Information Technology & Libraries
A Future for Academic Libraries

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CROOM HELM LIBRARIES AND INFORMATION
TECHNOLOGY SERIES

We are at the beginning of a communications
revolution.

Developments in computers, electronic equipment and
telecommunications are bringing information
technology to all aspects of work and leisure.

These developments are focusing our attention on the
storage, retrieval and use of information, the way
we communicate with others, with ourselves and with
the world.

This series explores developments in information
technology and the way that libraries can use I.T.
to improve and extend our access to knowledge.

LIBRARIES AND INFORMATION TECHNOLOGY; A FUTURE FOR
ACADEMIC LIBRARIES is written by Roy Adams,
Sub-Librarian, Technical Services at Leicester
Polytechnic. He is specifically concerned with the
application of I.T. to library operations.

This book, one of the first in a new series, sets
libraries and their use of information technology in
a historical context, then looks forward to the
future of the library and the attendant effects on
users, structures, management and staff. The chapter
on the higher education environment will be of
particular interest to those concerned with the
future of formal education systems.

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P.J. Hills
Cambridge

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Preface

As each new technological development is applied it has an impact on libraries and information units, whether it is of direct application such as the development of more rapid communications brought about by high speed telecommunication networks or less direct effects such as independent travel consequent on cheap motoring. Each affects the way the library system acts or the way in which the users react.

Libraries, being small elements in the chain of information flow are usually more affected than effecting in relation to these changes. Such changes brought about in higher education in the 1960's by the space race and by direct student action in the colleges and universities of the United States followed by the oil crises of the 1970's with a world economic recession have had more impact on the way services are financed and presented on both sides of the Atlantic than any influence by the library profession.

The position could now be changing. The development of information technology or telematiques has already started to have a major impact on the way we conduct our lives, on education, employment and leisure. Major social, political and economic issues are being more widely discussed as are areas of central interest to librarians for decades such as, intellectual ownership, the security of personal data, freedom of information and of educational opportunity. Linked issues include the effects of cross border information flow on the less developed nations and the social and economic roles of information provision.

Librarians could have an opportunity to contribute to these issues, to help foster informed debate and to contribute expertise to major social and economic concerns as never before. The transmission, use and abuse of information is, librarians have been telling society, of singular importance to the well being of us all. The impact of information technology on Western society is just beginning to be felt; at last 'they' are listening.

Unfortunately libraries are not fully prepared. The rise of I.T., predicted in one form or another, has crept up on libraries hidden in the familiar guise of catalogues and circulation systems. The development of forms of information delivery system which do not appear to need libraries are not new, but they are growing and appear to be received with enthusiasm. Some view the future of the library within the information chain as simply a more efficient version of the existing structure, with I.T. supporting traditional processes. Others see the demise of the library and a radical change to a system focused directly on the end user, the intermediary function becoming redundant. Perhaps libraries could develop new roles within the educational process. The fate of libraries and the services provided are in our hands.

Within higher education new roles for the library can be seen. Academic libraries could provide the long talked of open learning situation, where those undertaking courses can learn on their own terms and in an environment in which both researcher and teacher can develop their roles to further the aims of the society. The best libraries have, however been doing this for years. Libraries could take on the role of communications centres and co-ordinators. The development of information technology and interest in its future impact on the learning process have provided librarians and others with an opportunity to re-examine the library's role. If libraries and librarians come out of this examination with a renewed mandate to serve in the education and development of our society they will be able to contribute as never before. If they fail to provide the requirements of users, or the basis of their very existence becomes obsolete they will have lost an opportunity to provide society with a service which the profession has believed to be valuable since libraries existed. Opportunities have been lost before, as with the library college concept.

Academic libraries need to be at the forefront of the debate on the changes in society resulting from I.T. They have advantages, in their ability to contribute to such discussion over the public library and industrial sectors in this area. There is a strong bond of co-operation and assistance between academic libraries which the industrial sector is unable to match in a commercially competitive society. The clientele of the academic library is clearly defined, easily accessible and generally recognises the contribution that libraries make to society. Public libraries have a much more complex role and a mission which is less easy to define. Academic libraries have a strong collective base from which to put forward their views.

Before an academic library can contribute in this way it must have examined the role or roles that it can undertake and how these could be managed successfully. It will then be in a position to discuss the future of services with the academic community and to reach conclusions on where they should be going and what they should be doing. The position established, if they find that they still exist, libraries can contribute to the wider debates which will take place over the next decade on the future of our society. Debates of this kind are not new, but an increasing role for librarians within those debates is.

