The Library as Hub of the Network Universe

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INTRODUCTION

In submitting a proposed paper for this conference I made four definitive statements:

1. The library is positioned at the hub or cross-over point of three network levels: the library network, the University LAN and WANs/VANs.

2. There is a perfect marriage between the library and networks: the satisfaction of mutual need. Academic networks need the services the libraries can deliver as much as the library needs network services.

3. The metamorphoses of the traditional 'computer services' function to the management of networks and networks services will justify the amalgamation of academic library and computer services as the network becomes the source of information and documents. The "cataloguing" of network services will become of great importance as the range and quantity of materials and services multiplies.

4. The combined resources of the library network, the university LAN and WANs/VANs can be presented as a virtual multi-format multimedia library image to the user.

I now feel that the first of these statements, the library as "hub" of the network universe, would better be expressed as a question.

From the perspective of those who work in libraries the perception of the library as hub or center is an understandable but dangerous one. To date, networks and the services they support have largely been used by libraries in support of their operations: resource sharing (bibliographical records from utilities) and reference/information services (online databases). In this context, the library certainly is a hub, a point to which all communications roads return.

The danger, arises from the fact that networks will increasingly become major sources of library materials, of documents of all types, whose target will be the individual user as much as the library. In this emerging, multi-dimensional universe, any concept of centrality is purely subjective, based on the perception of the individual interacting with the network at any one time. John Sack's classic distinction between the Ptolemaic and Copernican perceptions of respectively the supplier and the user of information services is particularly relevant here.[1]

The Ptolemaic view sees the library or other information service at the center of the universe, a body of such power and consequence that those who require its services cluster around it and act according to its laws. However, the reality is that individuals will follow their own guidelines in seeking information, very often following the line of least resistance rather than what we would see as the "correct" IR methodology.

The development of networks as sources of documents rather than guides to their location has revolutionary implications for libraries in terms of the
function and design of the services they provide and, by extension, for librarians in terms of orientation, role and skills, education and training.

In this paper I will argue that the library has the capacity to become the subjective or perceived hub on an information and documentation rich network environment, if some major challenges can be met.

**EVOLUTION**

The use of networked services by libraries has, until recently, been evolutionary in the sense that they were used to do old things in new ways: bibliographic research, record acquisition, library administration. However, from the mid-1970's there have been other types of networks evolving which were originally distinct but are now merging to form one information environment.

**The Library Network**

The earliest form of library network was that of a set of terminals wired to a central mainframe, typically located in a computer center. The primary objective of this was to support the operational requirements of libraries in terms of acquisitions and circulation control. A later development would have been to provide better access to holdings through some form of OPAC. Hardly a network at all in the current understanding of the term.

**Wide Area/Value-Added Networks**

Libraries were very early users of wide area networks for value added services in terms of resource sharing and information retrieval. The first emergence of wide area networking, as we now understand it, was in the area of shared cataloguing: OCLC and RLIN in the US, the BLCMP and the British Library in the UK. Some regional consortia emerged in support of resource sharing, particularly in the US. In the UK and Ireland the excellent interlibrary loan service of the British Library defused any large-scale inclination to materials resource sharing.

Again from the mid-1970's a parallel and rapidly developed network application was in the area of on-line searching of commercial bibliographic databases. Today there are almost 5,000 such databases available. A more recent development is the availability of full-text electronic documents, typically major newspapers and popular journals. There are approximately 2,500 titles currently available for searching and downloading.

**Academic/Research Networks**

Another parallel development throughout the late 1970's and 1980's, this time outside libraries, was the development of academic and research networks such as ARPANET and BITNET/EARN. To date, these have largely been used as mail and file transfer systems between academic and research communities, originally for the computer specialist community but now used by almost all disciplines. The coming of academic networks gave a tremendous boost to the ease and speed with which individuals could communicate with colleagues throughout most of the world. Comparatively primitive forms of electronic publishing emerged on these networks in the form of computer conferencing and bulletin boards, with, however, little or no control on the content or organization of the material. Some of these facilities now contain vast quantities of very "gray" literature.

The research networks are currently in the process of evolving into what has been described as an information infrastructure. It is this development which is of revolutionary importance to all aspects of academic librarianship and I will return to it in detail.
Local Area/Campus Networks

A fourth strand in the network development has been that of local area networks, originally within units of parent organizations, and ultimately throughout the parent organization. The original raison d'être of LANS was the sharing of resources, particularly physical ones such as large disks and expensive printers. As the capacity of the technology developed, and as they became more prevalent throughout organizations, LANS served as support facilities for e-mail, centralized software resources, specialized computers (servers) and, increasingly, information resources.

