

## THE PRESENT STATE OF LIBRARY AUTOMATION A Study in Reluctant Leadership

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This discussion will cover a rapid survey of the various undertakings in library automation during 1964-65, a brief sketch of how automation reached our national libraries, and the uses to which it has been put, including this author's views concerning the role these libraries must play in the future of automation in all libraries, and some actions worth considering to insure that national libraries fulfill their central and crucial role in the nationwide system as well as in the process of automating libraries.

Library automation in April 1965 affects only a very small part of the activities of libraries in the United States, for attempts to automate have been undertaken in only a very small number of libraries in comparison to the total, and only for a limited number of operations in those libraries. In spite of this circumstance, the amount of activity directed towards library automation is already so large that accurate information is not available on how many libraries have operative programs, and even less information is available on how many libraries may be considering the automation or mechanization of some of their operations. There is not even an organized and continuing effort to gather information about library automation and to publish it for the profession.

These conclusions, consequently, are based almost entirely upon secondary sources because it was not possible to visit most of the operations which will be described and summarized. The necessity of relying upon written descriptions and conversations and the failure to visit most of the installations should lead to suspicion that there are inaccuracies and misinterpretations in this presentation. Time and careful studies will uncover them. One lesson learned thoroughly from efforts to introduce automation and to provide objective, balanced, and satisfactory consulting and engineering services to libraries is that the reality of mechanization and automation

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in a library, as a direct experience, is likely to be quite different from the impressions gained from conversations and written descriptions. In spite of this, and in addition to the warnings about the unreliabilities on which the conclusions may be founded, an attempt will be made to present what the author believes to be a reasonable selection and interpretation of the library automation which exists at the present time. The author is very much indebted to many librarians for the up-to-date information they have sent, because the accounts in our literature are too often out-of-date on publication.

There are a few doers who are making library automation a reality in their libraries. A larger number of librarians are designing and planning, and an even larger number are interested or are watchfully waiting to see what other libraries, especially our national libraries, will do. It is fortunate that so many of the doers in library automation have prepared papers for this Clinic.

The summaries the author has seen and has roughed out himself show that information retrieval (IR) is the least common of library automation activities. Information retrieval is more common in documentation centers than in libraries, a distinction which accurately reflects their greater needs for IR.

The operating examples of library automation are found in acquisitions and order work; cataloging, in the production of book catalogs and card catalogs; serials work, in most of its aspects; and circulation records work. The introduction of automation for acquisitions and order work improves those procedures internally and offers better financial control. The ready availability of new catalogs in book form, as yet of less than 100,000 titles, in cumulated series or in new editions, serves our library users better than before, because of their currency and easy distribution in published forms. The use of automation for circulation and serials records has improved service to library users, in an area where there is much work to do. Daily circulation lists organized in two parts, one by book call numbers and the other by borrowers' identification numbers, and lists of reserved or otherwise displaced books are invaluable aids, especially when they are in multiple copies and can also be used for immediate inventory control. Weekly lists of newly-arrived serials, showing all the pertinent facts about individual issues, are a great help in serving users, especially when supported by updated holdings lists of all serial titles.

The following equipment is currently being used:

1. Most of the standard units of punched card equipment.
2. Paper tape typewriters as peripheral computer components, or as independent units for catalog card production.
3. A very representative sample, as to models and manufacturers, of small, medium, and large electronic digital computers.

4. Magnetic tape units—these are much more common than random access units for storage, recall, and memory operations.
5. A small number of terminals connected to computers; even fewer at remote locations.
6. Computer line printers in all capitals are in the majority; a few upper-lower case computer printers chains are used; computer-driven compositors for photo-offset work are coming in.

Operations research and engineering personnel are being used at Purdue University, Johns Hopkins University, and Massachusetts Institute of Technology to help solve their library problems. This shift to reliance on professional persons other than librarians and computer manufacturers is very significant.

