

● 전국도서관대회 기념강연

1) TECHNOLOGICAL INNOVATION AND FUTURE PROSPECTIVES OF LIBRARY INFORMATION

— The Electronic Library: The Impact of Technology on a Traditional Institution —

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Libraries have for centuries served as bastions of accumulated knowledge, at times quite literally so. As repositories of our collective documented wisdom, libraries have both invited and intimidated those who would come in search of knowledge. Libraries necessarily act as magnets for those seeking information and yet, access to such information has traditionally been mediated through the professional librarian who screens and evaluates each request. The very aura that surrounds stately buildings housing libraries sets people to speak in hushed tones and to show deference to those who have made the collection and care of books and other printed matters their life's calling. In this same sense, the reputation of libraries is based on the quality and scope of the collection. An oasis of grace and learning in the midst of mundane travails, the traditional institution of the library is being buffeted by winds of change that challenge its very structure and role in modern society.

I would like to address some of the changes confronting libraries today. First, we need to discuss the explosion of information produced by the technology of mass communication. To the extent that libraries expect to manage a share of this expanding information base, automation of library work becomes imperative. In this regard I would like to briefly assess the current state of affairs in computerized library services. Of particular interest is the phenomenal impact of electronic networks which have the capacity of eliminating the concept of a library as a physical entity. However, the most significant technological trend worth mentioning is that which shows a gradual migration of all information to electronic media; printed materials become secondary backup sources. In short, I want to discuss the predicament libraries face, awash as they are in a sea of information and hoping to command the surging waves through the application of technology.

At one level, libraries are experiencing the

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impact of a mass society, a society that produces and consumes information voraciously, but in doing so has come to redefine the meaning and value of information. In their traditional role, libraries collect and keep static information. Specifically, the process by which knowledge, as contained in a book or article, is created, adheres to universally honored standards that impose a time-consuming rigor on the authors. The hope that feeds this laborious process is the expectation that such knowledge will survive the test of time and remain meaningful to audiences long after it was first created. Our formal education is largely based on the assimilation of such knowledge gained through the reading of materials in our school and university libraries. The traditional library thus, stores and dispenses, upon request, knowledge which we may call "permanent" information in contrast to "temporary" information associated with the conduct of our daily lives.

The pace and structure of modern society, amplified by communications technology, has dramatically escalated the value of temporary information requiring its instantaneous and widespread dissemination. Let us use examples to clarify this concept of temporary information. The marketplace, taken in a literal and universal sense, always generates a constant flow of information as goods and services are exchanged. In simple terms, I need beans, you have beans, we agree on a price, and the sale is consummated. This exchange of information is specific, repetitive, and time bound—once I go home and cook the beans, it no longer matters how I came by them. In a pre-modern, traditional society, the

market opens, individuals exchange the necessary temporary information and the market closes. By contrast, the market in a modern society maximizes the value of this information by feeding it back into the marketplace, thereby influencing behaviors, prices, supply and demand. Temporary information is thus recirculated at varying speeds depending on the medium used to disseminate it. As it recirculates, temporary information engenders more temporary information. The frenzied ups and downs of international stock exchanges bears witness to the fact that temporary information expands by feeding on itself.

Lest we think that only economic behavior illustrates the enormous impact of temporary information, we should briefly recall the recent furor over "cold fusion". Although ostensibly operating in the scholarly realm where knowledge of permanent value is created, experiments in "cold fusion" were detailed and widely disseminated, almost exclusively through mass media, for the entire world to share. Otherwise careful scientists threw caution to the wind and joined a chorus of extravagant claims coming from a variety of research laboratories. Scientific information thus, has the same capacity to engender additional temporary information. Also, like stock market information, scientific information, as generated in the "cold fusion" debate, can be of value for a very limited period of time after which it proves more embarrassing than helpful.

As a final example of temporary information, let me suggest to you that we have learned to reduce the complexity of current world affairs, the very substance of our history as

it might be written by scholars years hence, to ephemeral bits of temporary information to be consumed, without much effort, on a daily basis. In this context, and following no apparent logic other than that of temporary information feeding on itself, communities are made sympathetic or moved to action in erratic patterns, sometimes heroic, sometimes bestial.