The OPAC has migrated from the library onto the LAN and is frequently voted one of its most useful facilities. Some LANS now support access to secondary information resources previously only available on remote commercial online services, from tape files mounted on local mainframes or, increasingly, from networked CD-ROMs. Again, full text electronic documents are becoming available on local networks. In the case of the University of Limerick these would be computer journals on the Computer Library CD-ROM and university policy documents on the text database of the office system.

The interlinking of university campus networks gives rise to the next phase of evolutionary development, which however has revolutionary implications for libraries.

REVOLUTION

The extension of the services and resources associated with campus LANS onto a universal scale is the beginning of a development having revolutionary implications for libraries and librarians. We are beginning to see the emergence of a universal information infrastructure.

An Information Infrastructure

By this is meant a network structure giving access to a vast quantity and variety of information resources accommodated on a variety of computers in a wide variety of organizations, across all geographic areas, directly and easily accessible by the end user from a desktop workstation. Data/information will be capable of downloading for insertion into a personal electronic library. The network would automatically cater for administrative concerns such as cost accounting and copyright.

The intellectual organization of this huge volume of material is a challenge of major proportion. Remember, the information objects will not be just the simple packages with which we are so familiar.

"In some instances, research results are not published by conventional, printed means because the results can't be printed and still be meaningful ... for example, when the results are three dimensional, graphic, moving simulations or animations, or when the outputs are dynamic visual representations of variable processes or theoretical constructs".[2]

The essential skill of the librarian is in the intellectual organization of knowledge for subsequent retrieval. DC 20 and AACR 2 will hardly be adequate to the demands of the universal information infrastructure. We will have to become equally knowledgeable about knowledge representation techniques such as concept indexing, frames and semantic nets, and developments in natural language processing. The Spring 1990 issue of Library Trends on Intellectual Access to Graphic Information gives a fascinating overview of the problems associated with devising new modes of access to images.[3] I particularly liked the article by Harold Thiele in which he proposes the use of the
techniques of heraldry and blazon to form a generalized algorithm to describe trademarks, logos and other forms of graphic design.[4] The introduction by Mark Rorvig contains a very important statement:

"(T)his Library Trends issue, taken as a whole, describes the great revolutionary transfer of ideas once confined to documents, to the universe of non-linguistic knowledge; a great stripping away of the "biblio" portion of bibliography from the graphic component. Moreover, this truly is a revolution. Usually when an author uses the word revolution it is a misnomer for the real word evolution ... But intellectual access to graphic records, as opposed to textual records, has returned bibliography to the same complex of concerns it had twenty-five years ago ... The IBM 360 ... replaced more than clerical workers ... it replaced whole sets of intellectual problems as well ... But this time we will not be rescued by the machine of the gods. A photograph has no way to tell us about itself as a document is so able to inform us."

We do not have the professional field of information organization for retrieval to ourselves anymore. Some of the most interesting recent material I have seen on the topic of knowledge representation for retrieval has been in the computer literature. A typical example would be a book on intelligent databases co-authored by Kamran Parsaye.[5] This work discusses the theory and process of information retrieval in some detail, including the role and modus operandi of the library information desk intermediary. The qualifications of the four authors are exclusively in the area of computer science and mathematics. None appear to have any library or information science qualification or experience. The word library or librarian does not appear in the index.

The INTERNET

The major physical element of this emerging information infrastructure is the Internet, a global network having a tripartite structure of high speed backbones (eg NSFnet), large mid-level networks and local institutional networks, based on the TCP/IP standard.

As of end 1990 NSFnet segment alone connected 2,063 networks, 500 of which were located outside the US in 35 countries. Traffic is growing on NSFnet at a phenomenal rate. In the year to March 1990, there was a five-fold increase in traffic; over two years a forty-fold increase. October 1989 traffic represented a 550% increase over that of October 1988. Growth comes from more connected networks, more users on these networks and increased use as individuals discover the benefits of networking.[6] The nearest emerging European equivalent would be IXI, based on OSI X standards.

NREN

In the US the National Research and Education Network (NREN) is a major extension of the Internet and aims to link supercomputers, libraries, national databases, and academic and industrial researchers into a unified information infrastructure. The library element will be composed of a number of centers containing information resources of all types and in various formats, linked by some form of common directory structure: a "virtual" library.

