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A survey of computer application and usage problems in library processes of large university libraries in the United States

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by

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CHAPTER I

INTRODUCTION

Background

The information explosion, more than ever before, has produced some profound effects upon libraries in the United States. These effects are evidenced in the rapid growth of library collections; the growing inadequacies of many library facilities; backlogs of unprocessed materials; and new demands made by patrons for rapid access to materials.

New and successful experiments in the field of library automation have prompted many academic libraries to adopt computer techniques to solve their problem in such areas as circulation control, ordering and billing procedures, and more recently for bibliographic control of information. A general survey of automation activities on American university campuses, published in 1967, reveals that many libraries have begun to make use of automated processes for ordering, acquisition, cataloging and distribution (Caffrey, 1967).

The report of the panel that surveyed the operations of the Library of Congress, with automation in mind revealed in 1963 that:

1. Automation can, within the next decade, augment and accelerate the services rendered by large research libraries and can have a profound effect upon their responsiveness to the needs of the user.

2. Automation of bibliographic processing, catalog searching, document retrieval are technically and economically feasible in large research libraries.
3. Automation will enhance the adaptability of libraries to changes in the national research environment and will facilitate the development of a national library system.
4. The retrieval of the intellectual content of books by automation methods is not now feasible for large collections, but progress in that direction will be advanced by effective automation of cataloging and indexing functions.
5. Automation will reduce the cost-to-performance ratio; however, the library should aim at the expansion of services rather than the reduction of total operating costs (King, 1963).

Cataloging

Among the first recorded attempts to introduce computers in university libraries was in the form of book catalogs. The book catalog can be viewed as having advantages in terms of its mobility and the user's ability to browse through its pages, while the card catalog is stationary and cumbersome.

The advent of the MARC (Machine Readable Cataloging) experiment in 1966 marked the beginning of a line of development which successfully affected computer applications in library operations, including the standardization of computerized cataloging (U.S. Library of Congress, 1968).

Technical Services

The impact of the computer has perhaps been greatest in the clerical aspects of library technical services. A computerized acquisition system searches outstanding orders, handles ordering, receiving and notification and provides statistical information.

The effect of these computer capabilities has been to reduce errors associated with manual sorting and with typing; to speed the flow of material through library processes; to aid book selection by providing fast access the central machine files; and to enable librarians to advise a patron of the exact status of a work about which he or she is inquiring.

Serials Control

The continually growing mass of series publications, the necessity of constantly changing entries, the uneven receipt of some titles, the fact that serials are increasing in number and complexity are a few of the major problems faced by the serials records librarian.

Automated serials systems include four major functions: acquisition, fiscal check-in, display, and public service. The acquisition and fiscal functions usually include accounting, subscription renewal, subscription records (historical), and at least some aspects of budget control. The check-in system should achieve at least the following goals: (1) provide efficient, inexpensive, over-all control of serials receipts, (2) provide rapid check-in, and (3) provide efficient and dependable retrieval of holdings information.

The greatest activity in the field of serials automation has occurred in the production of lists of holdings.

Circulation

Circulation in any type of library involves a regulated movement of materials from the shelves to borrowers who request them. These materials must be properly recorded and monitored to insure their return. In a manual system, this process has been a constant problem to librarians, especially with the increase in materials published and acquired by libraries annually. This problem has been eliminated to some extent through the use of computers.

Library Cooperation

Academic library cooperation, made possible by computers, is spreading fast in the form of library networks. These networks consist of either a group of participating libraries or a group of regions.

Cooperative library programs on the regional level are exemplified by the New England Library Information Network (NELINET). NELINET is a regional center for the provision of computer-aided services in New England libraries. NELINET is supported by the New England Board of Higher Education, the Council on Library Resources, and the U.S. Office of Education. It has progressed from an initial systems analysis of the New England State University Libraries to pilot operations in which five of these libraries receive customized cataloging products, conventional catalog cards, and labels.

The Five Associated University Libraries (FAUL) is an example of a cooperative consoritum comprising the SUNY (State University of New York) units at Binghamton and Buffalo, the University of Rochester, Cornell, and Syracuse University. It was formed in August of 1967. The stated purposes of FAUL are to: "work toward a coordinated acquisitions policy, shared resources, the development of compatible machine systems, provision of easy and rapid communications systems among the membership, the provision of shared storage facilities, and exploration of other areas of cooperation (Kaser, 1971).