One of the very interesting applications is the effort under way at the Medical Libraries at Harvard, Yale, and Columbia Universities, as described by Frederick G. Kilgour, Librarian of the Yale Medical Library.<sup>1</sup> The objective of these three libraries in their computerization project is eventually the rapid and complete retrieval of bibliographic information. However, they are starting with the catalog, entering information for books in their collections published in 1960 or later, and to this monographic record they hope to be able to add the MEDLAR'S indexing which cares for the indexing of journals supplying upwards of 75 percent of the recorded use in their libraries. They intend to have each library connected to the computer by telephone lines and to be able to ask through remote information terminals for references on various subjects, with specific limitations on the questions. Hopefully, the references will be supplied to the inquirer almost immediately. The effective speed of response will be limited only by the ability of the terminals to print out references.

They are starting with preparation of catalog cards by machine operations now and will go to information retrieval later; use is being made of the medical subject headings used by the National Library of Medicine. The depth of their subject cataloging has already increased from approximately 1.5 subject headings per title to 10.4. The production of catalog cards is designed around the IBM 1401 computer, because this is a very common computer at the present time. The four major computer programs are used to allow the production of punch cards to be placed in the IBM 870 Document Writer to produce catalog cards from continuous forms. All of the different entry cards are prepared for the libraries in this way, including their contributions to the National Union Catalog. When the machinery is operating perfectly, the cataloging completed one day is punched the next day and the mechanized catalog cards are produced for filing the following day.

Once a month at Yale the accessions list is added to the Bulletin of the Yale Medical Library. This process has been reduced from one week of staff time to an hour of time in the computer center, of which only a very small fraction is computer time. The average production cost is now in the vicinity of \$20 a month, and the saving in the human cost has been far greater, for staff members disliked the re-editing required. The accession list is now approximately 50 percent larger than it was formerly and costs less to prepare.

The project directors have endeavored to ascertain the cost of producing cards, and it appears at the present time that mechanized catalog card production does not cost more and probably costs less than other conventional card production techniques. When an additional use is made, as in the case of accession lists, the costs drop far below those for conventional procedures. The project is only at a beginning stage. They intend to produce the cards on a computer using upper and lower case characters, and this change will materially speed the card production to approximately one card every two seconds.

The National Agricultural Library (NAL) has been actively surveying its needs for automation in recent years, and a report on its efforts, Project ABLE, is to be published very soon. The NAL has already made a modest start. The August 1964 issue (and subsequent issues) of the Bibliography of Agriculture contains an author index produced with the aid of a special typewriter font (capitals and numerals), a Farrington optical scanner located in New Orleans, and IBM 7074 and 1401 computers in Washington. Input errors made in typing the authors in random order can be lined out or indicated by this symbol: †. The optical scanner is used to produce magnetic tape records, the alphabetic sorting is done on the IBM 7074, and the printing is done on the IBM 1401.

The NAL has already advanced towards the preparation of the subject index for the Bibliography of Agriculture, and its computer production is planned for publication in the January 1966 issue. Concurrently, the NAL is preparing for the retrieval use of the subject index.

The NAL has also started, with Vol. 1, No. 1, March 19, 1965, the biweekly Pesticides Documentation Bulletin. The first issue, computer produced, contains 1,289 entries, an author index, and a permuted keyword-out-of-context (KWOC) subject index, in which each index term is in the left margin as well as in the body of the title. On the same date, the NAL invited potential bidders to submit proposals for a computer based systems design and programming for a Pesticides Information Center.

The Library of Congress (LC) has responded to the need for automation within the last year by establishing the position of Information Systems Specialist, to which Samuel S. Snyder has been

appointed. He has had much experience with computers. His staff includes Barbara Evans Markuson, his assistant; Donald M. Ricker-son, electronics engineer, and Henriette D. Avram, an experienced programmer.

Their plans are under way. They are beginning a systems analysis of the LC and are gathering data using six of LC's latest interns. They are working on the machine readable record problem as related to catalog cards, the subject heading authority list, National Union Catalog entries, and a possible subscription service corresponding to current catalog card sales. Samuel Snyder hopes that his office can become an information exchange on library automation and that some internal memoranda can be published later in a professional journal, but he wrote that he could not release the amount of money requested for the 1966 fiscal year budget.