CNI

The issues arising from the creation of a universal information infrastructure are indicated by the concerns and work programme of The Coalition for Networked Information. This is a joint venture of EDUCOM (a non-profit consortium of higher education institutions, which facilitates the introduction, use, access to and management of information resources in teaching, learning, scholarship, and research), CAUSE (the association of
higher education administrative computer centers) and the Association of Research Libraries and is a strategic move to generate awareness and to focus and direct effort towards the construction of the information infrastructure. As of June 1991, there were 170 members, which has far exceeded initial expectations, even with a $5,000 membership fee.

The development of the information infrastructure requires a major collaborative effort by those with the knowledge, skills, and resources to address the policy questions and the technical, operational and economic challenges which are emerging. CNI aims to address these challenges, as well as related public policy issues such as intellectual property rights, standards, licensing, servicing arrangements, charging algorithms and cost recovery fees, and economic models. There is important current work on the development of a model for journal pricing.

The work of the Coalition is carried out through a Task Force of organizations and institutions. Seven Working Groups have been set up to further the aims of the Coalition. These are:

- Non-commercial Scholarly Publishing
- Commercial publishing
- Architectures and standards
- Legislation, codes, policies, and practices
- Directories and resource information services
- Teaching and learning
- Management and professional end user education.

The people involved include librarians, academic computing specialists and commercial publishers. It seems to be accepted that the development of the "information infrastructure" will be a collaborative effort between libraries and computing and information technology centers. The latter will establish connectivity and manage the network while the former perform for materials in electronic formats the tasks of collection, acquisition and control that they have always provided for printed materials.

Some librarians are very active in shaping a new role of libraries in the delivery of networked services. For others, it is something new and interesting, irrelevant or even depressing.

The Digital Library System

The concept of the virtual library has been most highly developed by Kahn and Cerf of the Corporation for National Research Initiatives.[7] They assume that the user will have a powerful workstation, a "client" that will communicate with a set of specialist computers, "servers", over a high-speed network. It also is assumed that, on this workstation, the user will have a "personal library system," and an integrated set of tools for identifying, locating, accessing, transferring, analyzing, manipulating, comparing and revising text, images and data.

Kahn and Cerf are best known for their concept of active intelligent software agents which they call "knowledge robots," or "knowbots". A knowbot is a program combining expert system and object-oriented characteristics, which would be adaptive and relieve the end-user of having to know about the characteristics of the Digital Library System.

PERSPECTIVES

The development of information and document rich alternatives to libraries, accessible from the desktop, will revolutionize how scholars and researchers find, process and communicate knowledge and information. If these facilities
are perceived to be easier to use and more productive than traditional library systems, then researchers will use libraries even less than they do now. Paradoxically, this presents an opportunity for librarians, if we can convince ourselves to concentrate on ends rather than means to ends. The packages (books, journals, microforms) with which we deal are only means to the end of recording, retaining and transmitting knowledge. If these means change we have no option but to change with them, even if the nature of that change is revolutionary.

Human Clients

Even in our contemporary (comparatively small and well organized) information world, it is easy to overestimate the sophistication of the information seeking activity of researchers. Research shows that for many faculty the library is a minor source of information. More frequent sources are colleagues, personal documents and collections of colleagues, bibliographies and footnotes in journals and books. How well do we really know those who we immediately serve, their information needs, and how they meet those needs? People will use sources that are productive, convenient and timely. The majority will adopt the line of least resistance. They will use the library if it fits within that definition.

Researchers faced with the riches of the information infrastructure or the Digital Library will be befuddled. The networks of the future will contain vast stores of data and information resources, ranging from thousands of individuals contractible by e-mail to library catalogues to online reference and text databases, from image (still and moving) banks to trillions of bytes of scientific data on astronomy, meteorology, biomedicine, etc.

Our users need individual, coherent support across the technology, the information resources and the tools they use. Can we ensure that it will be to us that they will turn for productive guidance? Have we the credibility and respect of the research community? If it is, then we will earn their eternal gratitude and the library (as represented by its librarians) will be truly the hub of the network universe. But, there are others claiming our turf!

Human Servers

It is imperative that the design and delivery of future information systems be modelled on the real needs of researchers and operate on the basis of how people really work, not, as so often happens now, on how libraries are organized by librarians for crypto librarians and network services by computer people for crypto computer specialists.

The Economist recently published a special feature on some of the world's great libraries, quoting Francis Bacon speaking to Thomas Bodley in describing them as "arks to save learning from deluge". The Economist states that; "Far from being dusty storehouses, the world's great libraries are both the pilots, and the lifeboats, of the new information age. Do they know it, and can they cope?"