The SUNY (State University of New York) Biomedical Community Network was conceived in the fall of 1965 by a committee of librarians, medical faculty members, and administrators from the three State University medical centers. The network was designed originally to tie the four medical centers of the State University together in order to amplify their sources and thus provide vastly improved services to the medical community of the participating schools. The network has now evolved into a facility with connections among federal, state, and private institutions.

The Ohio College Library Center (OCLC) in Columbus, Ohio, is still another example of library cooperation.

General Statement of Problem

Many library authorities feel that automation is one means of dealing with the problem created by the tremendous growth of informa-

tion. As a result, librarians as well as library administrators are interested in knowing the tendencies toward automation in libraries; their future plans in relationship to automation; and whether automation is assisting libraries in providing services to their patrons.

Much has been written about automation in general, but to date, there is no current study which determines the tendencies toward automation within this country's large university libraries. It is felt that this study will be of practical value to librarians and administrators in all types of libraries. Learning of the problems encountered by large universities' libraries in applying automation techniques to their operations and of the methods used to solve these problems can assist librarians and administrators in developing feasible approaches to their own automation programs.

CHAPTER II

REVIEW OF LITERATURE

The literature was reviewed for the following purposes: (1) to obtain an overview of reported views regarding the extent of automation in university libraries; (2) to determine the expressed problem areas in library automation; (3) to ascertain the present inclination of librarians toward automation in general; (4) to determine the reflections of research regarding present and possible future trends in library automation; and (5) to examine the results of reported applications of automation to the primary library processes.

The first section of the review centered on research and information reflecting the overall extent of library automation, its problems, trends, and the views of librarians regarding automation. The second section of the review focused on research reflecting automation as applied to the primary library processes.

The Extent of Library Automation

The literature does not reveal an extensive amount of quantitative information regarding the extent of library automation from its infancy in the early 1960s to present date. There are, however, a limited number of surveys which, though not adequately analyzed, offer some insight into the extent of automation in university libraries.

In 1966 a comprehensive survey of data processing equipment used by libraries and information centers was conducted and sponsored jointly by the Documentation Division of the Special Libraries Association and the American Library Association (ALA, 1966). This survey has been viewed as the "first step toward identifying library functions which are automated and the places in which they are operational."

The ALA survey sought responses from 1,810 college and university libraries. Of the responding libraries 23% indicated that they had automated one or more functions. Because university libraries were combined with college libraries in the ALA study, it is difficult to tell how many of the libraries responding were university libraries. As a result, the survey was of little use in providing information regarding early trends in university library automation activity.

A general view of computer applications is provided through a 1972 survey. Liberman's study provides a summary of computer applications in the libraries of business, industrial, and academic organizations. It also includes statistics on these organizations and the specific automation system in use. Similar information is provided in A Bibliography of Literature on Planned or Implemented Library Projects. Patrinostro (1973) states as his primary purposes in compiling the bibliography: "to present an overview of published works which relate to the use of new technologies in library operations, to call attention to a number of valuable reference works published on the subject, and to assist librarians and library systems personnel who are

engaged in the planning and/or implementation of computer-based systems to locate documents for their own studies." This source provides over 1,600 citations of library automated activities as presented in the literature.

Of particular interest is a survey conducted in April and May of 1972 by a group of German librarians visiting the United States and Canada (Lindenberg, 1975). This information reveals the views of librarians from another continent. In a report of their findings, the German librarians stated that in the last five years significant progress has been made, especially in the area of on-line retrieval. In an attempt to compare the progress of computer application in the libraries in the U.S. and Canada to their counterparts in Europe, the Germans indicate that "book catalog production is being pursued at a very slow rate in the United States." In connection with progress toward catalog automation, the German librarians note that "some promising beginning toward regional centers can be seen in the U.S. and Canada."

Patrinostro in the first of his automated activities surveys reported the results of the 1971 study which showed automation, personnel, and equipment of over 600 libraries, 200 of which were college and university libraries. Of the 200 college and university libraries, each reported at least one automated activity.