The preceding survey shows that none of the libraries which have adopted mechanization or automation to any extent has attempted seriously to consider a whole library as a total information system which is to be integrated so far as possible in its concepts, design, provision of equipment, and daily operations. That kind of integration is certainly in the minds of the top staff members at the National Library of Medicine, the National Agricultural Library, and the Library of Congress, but as yet only as intellectual aspirations. The King Report<sup>2</sup> and the Proceedings of the Airlie Conference,<sup>3</sup> remarkable reports in themselves, provide us with an adequate realization that an integrated, electronic library system is a monumental undertaking which should not be embarked on lightly, but one for which there is every prospect of eventual success.

The foregoing examples in various libraries show diversity in operations, equipment, programming languages, philosophic approaches to the problem, and methods of implementation. The amount of compatibility from one system to another is unfortunately low. In this lack of compatibility, a repetition of the divisive events in library history can be seen. Unless there is a change, it is reasonable to predict that librarianship and library users will continue to suffer from the failure to standardize, cooperate, and centralize. Evidently, the spirit of independence, of seeing one's own problems and solving them one's own way, still prevails to the detriment of librarianship as a whole. This condition demonstrates that there are too few librarians in this country who are willing to rise to the opportunity of leadership presented now and to work for the benefit of libraries, librarianship, and library users. Many librarians prefer to work on their own restricted problems and solutions. It is this prevailing situation which led to the adoption of the subtitle, "A Study in Reluctant Leadership," for this paper.

For twenty years it has been clear to a number of librarians, most of whom are still active in this work, that first mechanization,

next computers, and more recently the restricted field of information systems engineering, offer the only real hope that libraries will be able to cope with the ever-growing problems of acquiring, analyzing, controlling, manipulating, and distributing information. In retrospect, that period seems much too long for what has been accomplished.

The first stimulus to action came from outside the library profession. The Office of Naval Research at the close of World War II saw the need to do something with the mass of research and development reports which were left over from the war effort. The Office placed a contract with the Library of Congress to undertake research and development for the better handling of this material, and turned over the mass of reports. That backlog and the growing bulk of material produced by our enormous defense program sidetracked the research and development aspects, and the problems became almost wholly operations at LC, rather than research, as can be seen in the name changes which occurred. The Science and Technology Project at the Library of Congress became the Navy Research Section; in turn it became the Reference Center of the Armed Services Technical Information Agency (ASTIA) when that agency was established under the order of the Secretary of Defense in 1951.

In 1952, ASTIA placed a contract with Documentation Inc., a new commercial research and development organization, seeking an improved method of analyzing the content of the report literature which would be amenable to manual and mechanical or electronic operation. The result was the Uniterm System of Coordinate Indexing. There are a number of manual and electronic installations now using this system, attesting to the success in meeting the operational requirements of the contract. Controversy arose immediately over fragmenting index terms in this manner; the controversy was once violent and is perhaps only quiescent now. There were other research and development efforts during the early 1950's, as well as ever widening study by people concerned with the problems.

Another federal government agency embarked upon some contracts which eventually led to a markedly different development at the Battelle Memorial Institute and subsequently in the newly established Center for Documentation and Communication Research within the School of Library Science at Western Reserve University. The result of these efforts was the even more controversial telegraphic abstracting style of subject analysis based on some traditional ideas of classification and a new concept of semantic factoring. Telegraphic abstracting proved to be one of the most complicated methods ever developed for the control of information. It was based on some firm belief, and weakly supported by experimentation, and is used today for only one sizable effort, the control of metallurgical information

by the American Society for Metals. One cautious report suggests to me that the development has turned out to be metallurgy's greatest obstacle in the past decade.

The relative measure of success of these methods, coordinate indexing (extremely simple) and telegraphic abstracting (extremely complex) remains unresolved at this time. The simplest and the most complex methods are both being implemented with computers at the present time. Perhaps the most useful conclusion is that computer is larger than either of the systems, and we are fortunate that this is so, because we have the opportunity to develop other useful methods within the extremes.

During the period that the Library of Congress administered part of ASTIA, it participated in the developments which were leading toward automation in libraries. However, the ever growing requirements of the Library of Congress for space and other considerations led eventually to the removal in February 1958 of ASTIA activities to Arlington Hall across the Potomac in Virginia, where ASTIA installed a computer in 1960 for its operations. This change removed the Library of Congress from the mainstream of developments leading toward the adoption of computers. Computers were adopted earliest and most willingly by documentation and information centers.