To close on this issue, temporary information, originally useful in the execution of daily routines has, in the modern age, the potential of usurping the role of permanent knowledge as libraries have treasured it. We are generating vast amounts of temporary information and are discovering that, under the free enterprise system, it can successfully compete with more traditional, permanent information. Specifically, libraries find themselves surrounded by commercial information services trading in temporary information. To make matters more complex, temporary information is basically process information, it takes on the form of a continuous read out, not unlike that shown in the electronic displays of stock markets, and thus, is impervious to the librarian's interest in indexing and cataloging discrete and complete items of permanent information. Indeed, temporary information in our modern, mass society is produced by consumers for consumers eliminating the mediation of the librarian. Referring back to our examples, market information is available electronically by the minute throughout the day; scientific data is transmitted over the network to interested researchers any-where, and world affairs are condensed into headlines available to television services 24 hours a day, seven days a week. Con-

sumers surround themselves with the technology required to plug into this constant stream of information.

Having drawn a distinction between traditional and modern society with regard to the nature and value of information, let me apply this contrast to the concept of time. We range the value of information on a time continuum—some information is very much dated and thus “spoils” quickly whereas other types of information survive the test of time without much amendment. The question then, is what are the meaningful units of time and I will submit to you that modern man has, in the proverbial as well as literal sense, no time. By contrast, pre-modern man had a plenitude of time to the point of being careless about measuring it. The most concise way of drawing the difference is to suggest that we comfortably speak of time as money; in a pre-modern society this is a preposterous statement that ignores the very rhythm of social life. In a traditional society tomorrow is soon enough; for us it is already too late. It is this valuation of time that further emphasizes the ascendancy of temporary information. Modern society operates through the instantaneous processing of temporary information—it must be accessible this instant or be of no value in the next.

While I don't think that the library is doomed to disappear, washed away in a stream of temporary information, I do think that it must reposition itself and focus on its strengths while at the same time adopting the perspective of an information service organization. The library must recognize that its contribution to society is becoming less obvious; librarians must learn the meaning of cus-

tomers who have the option of choosing information services; librarians must define levels of service in the context of costs associated with the delivery of differentiated services. In short, librarians must reach out and market themselves to customers and prospective customers; librarians must devise programs by which they impact not only the dissemination of information, but the decisions made using that information.

Librarians are being challenged to reposition themselves, not as better managers of larger or more specialized collections; rather, they are being driven, by the competing information services, to facilitate access to permanent information regardless of its location and ownership. What makes temporary information so attractive is that it is accessible, quickly, easily and at any time. Librarians can emulate their competitors by the use of library automation and the networking of library resources on a national and international scale.

Let us talk about the automation of the library through the introduction of computer-based management and retrieval systems. The installation of systems has, over the past few years, proceeded at a very significant rate. Although the American market for systems is maturing and looking for the next generation of technology, the international market shows tremendous opportunities for growth. Certainly, the constantly declining cost of hardware ought to make automated library systems more affordable, creating an opportunity for many smaller libraries to introduce much needed technology. However, vendors of automated library systems have found it very difficult to meet this demand for

smaller systems at an affordable price. On average, smaller libraries looking to provide circulation control and a full online public access catalog in a 1:15 terminal environment cannot do so for less than \$US 65,000. The reason for disproportionately high systems costs, when compared to the falling hardware prices, lies in the labor intensive installation, training and ongoing support effort which is relatively insensitive to the size of the library. Where such costs deter the library from acquiring an integrated system, micro-computer based systems offer an alternative approach. Typically, such systems have more limited functionality, cannot be readily expanded to meet growth needs and are unlikely to support a MARC database. Yet, if library standards such as MARC are not essential, the constant price/performance improvement at the microcomputer level makes this an almost irresistible option for the small library. As a consequence, vendors are forming distinct camps—larger systems vendors offering integrated, well supported, turnkey installations find themselves challenged by the micro-computer based vendors who fight tradition incorporated into cataloging standards. The likely outcome of this confrontation is declining costs of large systems and richer functionality for micro-computers based systems; the winner is the library.

