

Library Networks: The Beacon Lights

In early 1950, Ralph R. Shaw, the father of library mechanization, persuaded Louis N. Ridenour, a science advisor to the President, to come to Urbana and give one of the Windsor Lecture Series in Librarianship at the University of Illinois. The program was entitled *Bibliography in an Age of Science*, and the resulting collection of papers became a classic in library literature. Ridenour was a dynamic, energetic man. He was barely into his thirties then, a technologist, not a librarian, intimately acquainted with the research and development activities of World War II and keenly perceptive about the future role of technology in the evolution of the nation's libraries.

One particular passage in the lecture caught my attention and stayed with me. Ridenour said:

What is needed is a re-evaluation of the whole fabric of the library, from the bottom to the top. In making this analysis, no prejudice should enter, nothing should be taken for granted.

To mention only one thing, a [research] library should no longer necessarily be regarded as a place where books are stored. Perhaps it is entirely something else. Possibly a library is a combination of study rooms, seminars, and a first-rate communication center of a specialized sort.¹

This was Ridenour's way of challenging librarians to rethink their basic goals. He was urging them, because of technological developments, to shuck their traditional role as passive keepers of books and aim at operating dynamic information mechanisms. His phrase "a . . . communication center of a . . . sort" implied reaching out to users with library and information service, sharing resources, switching information messages, and exchanging knowledge. He was talking about networks without mentioning the word, and he was dramatizing the need for an organizational and technological upgrading of libraries.

I had the good fortune to know Louis Ridenour personally, and he was more than just a visionary. He was a practical, hard-hitting engineer who, in 1951, was already aware of the potential information power of digital computers and high speed communications. Regrettably, Ridenour never saw his

technological predictions come to pass; he died unexpectedly a few short years after delivering his Urbana address.

Ridenour was right in saying we need to examine the whole fabric of the library from the bottom up. The "whole fabric" means looking into the way libraries are organized in this country, and viewing them not as separate pieces but as one total system. Changes in libraries will not come about by technology alone.

Library growth at the turn of the century was in the direction of decentralization. Public libraries spawned branches, academic libraries created departmental collections, and so forth. But in recent years, we have seen this trend reverse. During the last decade, libraries across the country began to develop new organizational relationships to facilitate the sharing of resources. These cooperative programs are variously referred to as regional library systems or library consortia, but they are the germs of networks that one day soon will link one library to another through some national system of interlibrary communication. Libraries are regrouping both by type of library and by geography—striving to serve wider jurisdictions.

The concept of serving wider jurisdictional units is attractive for a number of reasons. First, it has political appeal because sharing implies better utilization of existing resources. Second, sharing has professional appeal because it makes a larger base of knowledge available to serve local needs. And third, it has administrative appeal because sharing across jurisdictional boundaries implies greater economy and efficiency of operations. From the standpoint of computer application, for example, libraries with similar problems and responsibilities stand a better chance of automating as a group than as individual institutions.

Regrouping of libraries by type and by geography must inevitably lead to regional hierarchies and then to a national intertype library network. Unmistakable signs of this trend are already evident. Intrastate intertype networks are being planned or are in partial operation in Washington, Illinois, New York, Wisconsin, Maryland, and California; and regional networks such as SLICE in the Southwest, NELINET in the Northeast, and a new one forming among the states of the Southeast are examples of emerging networks that will cross state lines.

Interlibrary cooperation has been practiced by enlightened libraries for many years on the principle of the golden rule—it is every bit as important to give as to receive. Libraries have been organized essentially as separate entities and, for the most part, they cooperate with one another to the extent that it does not interfere with local obligations. Library networks, on the other hand, are something new and something else. They imply interdependent rather than independent organization; they imply intermembral rather than individual decision-making; and they imply having extrajurisdictional responsibilities rather than merely local ones.

Before considering how a national intertype library network would function as a total system, let us examine the consequences of segmented organization by looking at some of the major problems confronting libraries today:

We are in a period of "quiet crisis." Most libraries are crowded and understaffed, unable to keep pace with service demands, critically short of money and uncertain about their future goals, objectives, and sources of funding.