There has been some success already, in for example, the way that librarians in the U.K. have been able to make national contributions to the issues of copyright and data protection. More should be done, and the number of librarians making a direct contribution needs to be increased.

A prerequisite of this contribution being the continuance of the librarian's role and the ethos on which we claim our existence, this book attempts to examine some of the issues, problems and opportunities which the development of I.T. is making and will continue to present to librarians.

On the basis that libraries have reached the present situation from an historical context, the development of information technology in libraries is examined. Some possible changes in the way society will operate and the effects on the higher education system are examined as a background to the library service. External networks bringing in data for the institution to use and the local networks which will distribute and add to that data are also examined. These will change the way libraries operate and the mechanisms employed by members of

the institution to gather and analyse information. Changes in the way libraries operate will result, which are examined in the context of a possible library environment and structure for the future. Key issues for the library manager are examined, and the requirements for library staff education, training and skills.

Being wrong is the fate of all who predict and so this author accepts that much of what will be written here may become irrelevant in the near future, but if the text makes the reader consider or reconsider the future of the library, if it has one, and the personal role and commitment of the reader then it has fulfilled its purpose.

ACKNOWLEDGEMENTS

CONTENTS

CHAPTER 1

A Historical Perspective

The convergence of telecommunications and computer technologies in the context of libraries has been the product of continual development rather than a sudden movement. A view of the past may therefore provide us with useful information for an examination of the future.

This review looks at some of the most important developments in the application of information technology in libraries and related information centres in the United Kingdom, the United States and in Europe.

EARLY DEVELOPMENTS

Computer applications to library tasks first appeared in the United States in the 1950's. Much of the early work by Baten, Mooers, Taube, Luhn and Baxendale into the development of indexing techniques together with the work of Horty on the LITE project (Kehl,1961) formed the basis of later online systems. Between 1956 and 1968 the LITE system was developed to contain many features incorporated into later applications. The system was created at the Health Law Center of the University of Pittsburgh to assist in the drafting of law text. It used natural language, a list of 'stop' terms and Boolean which could be operated on individually defined fields, with Pennsylvania statutes as the data base. The system was developed further under the control of the Aspen Corporation and used by the Department of Defence in project LITE, the Legal Information Through Electronics system. By 1973 the LITE project had become FLITE to provide a Federal collection available to accounting, auditing, personnel and legal staff.

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Perhaps the first example of the integrated approach to information retrieval was the TIP [Technical Information Project] run at M.I.T. under the sponsorship of the National Science foundation. From 1962, it acted as a test bed for the evaluation of computerised libraries and methods of scientific communication. Originally operated on an IBM 7094 within the M.I.T. time sharing configuration the system started with 35,000 articles from 25 physics journals. In addition to key word in title searching, retrieval could be made by bibliographic coupling, examining linked papers by citation analysis. In 1965 a serials administration system was developed but never successfully implemented (Mathews,1967).

Luhn and his colleagues at IBM introduced a computer based selective dissemination of information system (Luhn,1968) and KWIC indexing (Stanwood,1962) during 1960/61. At the University of Harvard and later at Cornell University Salton carried out research on his SMART system, one of the most sophisticated developments in indexing techniques during the mid 1960's (Salton,1968).

1963 saw the start of a process which would change many operational techniques and the attitudes which went with them. In that year a consortium of Ohio college and university presidents grouped together to examine the role of new technology, including computers in library co-operation. By 1965 they had commissioned an analysis from Fred Kilgour, who recommended the creation of a regional library centre to serve both state and private academic libraries in Ohio. The centre was founded in 1967 under Kilgour with 48 libraries. An online cataloguing system was introduced in 1971, and the 1973 decision to offer services outside Ohio led to over 240 libraries participating by 1975. In 1981 OCLC entered the European market and started offering a stand alone system in 1982. By 1985 OCLC served nearly 3,000 libraries and had been imitated both in the United States and elsewhere (Kilgour,1973).

The 1963 King report on the development of the Library of Congress recommended a ten year programme for the automation of the library. Although the report itself was not implemented it stimulated the eventual development of the MARC cataloguing format (King,1963).

More research funding for university and college libraries resulted from the U.S. Library Services and Construction Act and the Higher

Education Act in 1963. In the following year the Federal Council for Science and Technology, Committee on Scientific and Technical Information [COSATI] was given responsibilty for the co-ordination of extra library information systems within agencies of the Federal government. This committee was to give support to the Department of Commerce in the setting up of the Clearinghouse for Federal Scientific and Technical Information, later the National Technical Information Service [NTIS]. In 1965 the Federal Library Committee was charged with the co-ordination of federal libraries, from the Library of Congress to small specialist collections.