Within a year the Librarian of Congress, L. Quincy Mumford, let it be known that small surveys about the possibility of automation for the Library of Congress would be welcome and that the Library of Congress would consider unsolicited proposals for work. Richard S. Angell, Chief of the Subject Cataloging Division, was chosen as the official contact and soon demonstrated that he was the LC's most knowledgeable member in this area.

This act of leadership produced mixed results. Three companies, General Electric, International Business Machines, and Thompson-Ramo-Wooldridge, made brief surveys and in October 1959 presented proposals for initial work, thus preparing their personnel for later work elsewhere. This preparation was the principal benefit.

The proposals made clear to the top administrators at the LC that automation would eventually be feasible and successful, that an integrated electronic library system would be complex and difficult to achieve as well as costly (\$20,000,000 over a twenty year period as a minimum), that the catalog records could be computerized to provide a new level of bibliographic apparatus, that the Card Division operations were particularly suitable for early automation, that inquiry stations should be developed, and that LC needs exceeded the capabilities of the existing equipment in some areas. The proposals made clear that the LC would have to undertake its pioneering effort to solve its problems with the aid of a branch of engineering which was also still in its initial pioneering stages.

Modest sums were quoted by the companies for the initial studies, about 1 percent of the Library's annual expenditures. This figure is a low percentage for innovation in contrast to figures of 3 to 5 percent for this country's leading innovating corporations and 10 percent for research and development in the Federal Government.

The proposals were politely and gratefully accepted, but no funds were obtained from the Congress and no contracts were let. Because of their proprietary nature, the survey proposals were never published, and the information given to the library profession was limited to a brief account in the Library of Congress Information Bulletin.<sup>4</sup>

The unfortunate result of the proposals was to paralyze the spirit of innovation at the Library of Congress just when encouragement and action were required. Libraries are still paying the penalty and probably will continue to pay for years to come, because of inordinate delays in attacking the problems of our national bibliographic apparatus.

In contrast, the history of the National Library of Medicine in 1958-1965 provides a remarkable demonstration that the spirit of innovation, decisive administrative action, thorough homework, an outside contractor, and available technology can be combined to accomplish a great deal towards automating a library.

The Library of Congress chose a reasonable but regrettably inadequate course of action in 1960-61. The course was to seek high level advice without other action. Even the official contact was changed and became Henry J. Dubester, Chief of the General Reference and Bibliography Division. He soon became LS's other expert in library automation; he was later to leave the Library for the National Science Foundation in 1964.

Again the result was delay. The blue ribbon study committee produced sound advice, but it took too long to publish the King Report (January 1964)<sup>2</sup> and the Proceedings of the Airlie Conference (October 1964);<sup>3</sup> and no implementation of automation has been accomplished as yet at LC.

No one should argue against the desirability of securing full and competent advice for the automation of the Library of Congress. The point is that LC could have obtained action as well as advice during the past five years. While a Congress accustomed to large appropriations for research and development in all areas of federal activity is unlikely to reject a request for R&D funds for its own Library, it is unlikely to appropriate funds without being asked by the Librarian or without being urged to appropriate funds by the library profession. We can assume very reasonably that if LC had asked for funds five years ago, at least some significant operations would be computerized at LC now.

In support of this study, a summary of the accomplishments of the NLM for this same period should be noted. With a grant from the Council on Library Resources in the period 1958-1960, Seymour Taine and Frank B. Rogers, then Director of the NLM, studied the problems of compiling, indexing, and publishing Index Medicus, and converted its production from a manual card shingling operation to a paper-tape typewriter, punched card, automatic camera production method. They also defined what they wanted to accomplish in a very complete fashion, formulated a public request for proposals, secured twenty-six proposals, selected a contractor—the General Electric Company—secured the financing of a \$3.4 million effort from the U.S. Public Health Service, monitored the contractor's work, and converted Index Medicus to computer production in January 1964. In the same period, they also expanded the coverage of indexed journals, more than tripled the depth of indexing, revised the list of subject headings, reduced the productions time of Index Medicus, and secured by a development contract the most sophisticated computer-driven photo-composer yet in use. They also kept their secondary objectives always in mind, some of which are being worked on now.