We are not up to standard. The level of library and information service is below ALA standards in most parts of the country. Certain segments of the population are better served than others, and some are not served at all. In thirteen states there are no state programs for providing aid for libraries.

We have a public relations problem. Few people fully realize the extent of the services we can and do provide. The public associates us with books. They do not perceive us as information specialists nor do they recognize the national significance of our information efforts.

We have reached the limits of local self-sufficiency. Most libraries are unable to afford the cost of acquiring all the books and other materials they feel they need for their constituents. As Paul Wasserman points out, "the ever mounting spiral of acquisition costs (has led to) the concomitant realization that comprehensive collections in any but the greatest libraries of the land are not realistic."²

We are unsure of federal funding. The traditional federal funding structure for libraries has collapsed. Washington is discontinuing categorical programs like LSCA in favor of revenue sharing allocations at the local level. Since libraries must compete with other local agencies for such funds, the amount they will receive from revenue sharing is still uncertain. However, it is clear that revenue sharing funds are unlikely to be allocated to projects involving extrajurisdictional services and facilities.

We are drifting toward incompatible systems. Those libraries that have formed consortia have no national standards to follow which will assure compatible systems development of the technical components of networks. Without technical standards for interstate and regional network development, we are in danger of developing a series of systems that may never connect.

We are not teaching enough librarians about the new technology. Most of our library education facilities are turning out professionals who are not technically equipped to deal with nonprint materials or with the new computer and communications technology. Carlos Cuadra says, "the hardest problem about networks... [and] the most serious... is the lack of training and preparation of people so that they can contribute to progress in the individual libraries which will be the nodes of networks."³

We are without a master plan. Libraries and information centers are not developing according to any national plan, and consequently, from a systems viewpoint, their growth is uneven and uncohesive.

If ever there was a point in library history when we needed a beacon light to guide us, now is the time. Will a national network be the goal that mobilizes fresh initiatives, cures ills, and stimulates library progress? Some librarians believe its achievement can breathe new life and spirit into present-day librarianship. Others feel that the benefits of an organizational and technological upgrading of librarianship are more conjectural than real. I ally with the first group, but no one yet has a clear enough picture of how a national network will function to know whether it will represent a true information breakthrough.

The main reasons why libraries must seek greater communication with sister institutions are very clear. First, they recognize the economic impracticality of massive duplicate collections proliferating in different geographic locations. The logical alternative is to consider interconnecting libraries so that the combined information utility is available to each of them. Second, libraries believe in the right of each citizen to the information he needs. A mobile, expanding, diverse population requires equal access to available knowledge no matter where people reside, or where the information resides, unless, of course, there are valid legal or proprietary restrictions. With the advent of new communications technology, the constraints of geography need no longer impose barriers to the free flow of information. And finally, libraries see a change in their own role as a social institution. Society requires improvement of the amount, kind, and quality of information services it receives, and libraries must recognize that they serve their clientele not just with print, but with information in all forms.

At this juncture, it may be helpful to consider a hypothetical national intertype library network so that we begin to develop some common understanding of its principal components and capabilities.

The focal point for any national network will of course be the Library of Congress. Although the Library of Congress is not officially designated as a national library, it does in fact perform many common processing services and provide many user services for the libraries of the country. Its latest national processing activity is MARC, which led to the establishment of a host of commercial and nonprofit processing centers, serving well over 1,000 satellite libraries.

The national libraries of other countries have also adopted the format. Today, LC exchanges tapes with the United Kingdom by 747 jet, but the time is near when this will happen by satellite, and the data bases of several countries

will be integrated into a single electronic network. R. M. Duchesne of the United Kingdom has already proposed an idea he calls SUPERMARC—that is, a superset of national MARC fields for truly international communication—as one way of proceeding toward an international network.⁴

The point is that LC is crucial to the organization of a national network because it has the capacity and the materials to perform many common services in both the areas of technical processing and reference, and because it can set bibliographic standards for the network. A national plan would define these new national services and authorize and support LC to perform them for the common good.