Problem Areas in Library Automation

It seems that librarians in the past have been willing to report in the literature the successes they have experienced in their automated activities but apparently have not reported problems or failures as reflected by the dearth of information in this regard. But as Stephen R. Salmon of the University of Houston Library states, "no picture of library automation is complete unless problems as well as successes are noted." Although the information is limited in amount, the problems that have been reported will be discussed here.

Veaner in 1974 wrote of the factors affecting library automation development during the years 1967 to 1971. He points out three major factors that inhibited the application of computers in libraries: (1) governance; organization and management of the computer facility; (2) personnel in the computer facility; and (3) deficiencies in the library environment, such as the inability to communicate design specifications. Salmon's views are in agreement with Veaner's as reflected in his exploration of problem areas in library automation. Salmon states that difficulties appear to involve "three groups of people: (1) computer center and systems personnel, (2) suppliers of hardware, and (3) librarians; as well as three types of problems: (1) poor design, (2) poor planning, and (3) poor implementation." He cites examples in each of these categories some of which are here quoted for full emphasis.

Computer Center and Systems Personnel:

> Availability of computer processing time; the lack of priority given the computer center to the development of library systems; lack of control by the library over decisions regarding continuation of projects; attitudes of computer center personnel and their ignorance of library operations.

Suppliers:

> Failure of suppliers to deliver the necessary equipment; inadequate service response; and faulty supplies.

Library Staff:

> Failure to distinguish legitimate research and experimentation from operational improvements or to provide separate funds for research; lack of reporting to the profession the problems encountered; lack of training in programming.

Poor Planning:

> Many projects have been started because of internal or external pressures to be modern or to keep up with the Joneses of the library world.

Many of the problems noted by Salmon and Veaner are reflected in a study by Patrinostro (1973). Six hundred libraries were surveyed in the United States, Canada and Great Britain. Each was reported to be actively engaged in the implementation of computer-based systems. All of the libraries surveyed were asked: "What problems have been encountered in your automation activities?" An astonishing 44% responded that they had not encountered a single problem. Another 10% responded that the problems encountered were of such minor nature that they were not worthy of reporting. More than 33% of the libraries failed to respond. The remaining 13% reported problems such as the following: lack of control over shared personnel; inadequacy of

personnel; staff shortages; machines failures and shortages; inadequacy of long-range planning; absence of a coordinated approach to systems development; lack of suitability of library organizational structure for integrated library systems; low budgets; poor system design; lack of programming and debugging systems; and limited systems capability.

Unfortunately, the results of Patrinostro's study were not edited nor tabulated by categories; therefore, it was impossible to see with what frequency these problems occurred.

Grosch brings to our attention general problems in need of resolution. Some of these problems and need areas are:

> More emphasis on cost/benefit analysis of the new emerging technologies and automated systems compared to manual ones.
>
> More satisfactory resolution of some still very intricate problems inherent in certain output systems, such as COM output using full ALA character set.
>
> Development of computer-to-computer communication among major online networks and among individual libraries using their own computers.
>
> More recognition by hardware suppliers of the needs and potential market for devices designed for library use; particularly CRT terminals, circulation terminals, and low cost, high capability slow-to-medium speed printers.
>
> And, finally, more attention to the ways in which the computer can provide information to improve the management, organization and budget allocation of the library rather than merely perform functions once performed manually.

Some of the problems pointed out by Grosch are presently receiving some attention. Plans are now underway, for example, to connect the Research Libraries Group computer at the New York Public Library to the Library of Congress computer system. Also recently, many CRT

terminals have come to the market offering full ALA character set capabilities. These terminals still do not, however, offer a wide feature choice nor all desired functions needed or desired by library system designers (Grosch, 1976).

Trends in Library Automation (Present and Future)

Present-day trends in university library automation are based on what Grosch calls the four generations of computer systems in libraries.

The first generation is described as the largely experimental use of Hollerith cards and hard-wire card processing machines. The second generation comprised the move to the digital computer in a batch processing mode for application such as circulation, book ordering, accounting and serial listing. The third generation involved a wider integration of application capabilities and dependence upon on-line data entry, updating, and output using the IBM 360/370 generation computers. The emerging fourth generation consists of widely integrated application systems supported by on-line computer systems operating in either network or stand-alone environments.