It should be noted that the offerings of library information systems vendors rely on technology that has been available for the past ten years. By and large, integrated library systems, meaning systems operating with an online public catalog, with circulation control, and offering acquisitions and cataloging support in conjunction with a single database, are

built relying on centralized hardware using proprietary operating and networking software. In other words, integrated library systems, as they are currently available, are not ideal partners in the resource sharing network we identified earlier as essential to the modern librarian. In the same context, these present systems are not well suited to interface with other information sources outside the library world and neither are they capable of interacting with publishers and agencies that act as suppliers to the library. In short, the state of the art in library automation has not typically reached beyond the physical boundaries of a library, and where it has stretched its inherent limitations, it has done so by expanding the perimeter of a very centralized support structure.

The preceding assessment of library automation in its present state shows, through the limitations we noted, what we need to see from vendors of such systems in the future. Specifically, we need automated library systems with the following characteristics;

- They need to be based, to the extent possible, on standard hardware and operating software; while I am not advocating a particular hardware vendor or operating system I do think that the goal for systems developers ought to be one of making their software portable to a variety of technical hardware platforms and thus achieve a "standard" effect.
- They need to be built as linked applications modules which can either be collocated in a single, centralized, hardware environment as distributed to remote locations without thereby losing the functionality of an integrated system.
- They need to be designed to take advantage of an emerging computer technology which allows the segmentation of data and processes to a variety of cooperating work nodes operating in a client-server relationship. In this architecture, powerful microcomputers act as peers with computers of greater capacity, together achieving an end result that neither one could complete as effectively.
- They need to support standard query languages and provide software facilities through which reports and statistics are readily generated by library staff and client alike.
- They need to adopt and support emerging standard communications protocols to insure the interconnectivity of library systems, both at the physical and logical level. This includes support for mail and document exchange.
- They need to incorporate standards defining library records and transactions including ordering, invoicing, and claiming.
- They need to present information to the client or library staff in a way that is both seductive and easy to understand. This is to say the design of the screens and help facilities within the system need to be such, as to appeal to the intuitive sense of the users of library systems. Clients will not only be drawn to use the systems because they interact in obvious, predictable ways but do so consistently from module to module.
- They need to do all the above and cost very little!

It is clear from the foregoing that automated library systems will allow librarians to become successful coordinators of access

to a variety of information sources. Libraries, however, cannot remain islands sufficient unto themselves and their community of interest. Instead, to be credible providers of information, libraries must be networked with each other and with competing information services.

Although frequently invoked, networking technology is generally not well understood by librarians. Networks have existed for some time and have, the ubiquitous telephone aside, typically developed around very specific needs. Thus, businesses with multiple locations find it necessary to link their operations in order to manage critical information flows related to inventory, sales, and production. Similarly, research scientists find it necessary to exchange experimental data quickly and do so through networks linking laboratories and instrumentation together as if it were one location. Networks can thus be private electronic links or public utilities designed to move information between connecting parties. The technology supporting the need to be networked is evolving from the requirement of a physical circuit between sender and receiver to the present implementation, where parties to an exchange are known by their electronic address; the route to the address is determined dynamically as the message progresses through the multiple nodes that connect pieces of a network.

From the above description you can see why a highway system is frequently invoked as the metaphor to best explain a network. A more appropriate analogy may be the human nervous system since networking takes on biological characteristics; it is an information processing system that relies on feedback

loops, it adjusts for system failures and learns from previous experience.

Whatever analogy works, successful networking requires certain rules or standards by which we can guarantee the arrival of a message at the intended destination. While such standards do exist, they have been vendor specific and are only slowly being transformed into international communications protocols. As such, these protocols insure the integrity of the message being passed, if necessary retransmitting it until it has reached its destination. Protocols under development by inter-national standard setting bodies go one step further and add to the integrity of the delivery whatever translation is necessary at the receiving end. It should be pointed out that networking stops at the point of providing a syntactically correct translation—the user must still make sense of the message and that is the role of the applications programs we refer to as information system software. By way of an example, libraries can be networked and exchange bibliographic information but it is the automated library software and its cataloging module that make sense of the data received.