Electronic publishing was used at the 1963 annual meeting of the American Documentation Institute. H.P.Luhn supervised the first use of fully automatic computer based typesetting techniques applied to the production of technical papers, in this case the meeting preprints.

The first public demonstration of an online bibliographic retrieval system was given at the Library/USA exhibition at the 1964 New York Worlds Fair.

In the same year Swanson described the design for a system which would have remote entry to a catalogue and data bank. Access to indexes would be via a remote computer terminal, items selected being displayed using a central microfilm data bank and shown on a local terminal using a slow scan television system (Swanson,1964).

The Robbins report would stimulate the growth of universities, in the U.K. and bring new pressures on libraries which in turn produced interest in automation (Great Britain,1963). The Flowers report on computers in research which followed two years later would provide the universities with the computing power to make such developments possible (Great Britain,1965)

THE GROWTH OF INTERACTIVE SYSTEMS

The first commercial selective dissemination of information system, the Automatic Subject Citation Alert [ASCA] service was introduced by the Institute of Scientific Information in 1965. In the same year the System Development Corporation introduced the COLEX online experimental system for the Foreign Technology Division of the U.S. Airforce Systems Command. The system later became the basis of the

commercially available SDC, ORBIT system. A similar configuration was ordered by the National Aeronautics and Space Administration [NASA] from the Lockheed Missile and Space Corp. Experimental work began on the Remote Console or RECON system in 1965, became operational for NASA in 1969 and was later developed into the Lockheed DIALOG service (Summit,1967).

In 1969 the library of the University of Southampton introduced a computer circulation system. Later work at Southampton sponsored by OSTI and the British Library set the pace in the development of computer applications in British academic libraries. The Illinois State Library introduced an issue system in December 1966 that stored data on an IBM terminal, which was batch processed overnight. In 1969 the system went fully online, permitting enquiries to be made (Hamilton,1969)

Although the King report was not acted on by the Library of Congress, some further work was undertaken. In 1965 a preliminary report was issued on problems associated with the conversion of the catalogue to machine readable form. A grant from the Council of Library Resources allowed the library to start a pilot project. By the end of 1966 there were 16 libraries co-operating in the establishment of a centralised cataloguing system. During 1967 a feasibility study was undertaken of the requirements for a machine readable catalogue jointly produced by the Library of Congress and the British National Bibliography. Over the period 1968-1974 further experiments were conducted with twenty libraries. From 1969 catalogue cards were partially produced by computer and 1970 saw the introduction of project RECON, the retrospective conversion of records back to 1950. The British National Bibliography started to be produced by computer in 1971 and Books In English achieved ultrafiche production in 1972 (Library of Congress,1968).

SDC developed the Bibliographic On-Line Display system in 1966 using boolean searching techniques. Users could have references ranked according to the number of hits scored against the search strategy, and the user could browse through the system using a sequence of menus displaying major subject groups and identifying the categories selected using a light pen (Borko,1966).

An integrated library system was introduced into the University of Chicago in 1966 and became fully operational in 1968. Modules included

acquisitions, serial control and a cataloguing
system. Unlike other examples of early large scale
systems it continued to be used, being replaced by
new hardware and software in 1975.

THE SPREAD OF NETWORKS

From the mid 1960's library networks in various
forms spread rapidly. The New England Library and
Information Network started a cataloguing system in
1966. This was developed during 1968/1970 into a
batch system to produce catalogue cards, book labels
and book pockets via teletype terminals
(Nugent,1968).

In 1967 an online catalogue for patron use was
introduced by the Medical Research Library,
Downstate Medical Center of the State University of
New York. The work associated with the catalogue
formed the basis of the SUNY Biomedical
Communication Network a year later (On-line,1967).
New York was the location of an early fax experiment
in 1967. The New York State Library FACTS network
was set up to investigate methods of graphic
transmission as a means of improving document
delivery. The pilot project financed by N.Y. State
covered 15 libraries peaking at 30 request
deliveries per day. The facility was withdrawn
because of a lack of urgent document demand and poor
equipment performance (Nelson,1968).