Do we know it? How will we cope when we rely on materials that we do not own, and certainly have not catalogued? How will we interact with patrons that do not belong to our community and who we may never see? Will we learn to work in close collaboration with fellow information professionals (information technologists, publishers, booksellers) some of whom we now perceive as adversaries? Ultimately, we are all in the same business.
A "NEW" PROFESSION?

I have heard it said that it will be necessary to re-invent the knowledge occupations in the light of a technology-rich, knowledge-rich future and that if we as librarians do not respond to the challenges and potential of the universal information infrastructure, there is a danger that we will become increasingly marginalized. Even if we decide to rise to the challenge, we will be following a difficult path. The complexity involved in the creation and delivery of the quantity and variety of information sources contained in the Digital Library will require the breaking down of professional disciplinary barriers between librarians, information scientists, organizational information system designers, personal information system designers, database designers, hyperdocument designers, publishers, booksellers.

A current development illustrating the future interaction required between previously discrete disciplines is the McGraw-Hill/USC Curriculum Technology Partnership which is an alliance between computing, library and the bookstore.

Under this agreement the two partners will focus on three activities: USC and McGraw-Hill editors will evaluate and develop course materials using McGraw-Hill's Custom Publishing System database; the USC campus bookstore opened the country's first on-site Custom Publishing Center in January 1991; ways to link the Custom Publishing System database with USC's library facilities and research programs will be explored.

I view this breaking of barriers between professions with a mixture of excitement and anxiety, the latter largely engendered by an article by Marion Paris on the rate of closure of US library schools.[10] Fifteen library schools closed in the US between 1978 and 1988. Why? Overtly the reason was retrenchment in time of scarce resource. Paris states that the real reason in many cases was the inability of the school to prove its academic validity:

"They themselves (library educators) could not satisfactorily demonstrate why library education is necessary. If library educators could not testify to a need for their programs, then who could?"

The breaking down of barriers is already impacting on the curriculum.

"Where turf battles influenced decisions to close, the library schools were seen as encroaching upon the pedagogical territory of other schools and departments. In particular, business, computer science, and management information systems faculty had become alarmed that MLS curricula threatened their own course offerings".

This malaise is not confined to the US. Earlier this year the London Observer [11] reported a 10% increase in new entrants to UK first degree courses.

"The least popular courses are in librarianship and information science. Materials technology, librarianship and minerals technology have much lower entrance requirements."

In the course of a blistering but very entertaining attack on the concept of information literacy Lawrence McCrank stated:

"Librarians have never clearly staked out a special domain of knowledge for themselves, nor crystallized their professional practice and intellectual endeavours into a true discipline. That means that their continuing education must now go beyond the professionalization of perpetual conferencing among themselves."[12]
If we are not to lose the high ground of information science to other disciplines it is imperative that we know precisely where we are professionally, and even more importantly, where we are going.

CONCLUSION

Can the library be the subjective hub of the information infrastructure/Digital Library/Virtual Library? Yes, if:

- We develop and support user-centered rather than library-centered services.
- We extend our expertise in the intellectual organization of knowledge resources.
- We can shift from the current speculative collection development model (just in case) to a rapid response on demand model (just in time).
- We are prepared to be judged on the basis of outputs measured in terms of user need satisfaction rather than on inputs such as acquisitions or journal subscriptions.
- We can remove the symbolic walls from the library and the real barriers in our minds, we have the opportunity to forge a new relationship with the community of scholars and our fellow information workers which will surpass anything we have enjoyed to date. Universal networked information resources give us an unparalleled opportunity to achieve this.

POSTSCRIPT

When I had just finished preparing this paper I read the following by an old colleague, Michael Gorman:

"An existential terror has seized some librarians, causing them to doubt the future of librarianship and even of libraries themselves. This angst leads them to seek refuge in the vacuities of "information science" and even to declare themselves no longer librarians but "information professionals." This form of professional suicide will, naturally, alienate those ex-librarians from scholars, because the latter live in the world of knowledge and understanding. That world is fuelled, in small part, by the flow of "information," but no scholar can live on information alone and will regard its purveyor as, at best, a useful supplier of a relatively unimportant service."[13]

Michael's dark night of the soul reminds me of T. S. Eliot's definition of Hell as a place where nothing is connected to nothing. I prefer to live in hope that the opposite is true.
REFERENCES