If LC is the apex of the national network hierarchy, the next level must certainly consist of other national libraries like NLM and NAL, plus a number of other institutions in the country, in both the public and private sectors, whose collections constitute unique national assets. It seems that a national network should protect and nourish these national resources whether they be research libraries, indexing and abstracting services, special libraries, or data bases, so that, in their respective specialized domains, they can offer user services to all libraries in the country that are affiliated with the national network. No systematic program currently exists to permanently safeguard or develop these resources so that their use can be extended nationally. A national network would have the leverage, for example, to assure standardization and the orderly development of machine-readable data bases in every important subject field represented by these collections, and thus speed the eventual integration of the information they contain.

Computer processing installations are at the third level of the hierarchy, and I perceive them to be of two types: type I dedicated to bibliographic production, and type II dedicated to service uses. Many computer centers will be needed to help the network transform the machine-readable bibliographic records produced by LC and other national libraries into by-products for local distribution—such as cards, book catalogs, special bibliographies, SDI services, etc. Each center would also be responsible for assisting local institutions with the conversion of unique holdings. For each library to own its own type I computer installation would be prohibitively expensive, so the cooperative, multi-institutional approach, successfully demonstrated by Kilgour at OCLC, seems to be a most economical and efficient solution.

Type II computer centers would be devoted to service uses; first as electronic holdings directories, later as automatic sources to on-line data bases in different fields. While we have no library example to point to today, the theory of use is similar to that of ARPANET. ARPA is the acronym for Advanced Research Projects Agency of the Department of Defense, which currently

operates an experimental, interdependent computer network among a set of far-flung university computer centers. ARPANET enables users on one campus to interrogate and manipulate data files that are under the control of a computer on another campus.

Commercial timesharing networks likewise have this capability, e.g., NLM's MEDLINE mentioned in Davis McCam's article in this volume. Closer to home is a system of interlibrary communication under investigation by the ARL. ARL is considering using a computer as an "electronic mailbox," which would store interlibrary loan request messages for particular institutions and transmit them automatically according to predetermined schedules or on demand. A national system of interlibrary communication for interlibrary loan would not only route messages more effectively, but it could also utilize companion computer programs to manage and administer the operation of the total system. Thus, a computer could handle billing, maintain the statistics, do accounting, keep track of copyright royalties, etc. In time, with heuristic programming and a directory of holdings, a computer might even learn to switch incoming requests automatically to those institutions in the network that have the highest response potential. This is only one example of an application which a type II center could perform for a family of libraries; I suspect there are many more.

A national plan would designate the number and the location of these type I and type II centers, and support them with research, software, technical guidance, and perhaps even funds for equipment. A good way to picture the computers at this third level of the national network is to think of them as a set of fast, large, timeshared information computers with many receiving sets in libraries. Just as large generators distribute electrical energy directly to homes, so timeshared computers in a national network will probably operate as information utilities. Computer usage usually implies economies of scale, and this suggests that type I and type II installations will be massed to serve the processing and service needs of many institutions on an intrastate, multistate, or regional basis.

A major resource library in each state will represent the next level of the national network hierarchy. These fifty libraries will be the backbone of the network because they will be responsible for establishing a compatible intrastate network, and for switching referrals in and out of the state. Each state would try to mirror the national network structure within its own borders, or band together with other states to achieve the same pattern regionally.

By affiliating with the national network, each state receives the products and services offered by all of the national libraries and by the type I and II computer centers.

A national plan would spell out each state's obligations to the network and specify the standards to be followed for guaranteeing technical and operating compatibility.

Telecommunications is the final major component in a hypothetical national network. A communications grid which ties all of our libraries and information centers together will do more for the democratization of information in the U.S. than anything else.

Until now, the U.S. mails, the telephone, and the teletype were the principal arteries of interlibrary communication. Federal postal regulations provide special, low mailing rates for books, states provide WATS line telephone facilities for libraries, and most of the major libraries in the country have teletype equipment for processing interlibrary loans.

It is obvious, however, that the future of interlibrary communications lies well beyond the use of the mails, the telephone, and the teletype. Communications are needed to bridge the physical distances between library and library, and between library and user. Communications are needed which can mix the variety of digital and analog signals that are destined to flow back and forth over tomorrow's library and information networks. And, communications are needed with channel capacities great enough to handle the message switching loads, and the enormous volume of data traffic implied by a national library network.