Kaplan (1973) also speaks of the developments of the past which have set the stage for trends in the present day library atmosphere. He broadly covered the development of library cooperation in the United States during the period 1875 to 1973 and reviews in detail the interaction between various library groups. Kaplan reemphasized the need for further cooperation between libraries in a number of areas but most specifically in the area of computerization.

The literature revealed a few trends in the university library of today. In the sixties and seventies the growth of shared, networked, and on-line systems for technical services were evidenced. These trends have been brought to bear through such networking systems as OCLC, FAUL, PALINET, NELINET and BALLOTS, discussed later in detail. The seventies have also seen the university library making use of commercial vendors such as LOCKHEED and BRS to meet the information needs of its patrons through machine-readable data bases for computerized literature searching. Computerized literature searching is another development of significance.

The literature pointed out conflicting views about the trends of research and development of automation. Butler (1975) concludes that library automation is out of the research and development stage and into the practical operational stage. The literature, however, revealed that this is true only in part. It is not really true for large on-line integrated systems, that is, those systems that use the latest programming innovations, or systems making use of the latest in distributive computer technology. DeGennardo (1975) expresses the view that the day of individual or small group systems development is past and that it is not feasible economically for the majority of libraries to undertake development. Other writers, including Grosch, think that there may be increasingly fewer institutions involved in research and development on a grand scale; however, new technology will undoubtedly permit lower cost and thereby allow for more systems development.

Perhaps this conflict of views could be resolved if the development of a system is viewed as the operation of that system and that any system is evolutionary in that its continued operation will generate research and development. The real era of computer research and development in libraries, however, would appear to be just beginning. The profession appears to be beginning to recognize the interrelationships among the large number of applications tasks that can be performed through on-line systems.

Librarians, like persons in other professions, are given to crystal-ball gazing into the future. The fact that the information explosion continues to grow at a tremendous rate urges librarians to greater heights of sensitivity to the future and the place of automation in the future.

J. Georges Anderla (1973) in his publication Information in 1985: A Forecasting Study of Information Needs and Resources predicts the information explosion rate of the 1980s. He tells us that in excess of 6,000 to 7,000 articles and reports will be produced each working day. Book items will also be growing at a rate of 100 million unique titles per year. Similar prognostications have been made by Kochen (1967) and by Licklider (1966).

Future trends in academic and research libraries is extensively explored in two books which are important reading for library automation planners and decision makers. Although both books are about the specialized topics of academic and research libraries, the content,

particularly the conclusions, have implications for other types of libraries. In Economics of Academic Libraries by Bavmol (1973) library statistical data from 1949 through 1969 are analyzed and some general conclusions about the economics of academic libraries are made. It is predicted that, in the decades ahead, economic and technological factors will force librarians to change their present labor-intensive mode of operation toward a more automated mode, and they urge librarians to prepare for change now. Of particular interest is their very-long-term approach, which is decades instead of years. Fussler (1973) looks at research libraries and technology for the more immediate future, that is, the next five to ten years. He analyzes the appropriateness of a variety of technologies including computers and telecommunications, microforms and other photocopies, and facsimile transmission of textual materials. He concludes that "the basic economics and other characteristics of large research libraries and the characteristics of the relevant technologies are such that entirely, local, independent, technological developments are unlikely to save large sums of money or radically improve performance with the limits of existing expenditure levels and concepts of service.

Grosch sees the 1980s as a period in which the fifth generation of computers will emerge. This generation will undoubtedly see the computer-to-computer communications tying various levels of individual libraries to networked systems. She further describes the systems of the 1980s which will build upon new concepts and technologies. Highly

integrated on-line systems for libraries of all types will be developed. These systems, according to Grosch, will not only be capable of performing all of those common routine applications associated with daily library technical and public services, but will also be capable of extending the profession's ability to cope with the complex policy, budget, and organizational problems that libraries in our society will face.

Kenneth J. Bierman of the Virginia Polytechnic Institute and State University believes that the recent trend toward computerization of existing library processes will continue for at least the short term. The growing demand for economy and efficiency in library automation, however, will increasingly force precise cost-effective studies to justify new projects. Although the path of new development might be slowed, Bierman thinks that in the long run the effects will be beneficial.