The present Director, Martin M. Cummings, summarized the accomplishments of MEDLARS up to March, 1965, as follows: Since January 1, 1964, with MEDLARS, they have:

1. Organized and composed 15 monthly issues of Index Medicus (10,476 pages), and the 1964 annual volume of Cumulated Index Medicus (5,698 pages).
2. Produced 300 demand retrieval searches for experimental systems testing.
3. Produced more than 1,000 demand bibliographies for physicians and scientists.
4. Produced the following recurring published bibliographies:
  - Cerebrovascular Bibliography (semi-annual)
  - Index of Rheumatology (bi-weekly)
  - Index to Dental Literature (quarterly, cumulative).
5. Produced magnetic tapes for use by others and in other locations; tapes are being made available in IBM as well as Honeywell format to increase compatibility for nationwide use.<sup>5</sup>

NLM is now engaged in a computer programming to accomodate monographic entries. Scott Adams, Deputy Director, has also written:

“ . . . there are two major strategic considerations underlying NLM planning:

1. NLM intends to share with the medical library community the power to search for and repackage citations in response to interdisciplinary needs we have developed through MEDLARS.

2. NLM intends to establish, through Federal grants and contracts, a medical library technical assistance program, to strengthen the medical library network so that its resources and services . . . (will become more nearly equal) to the complexity and volume of new interdisciplinary needs, and to the power of retrieval provided by MEDLARS."<sup>6</sup>

While library automation in its present state is only poorly advanced and is still in its pioneering stages, this development has brought forward again a number of the problems which are central to librarianship in this country. In the activities which are presently being carried on, there exists a diversity of philosophies, methods, techniques, and systems, and a variety of equipment already in use. Examples of individual leadership in individual libraries are evident. We recognize that the status of our national bibliographies is still central to the problems; witness the efforts of Verner Clapp to develop the report by Larry Buckland.<sup>7</sup> But there still remains a lack of standards for this bibliography and for other library practices. There is a considerable degree of incompatibility among the new systems being introduced within libraries. There is a very large lack of understanding of the capabilities and potentialities of electronic information systems within the library profession. The major lacks which have been brought to the surface by the arrival of library automation are our lack of national leadership in librarianship and the lack of a plan for automation.

The present situation must be translated into needs for some kind of equipment and for increased finances to accomplish the work that must be done. The engineers claim that equipment can be built for almost any requirement if the requirement can be adequately defined. It is known that increased finances can be obtained for worthy causes if they are presented carefully and persuasively.

Most of the conditions described immediately above prevailed at the time Herbert Putnam became Librarian of Congress in 1899. He overcame many of the problems of his period by a series of actions within the Library of Congress, by his effective relations with the Congress, and by his leadership for the profession in this country. He was not faced with problems of the same quantity as we are facing today, and his library was relatively more the national library than the Library of Congress is today. In the sixty-five years which have elapsed, the Agricultural and Medical libraries of the Federal Government have grown tremendously and have both achieved legal status as National Libraries, while it has been impossible for the Librarians of Congress to achieve the same formal elevation for the Library of Congress. Herbert Putnam did not face the technology and its capabilities which we face today, but he did face the absence of national leadership and the lack of a plan, just as we face these today.

If the profession were at this time in the situation of having a newly appointed Librarian of Congress, it might be reasonable for it to decide to let the newly appointed Librarian endeavor to provide national leadership and work towards a national plan for automating the libraries in this country; but this situation does not prevail. The Librarian of Congress, L. Quincy Mumford, has been in office since 1954, and his administration has been marked by the steady growth of the library, a corresponding but less rapid growth in its financial support, and a very cautious approach to changes of all kinds. All of the circumstances that have been considered suggest that Mr. Mumford truly needs our help at this time, and even more, help from outside the library profession.

What are some steps which could be considered to offer the type of help necessary to provide national leadership and to develop a plan for library automation?