Although the advantages of telecommunications have been known to libraries for many years, operational use has been hindered by vexing problems of cost and systems planning. However, as libraries begin to make greater use of computers they are discovering the opportunities which an effective communications interface makes possible. Thus, with the continued application of computer technology to libraries, we can expect to see the increased use of advanced forms of telecommunications.

Communication requirements of a national network may be grouped into three divisions: *interlibrary communications*, *internal communications*, and *user communications*. These divisions form a communications hierarchy which requires a different combination of communication capability at each level, as well as communication compatibility between levels. *Interlibrary communication* enables one library to communicate with another. Only in this way can a library develop information exchanges with networks in adjacent states or regions, with the national libraries, or with type I and II computer centers. Telecommunications at this level must be broadband, bidirectional, and capable of accommodating and switching a mix of printed, digital, and video formats. *Internal communication* refers to the use of library communications by the professional staff in a library to speed up the local processing and retrieval of information. Telecommunications at this level can be narrowband for both data and voice. *User communication* concerns the use of communications for delivery of information or material by the library directly to the user's home or office. Because user needs for information vary considerably from person to person, the

communication requirements at this level will vary, too, and very likely require broadband facilities.

A national network must, therefore, incorporate the means for communicating among the nodes of the network. While it is true that AT&T, Western Union, Microwave Corporation of America, and other companies are in the process of upgrading their commercial lines for domestic use, it seems that a library network exception to the federal telecommunications regulations will be needed to guarantee low telecommunication rates. If the main purpose of a national network is to place the user in contact with his material, then rapid, inexpensive telecommunications among libraries are absolutely essential. Achievement of open telecommunications among libraries will be the greatest boon ever to national distribution of knowledge for education and progress.

Although I have described a hypothetical national network in terms of organization, a group of communication and computer specialists met in 1970 at Airlie House in Warrenton, Virginia, under the leadership of John Meany of Notre Dame to study the technical aspects. The group was part of a national conference on interlibrary communications and information networks sponsored jointly by the U.S. Office of Education and the ALA to explore the telecommunications domain for library and information purposes.⁵ Meany's working group formulated several basic technical assumptions about a national network. As far as I know, nothing more useful has emerged since they were formulated.

I would like, therefore, to repeat his technical assumptions about a hypothetical network because they complement the ones I have made about organization and, in a way, summarize the concept:

1. The network would be national, regional, and local in scope.
2. It will include all types of libraries, data, information analysis centers, instructional media centers, etc.
3. It will facilitate the exchange of bibliographic data, mediation of reference inquiries, and the distribution of library and audiovisual instructional materials.
4. It will have no geographic restraints.
5. It will make maximum use of computer and communications technology.
6. It will provide timely access and response rates consistent with the urgency of a user's need for information.
7. It will adopt a standard format for bibliographic interchange and establish other protocols and common practices.
8. It will supply incentives and evolve a financial structure to stimulate network use.
9. It will consist of a formal set of major nodes at the national and regional

- levels, and individual access points within a reasonable radius of local nodes.
10. It will incorporate switching stations and directories for request and response referrals.
 11. It will enable users connected to one node to have access to any other node.

Will we see the beginning of a national intertype library network in the decade ahead? I think we definitely will. There is a marked trend in the profession today to search for new operating responsibilities and a new role for the library. While uncertainty may be our constant companion, that search must go on. A national network is appealing because it represents a unifying idea that is in tune with the times and professionally meaningful. The alternative is to continue compartmented development and to redress old problems.

Despite the social engineering headaches that will surely accompany network building, we begin with the foreknowledge that the technology will work—it has already been proven in other fields—and that the organizational implications are well within the practical limits of management science.

Perhaps I read more into Ridenour's words than he intended, but I do not think so. Now is the time to re-examine the whole fabric of the library in the context of technological developments. We must move forward—not working against machines, but working with them; not growing apart, but growing together; not thinking in local terms, but thinking nationally. A national intertype library network is our beacon light—and it's just around the bend.

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