The project is a good example of the use of available technologies and planning for advanced technologies. It is based on a philosophy of building on past investments in materials and technologies rather than one of beginning with costly new technology investments. Rural libraries are gaining access to the Internet through the statewide LINCNET System, which links the state universities, several private colleges, and the state's fifty-eight community colleges, thus making available packet switching in every geographic region of the state. The author points out that this will affect rural library acquisition budgets where money traditionally used for print resources will have to be shifted toward electronic resources. The State Library has played a pivotal role in the development and promotion of the network and has become the chief provider and marketing agency of the state's
information products and services. The North Carolina Network effort demonstrates the success of a model with the state library agency in a leading role.

While the vision of libraries with limited resources taking an active role in providing their rural publics access to electronic resources may be a challenging one (McClure et al., 1993, pp. 37-39; Vavrek, 1993, pp. 10-12), the array of regional, state, and local networking activities described earlier illustrates that libraries have been and can be viable players in this effort.

**Educating and Empowering Rural Librarians**

Because current costs for telecommunications technology can be very high, publicly funded rural libraries offer logical and potentially cost-effective sites for extending community access to electronic networked resources. They are open to all and are mandated to provide information services to their communities. However, because many rural librarians may have had little previous training in electronic networking, a large-scale effort is needed to educate librarians in using these resources.

Any effort to extend full access for rural communities to electronic networks, including the Internet, will benefit from clear national vision and leadership. Linking rural areas into the National Information Infrastructure will require cooperation from a number of sectors and at many levels, but a strong national commitment to this end, including funding, is nonetheless essential. In addition, models developed for assisting rural libraries in this endeavor need to be flexible and adaptable to differing local circumstances and needs. There are key elements or characteristics generalized from the literature and research discussed earlier which should be included in any effort to disseminate information technology to rural communities and libraries. These include:

- **Community leadership.** Effective dissemination requires a visionary, knowledgeable, energetic leader in the community. Flexibility and creative thinking are also extremely important.
- **Cooperation between public and private sectors at all levels.** Cooperation, particularly among key parties, is essential. Sharing and cross fertilization is critical in order to take maximum advantage of scarce resources in rural communities. A holistic approach, linking the deployment of communication technology to broader issues of community economic and social development (not simply in response to market demand), is needed.
- **Technology transfer/education component.** The use of a technology transfer change agent model for dissemination of technological
innovation will help rural communities implement electronic technologies more quickly and learn to use them more effectively. Research on the diffusion of innovation in rural settings suggests that the role of change agent is critical to successful adoption of a new technology (Rogers, 1983). In the classic model based on rural agricultural extension agencies, the change agent serves as an intermediary between technical experts and the field practitioner. The change agent helps practitioners understand and implement useful new technologies and programs to improve practice. At the same time, the change agent also provides the technical experts with insights and feedback on needs and problems of practitioners. Librarians have been proposed as logical agents of change in disseminating information technologies and services in rural areas.

A Model for Educating Rural Librarians

A model for educating public and school librarians in using and promoting electronic network resources to rural communities is being developed and tested at the School of Library and Information Science, University of Wisconsin—Milwaukee, with a grant from the U.S. Department of Education, Library Education and Human Resources Development Program. The model will be implemented and tested during a one-week institute held at the university in May 1994 and will target potential rural library change agents. It features an intensive training approach which combines informative sessions with experts in electronic networking and rural issues and hands-on computer laboratory instruction in using networked resources, particularly the Internet. In addition to specialized training in electronic inter-networking, the institute will also teach participants the skills needed to act as change agents in disseminating the knowledge gained to other library personnel in rural areas.

The institute will train thirty rural library professionals selected from two key groups: school library media coordinators based in cooperative education agencies or combined districts and regional public library systems or network specialists. To support the “training the trainers” approach of the model, the institute will target librarians who are in positions with responsibilities for training and providing technical assistance to rural public or school library personnel. Participants will be selected for their potential to serve as change agents within their library systems and communities and to provide leadership in promoting electronic networking literacy in rural areas. Because of their common mandates to provide technical assistance to member libraries, public library systems professionals and regional school media specialists are ideally positioned to carry out this role.
Using lectures, discussion sessions, and computer laboratory instruction, the training model will provide to participants an opportunity to acquire the following competencies:

- knowledge of, and skills in using, currently available internetworked services and resources, particularly through the Internet;
- an understanding of how these resources can benefit rural library personnel and patrons;
- an understanding of accessibility and cost issues associated with electronic internetworking in a rural setting; and
- skills in disseminating information about, and promoting networking literacy to, other rural library personnel and patrons.

In addition, by bringing together rural public and school library personnel, the model is designed to promote linkages and cooperation in order to make more effective use of limited resources in rural areas.

Participants will attend expert seminars on various aspects of internetworking, available services and resources, and access costs and availability. Prior to arriving for the institute, participants will be sent a packet of key papers and materials relating to electronic networking. This will allow participants to prepare for the training program and will permit a more effective interaction with speakers and other participants. Panel reaction sessions will follow lectures to promote dialogue between speakers and participants, and coordinated small-group discussion sessions will be held to promote additional exchange of information and ideas among participants. In addition, the expert papers presented at the model institute will be published to provide a foundation for future training sessions.

Computer laboratory sessions will require participants to tackle various information-seeking tasks using network services. Participants will first receive demonstrations of various information resources and access tools. Then they will be assigned information-retrieval tasks requiring navigation of the Internet to the appropriate sources to fill the information need. Participant success rate at resolving these information requests will be monitored by institute instructors to ensure that participants are absorbing basic knowledge and concepts from the speaker sessions. These hands-on sessions will be useful in allowing the participants to explore first-hand the capabilities of the different resources currently available. Commentary sessions will also follow the labs to allow participants to express their reactions to the networked services and to permit a second opportunity for questions that may arise from using the electronic services.

In order to help ensure that the training will carry over into practice, institute participants will be expected to develop a plan for promoting networking literacy among rural librarians in their service
areas. They must also agree to disseminate knowledge gained from the program to rural librarians and residents in their service areas by providing workshops, training sessions, and technical assistance. Participant success in implementing their new skills will be monitored by the institute directors with follow-up evaluations at six months and at one year after the institute session in May 1994.

CONCLUSIONS
The literature reviewed earlier provides an overview of issues and trends—including technological developments—in extending access for rural residents to information resources available through electronic networks. The availability of network access could provide rural areas with benefits that will stimulate economic growth, particularly for information-based industries and services, and could encourage them to compete more effectively with urban areas and in a global market. Examples of current network projects underway in rural areas illustrate both the variety and potential of electronic resources to address rural information needs and offer an array of potential approaches—at the state, regional, and local level—to ensuring that rural residents will have equitable access to information.

It is crucial that rural librarians learn about electronic network resources. The authors propose a model for educating and empowering rural librarians through a funded institute that will bring systems-level rural library professionals together with noted experts in networking and information technology to permit first-hand knowledge transfer. The model discussed earlier represents an innovative approach to training potential leaders and change agents to promote the use of electronic network resources by rural librarians and the communities they serve. Skilled use of these resources can enhance rural library services and enable rural libraries to address more fully the range of information needs of rural residents. Thus will rural librarians be better prepared to take advantage of the information technologies and resources of the twenty-first century on an equal footing with their urban counterparts.

REFERENCES