It is clear that networks are necessary highways to the world of permanent and temporary information beyond our border. Librarians must learn to navigate these roads with ease and know what is available and of interest at each location. Through such knowledge, librarians become consultants to decision makers, helping to frame the important questions and providing access to the resources that help answer those questions. We can cite several examples to emphasize this point. In an educational setting, librarians

and instructors can jointly plan and design curriculum that takes advantage of specialized resources not found at a single location. In the context of community development, librarians and local leaders can collaborate to research opportunities for economic growth based on data available through a network; expertise needed to design specific social programs can be located by searching multiple databases for references to individuals capable of guiding such efforts. In all these activities, librarians provide valuable service; the problem is that librarians typically don't behave this way and thus miss the opportunity to stem the erosion worked by the constant flow of temporary information. Equally sad is the fact that those unable to constructively collaborate with librarians will be less effective and more given to temporary, acceptable, but not optimal, implementations of their plans.

From a different perspective, networks can greatly accelerate the creation of permanent information thereby offsetting one of the major advantages of temporary information, that is its instantaneous availability. As alluded to earlier, the scholarly process is rigorous and time consuming. Yet, the painstaking gathering of information and, later, the elaborate politics of peer reviews prior to publication can be made more efficient through the use of a network. Obviously research can be expedited by electronic searches and retrieval of pertinent data; more interestingly, work in progress, if accessible through the network could be sped through its period of gestation. When completed, scholarly work, permanent information in our terms, could be left on the network for browsing and commentary prior

to its submission for a formal review by a panel of peers. Authors could thus have a far better chance to improve their work and most likely proceed through the review process with fewer iterations. Properly orchestrated, such a system could cut the time it takes an author to publish an article at least in half.

It needs to be stressed, however, that the end product is an electronic document stored on a computer and available to all those able to access that computer, directly or via a network. The obvious question arises: what is the role of the librarian in an environment where permanent information remains in electronic form. While I would like to say that the form in which information is delivered is of no consequence, I believe the contrary to be true. The elimination of the physical evidence of a collection, replaced, as it would be, by an abstraction, requires a new orientation towards the profession and, in fact, new training or re-training in information sciences rather than librarianship. In effect, librarians would emerge as information center consultants, adept at the manipulation of software and skilled in the design and construction of electronic databases. A preamble of this development is occasionally witnessed at American universities where the operation of the library is subsumed under computer services and no longer constrained within the academic hierarchy.

Electronic publishing, that is a process by which we give permanent information some of the characteristics of temporary information is a troublesome prospect. I am not referring here to the conversion of scholarly efforts, books and articles, to, for example, compact disk, read only memory (CD-ROM)

format. Rather, I mean to use the term electronic publishing to convey a situation in which the scholar creates only in an electronic form, and disseminates the work through a network. In simple terms, the electronic book is created using software that replaces the printing press. The electronic book contains pages of text, graphics, and images; it is indexed and carries citations and bibliographic references. Indeed, it is in every way at least as informative as its traditional counterpart and can, potentially, be more so by providing dynamic links to video or the raw research data that is condensed into a single observation in the text. This wealth of information, some even interactive with the reader, is available to any one able to, through a computer, access the network and retrieve the electronic publication. In short, electronic publishing takes permanent information and makes it available as if it were temporary information; it can be consumed in fragments or in highlighted format and made devoid of context through an abbreviated search.

The easy consumption of permanent information offered by electronic publishers can thus be a boon for those in need to absorb vast amounts of knowledge quickly. At the same time it may have aesthetic and ethical implications that are less positive. The viewing of an article on a computer screen may, from an emotional perspective, be less satisfying than the physical holding of the text in the com-

forts of an armchair. The risk of omitting critical qualifications in an otherwise authoritative search for specific references, allows the electronic book to become a moral hazard. We have, of course, distorted the contents of books before-now we can do it systematically without even being aware of it. The syntax of a search through the electronic text controls our cognition.

The socio-economic impact of moving in the direction of electronic publication of permanent information needs to be carefully managed lest it accentuate the all too prevalent pattern of the dispossessed unable to emerge from their culture of poverty. Access to a library is, I suspect, free everywhere in the world. Access to an electronic book requires a computer, network access, and communications capabilities. In its simplest configuration, the cost of a telephone connection, a modem, and a micro-computer creates an extraordinary barrier to those with a desire for learning.

It is the library and the librarians who must manage access to information for all. It is the library and the librarians who can work to prevent the privatization of information. But the library and the librarians must rethink the role they have traditionally held. They must adopt the tools technology offers in order to preserve their role as disseminators and guardians of permanent information, of knowledge.