While the literature clearly illustrated that the past decade of the 1960s was a decade of progress, the 1980s will present a variety of choices to university libraries in the United States. Some of these choices are: the enhancement of network bibliographic applications in relations to shared collections; the improved management, statistical and research applications; and more integrated reference/retrieval functions across a wider spectrum of data base types and resources through computer-to-computer networks.

After careful assessment of the literature, it appears that perhaps in the long run the greatest impact of the computer in libraries will be in the area of networking. The use of computers and communication technology to provide increased resources through communication, and even delivery systems among libraries and library users may be, in the long-range future, the major benefit of technology to the library and information science field.

Attitudes of Librarians Toward Automation

Librarians have received automation with caution, but all in all they regard it as a time, labor, and cost saving process. Few objections have been reported in the literature.

These few objections, however, have been voiced with vigor. Ellsworth Mason published an article entitled the "Great Gas Bubble Prick't or Computers Revealed by a Gentleman of Quality." This article started a debate. Mason's attack continued in 1972 when he described "modern society as retreating from reality, resulting in an unwillingness to think problems through to their ultimate conclusions; as being concerned with imitating industry; and as being unable to question marketplace ideas."

Many authors rallied to defend the computer's place in libraries. Two such writers representing what could be expressed as the collective views of many librarians are Avram and Kilgour. Kilgour speaks of the computer's "superb ability to treat users as individual persons. The

machine possesses the potential for enabling big libraries to recapture the human qualities of which classical librarianship has deprived them since their days of one-librarian libraries." Filgour furthers his discussion with a number of specific illustrations: "librarians will use computers to improve those present services that are seriously breaking down; to improve access to library holdings; to provide personalized bibliographies; and even to lower costs."

Avram defends automation in libraries in an article entitled "Library Automation: A Balanced View." She states that "without a doubt, hardware has been oversold and . . . many library automation projects are directed by librarians with a good deal less experience in computer technology than it takes," as she concedes to shortcomings in the field. She points out, however, that the great increase in the amount of materials handled in libraries, coupled with rising costs, has made it necessary to find a means of using librarian expertise at as few points as possible in the system. Avram also speaks of the future, noting that, although there are successful systems in operation now, we are still in a period where there are problems requiring solutions and concepts calling for further development.

Avram and Kilgour, like others in the field, question the validity of Mason's tendency to judge library automation solely on the basis of cost, suggesting that libraries today provide better service or handle larger volumes of traffic where computers are used.

This issue is far from resolved. It should be pointed out that the arguments presented by Kilgour and Avram do not contain the kind of hard facts that will be required to successfully refute Mason's argument. And while few librarians have spoken in favor of Mason's views, some librarians, as revealed in the literature, have no interest in bringing computer-oriented services to their libraries.

In a testimony to the National Commission on Libraries and Information Science in 1974, Sims stated that Kansas Libraries have not been involved in computer development to any great extent, and with present funding, considers such involvement a luxury. Mr. Sims does not request funds that would permit investment even on the lower levels.

Cataloging

Among the first recorded attempts to introduce computers in university libraries was in the form of book catalogs, according to the literature reviewed. Since that time, the book catalog has been a common occurrence of long-standing in the academic library. The advantages and disadvantages of card catalogs have been written about extensively.

The proponents of the card catalog have maintained that its advantage is that the file may be easily updated by inserting new cards in their proper sequence. Computer advocates have discovered that updating can easily be done by computers; that filing and updating

by machines tend to be faster and more accurate than by humans; that print-outs can be produced; that deterioration or destruction of the card catalog can be avoided by having a master file that can be safely kept; that special bibliographies can be produced by making copies of segments of the catalog; and that it is more convenient for the user to examine a book format with many entries per page than it is to use a card catalog.

Perreault (1965), an advocate of the book catalog, writes of the superiority of the book catalog over the card catalog: "in almost all areas of comparison: accuracy, handiness, intelligibility, flexibility, currency."