In the same year Washington State Library set
up a system to support shared bibliographic services
for other libraries. The organisation became
autonomous later and now offers cataloguing,
authority control, ordering and processing, fund
accounting and inter library holdings lists. NOTIS
the Northwestern Online Total Integrated System
started in 1967. Now in its third revision the
system for Northwestern U.S. university libraries
offers an integrated cataloguing, acquisitions,
serials control and circulation control system.

UNESCO and the International Conference of
Scientific Unions set up UNISIST in 1967 to assist
the bibliographic control of periodicals, which led
to the foundation of ISDS [International Serials
Data System] in 1972. The centre creates
authoritative records, promotes standards and
communicates data between libraries, growing at a
rate of some 30,000 items per year from data
submitted by member countries.

In the U.K. the Office of Scientific and

Technical Information [OSTI] stimulated computer based information provision by awarding a grant to the Institution of Electrical Engineers and the Physical Society. A preliminary study into the feasibility of producing the Science Abstracts series using a computer was carried out in 1965. By 1969 all six INSPEC journals were being typeset by computer and the data created used for S.D.I. and secondary information services.

The earlier work by M.I.T. on the Technical Information Project was used in the Information Transfer Experiments [INTREX]. Sponsored by the National Science Foundation, the Council on Library Resources and the Carnegie Foundation, the system attempted to place information retrieval at the user's desk (Reintjes,1969) (Overhage,1972). Remote terminals could be used to search a catalogue of twenty thousand journal articles in the fields of materials science and engineering, using natural language techniques. The full text of retrieved items was available online and permanent copies could be obtained in hard copy and microfilm.

In March 1968 the Bell Laboratories Library introduced a real time system, giving three remote libraries access from two terminals each, with a catalogue and issue system (Kennedy,1968). An online acquisitions system was introduced by the Washington State University Library the following month, using a purchase order number as the key.

The integration of a minicomputer and microfilm retrieval system was described by Zenner in 1968, allowing online access to a document data base and associated indexes (Zenner,1968).

Facsimile transmission was experimented with in the same year, to link eleven building centres and nine other building research and information establishments in the U.K. The Facsimile Information Network Development [FIND] project ran for two years but was discontinued because of high costs.

1969 marks the beginning of the bibliographic co-operative movement in the United Kingdom. OSTI provided finance for both the Birmingham Libraries Co-operative Mechanisation Project [BLCMP] and the South West Area Library Cataloguing Project [SWALCAP] until they became self supporting.

BLCMP, set up to experiment with co-operative cataloguing began with three participants, the Universities of Aston and Birmingham and Birmingham Public Library. By 1975 the system was self supporting and in 1977 became completely autonomous. Online catalogue editing was introduced in 1979 and

a stand alone circulation system developed in 1982. BLCMP now has over thirty members. SWALCAP started with three members; the Universities of Bristol, Cardiff and Exeter. A feasibility study was undertaken during 1969/72, and an online circulation system introduced in 1976, followed in 1978 by online catalogue editing.

A text retrieval system was required by the United Kingdom Atomic Energy Authority [UKAEA] to search legal and parliamentary documents. Using earlier work by Colin Tapper of Oxford University on full text case law searching by machine the UKAEA developed the STATUte Search [STATUS] retrieval system, now a widely used general information retrieval package which in various versions can be run on mainframe, mini and microcomputers (Niblett,1969).

STATUS replaced an earlier general online system developed at the UKAEA Culham laboratory, the Retrieval of Information by On-Line Terminal [RIOT], system. Based on previous work sponsored by OSTI in 1965 examining the use of computers in selective dissemination of information programmes, the SDI module has been used continually since April 1966. By the time the online RIOT system was replaced it had 40,000 documents in store (Negus,1971).

The Laval University of Quebec introduced the first online real-time periodicals checking in procedure in 1969, which initially dealt with 1,600 titles (Varennes,1970).

In 1970 Ampex introduced the Videofile, a videotape document storage system. Using two inch format, up to 250,000 pages could be stored on a one hour video tape. The system could search at a rate of 1,000 pages per second with results displayed on a cathode ray tube or printed on an electrostatic copier (Miner,1970).

In 1971 Philips demonstrated the first home video colour tape recorder and play back machine. The system used the Ampex helical scanning system, but cassette rather than open reel tapes.

Telecommunications networks, both public and private were expanding rapidly in the United States. The Advanced Research Projects Agency Network developed for the Department of Defence, used interface message processors to link computers via leased lines, at various universities and institutes conducting research in association with the D.O.D. Tymnet was introduced in 1971 using leased lines, followed by Telenet in 1975.

The first public teletext services were started