A Federal Library Committee has been appointed recently, with Mr. Mumford as chairman, and has held its first meeting. The establishment of this committee is clearly a step in the right direction, but the question must be asked as to whether this committee can properly be concerned with the problems of library automation, nationwide and for the library profession, as it should be. The cautious record of the chairman and the restricted phraseology of the name of the committee suggest that too much hope for the solution of library problems should not be placed in the creation and future activities of this committee.

The American Library Association (ALA) is the most broadly based of the library professional societies and the largest in its membership. It has demonstrated a continuing interest in the Library of Congress, in all its national activities over the past eighty odd years. The history of those years also shows that the American Library Association has had relatively little effect upon the development of the Library of Congress and upon the development of our national library system in general. Only in recent years has the ALA started a program of lobbying before the Congress, and this program is now beginning to show results.

This author inquired by correspondence of the chairmen of several committees in the ALA who are concerned with the automation of libraries in several aspects, trying to learn whether ALA is presently exerting leadership in this area, and if not, how it should go about developing leadership. From the replies I conclude that ALA has no effective leadership in this area, and these committee chairmen offer no concrete suggestions that will get ALA started in this direction. Consequently, there do not appear to be any particularly optimistic reasons for belief that the ALA is the direction to which the profession should turn for assistance in this matter.

One solution, sometimes used in this country to establish national leadership and to develop a plan, is the establishment of an independent non-profit corporation, designed to accomplish the objectives of the incorporators. Perhaps a title such as "Americans for the National Libraries of the United States" would be a suitable name for this type of organization. The creation of an instrument of this kind is so familiar that it seems unnecessary to describe it further except to say that its objectives should be to determine requirements, obtain financial support, influence the Congress, and persuade or lead librarians toward library automation.

The choice of the plural for "the National Libraries" is deliberate here. We can no longer afford to allow the historical accident that there are three national libraries, one in the legislative branch and two in the executive branch of our Federal Government, to hold up further progress toward a national library system making full use of library automation.

There are several organizations already in existence in our society which might be able to serve the purposes we have in mind. These are non-profit corporations concerned with one or more of the intellectual disciplines and the application of those disciplines to the general welfare of the population. These organizations include the National Academy of Sciences—National Research Council, the newly created National Academy of Engineering, the Social Science Research Council, and the American Council of Learned Societies, for example. With slightly differing charters, these organizations are in position to work together for advisory committees to debate the requirements, determine the needs for funds, lay out the requirements for national leadership, and bring information to the attention of the Congress. They are also capable of receiving funds for the purposes of conducting surveys and developing plans. All of the organizations named as examples have been and are being used for this purpose.

The problems of library automation are of such magnitude and so pervasive in their national effect that the possibility of the establishment of a Federal Commission for the National Libraries ought to be considered. Federal commissions have been most effective in many areas in accomplishing the objectives of informing the Congress, developing plans, and changing the direction of events in this country. Such a body can be an ad hoc or permanent group, empowered by statute, resolution, or executive order to investigate a problem in the public interest. It can secure information basic to the framing of new legislation. It informs public opinion on matters under inquiry; it can gain public support for new legislation.

A federal commission can be a legislative body or an administrative committee; it may hold oral hearings in Washington or throughout the country. It can be empowered to compel testimony. The body can be directed to report at any time and to make a final

report at a stated date. Majority and minority reports are always possible to reflect differences of opinion. There need be no limits to the subjects under investigation. Expenses of the federal commission can be met by special appropriation or from the contingent funds of the House and Senate.

George B. Galloway, at one time a member of the Legislative Reference Service of the Library of Congress, has written that the results of federal commissions have justified their use.<sup>8</sup> They have secured exposure of officials and set cautionary examples for others. With their aid inefficient officials may be removed or forced to resign. He also observes that the Congress may transfer neglected duties to another department or create a new agency.

James W. Fesler has expressed the hope that the establishment of a federal commission is not a concession to heavy pressure for action while at the same time its appointment postpones a decision.<sup>9</sup> One of the real advantages in the establishment of a Federal Commission for the National Libraries is that its membership would be composed of a minority of librarians and a majority of members of other occupations in this country. The problems are so great here that we need some unusually competent people drawn from the ranks of politicians, financiers, industrialists, scientists, and executives, as well as representatives from the academic world to take care of the humanities and the arts.

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