Parker (1964) points to the many disadvantages in card catalogs: "they are cumbersome to use, individual entries tend to be lost among the many cards; filing becomes difficult and is hindrance to effective use." He goes further and cites the cost of card catalog cabinets, of the space they occupy and the cost of catalog maintenance. According to Parker:

> As libraries grow in use and size, the single copy of the card catalog becomes inadequate. In colleges and universities there are special collections and departmental libraries . . . and then there is the use of the catalog by the staff itself for reference purposes, for acquisition checking, and for editing by the catalogers themselves. In some large universities, the demands on the central catalog are so great that it is difficult to find time to file cards into the catalog.

Many libraries are presently studying alternatives to the traditional card catalog format. The alternatives receiving most attention at this time are on-line catalogs and COM catalogs. The primary force

behind this move is the many changes in the new cataloging rules, and the planned closing of the Library of Congress Card Catalog in 1981.

One element must always be considered regardless of the alternative form of the catalog under consideration: the element of catalog usage; more accurate information about why and how catalogs are used.

The literature revealed a number of catalog use studies. Lipetz (1972), for example, offers a concise summary of his previously published information about catalog use at Yale.

Palmer, in a frequently quoted publication, reports on an extensive use study of users of the catalog at the University of Michigan. The purpose of the project at the University of Michigan was to examine the users and uses of the catalog and to determine whether or not most patrons of the catalog would find entries consisting of only five basic bibliographic elements sufficient to meet their needs. A total of 84% of the users found what they were looking for in the existing catalog, but 11% were seeking bibliographic data. Since only 84% of successful catalog users would have been satisfied with a five-item file, Palmer recommends that more data be gathered before a decision is made about which information might be omitted from the file. Perhaps one of the most valuable features of this publication is the comprehensive listing of catalog use studies. Each study listed includes the purpose, methodology, and findings (Palmer, 1972).

Kirkelas in a similar publication reports some general characteristics of catalog usage and the patron: (1) At any given time, between

25% and 45% of individuals entering a library will use the catalog; students comprise the largest single group of catalog users. (2) The approaches taken to searching the catalog vary and are related to the patron's educational status; the frequency of known-item (as opposed to subject) searches increase as the educational level of the patron increases. (3) The majority of catalog inquiries are made to identify English-language materials of relatively recent dates to complete classroom assignments. (4) The most frequently used items on catalog cards are author, title, subject headings, call number, and date of publication. (5) Between 70% and 80% of all searches are successful to the extent that a user is able to identify some relevant document; of the failures, 5% to 10% are attributed to the fact that the document is not in the library's collection. Kirkelas' article, like Palmer's publication, concludes with an excellent bibliography and a chronology of use studies (Kirkelas, 1972).

The advent of the MARC (Machine Readable Cataloging) experiment in 1966 marked the beginning of a line of development which successfully affected computer applications in library operations, including the standardization of computerized cataloging (U.S. Library of Congress, 1968). One of the most important elements illustrated by the MARC project was that libraries could periodically produce machine-readable catalog data for commercial distribution. In addition, bibliographies could be produced which was of interest to local academic communities.

Perhaps the largest cataloging venture in university libraries in the past decade has been cooperative on-line cataloging. The prevailing force behind on-line cataloging has been and continues to be OCLC.

The Ohio College Library Center (OCLC) at Columbus, Ohio, was formed on July 6, 1967, to "establish, maintain and operate a computerized regional library center to serve the academic libraries of Ohio (both states and private) and designed so as to become a part of any national electronic network for bibliographic communication (Kilgour, 1973). OCLC when formed anticipated development and implementation of six subsystems: (1) an on-line union catalog and shared cataloging system; (2) an interlibrary loan communication system; (3) serial control; (4) technical processing with initial emphasis on acquisition; (5) remote catalog access; and (6) user access by subject and title.

Perhaps the best concise source of current information on OCLC is the Ohio College Library Center Annual Report. The 1976/77 report includes the following:

> The Ohio College Library Center has again achieved a rapid growth in performance. Billable first-time uses rose from 4,118,878 to 5,942,423. Participating libraries continued to enjoy existing records already in the system for 92.4% of the titles cataloged. The Center produced 60.9 million catalog cards, up from 39.6 the previous year. At the end of the year on-line catalog contained more than three million catalog records and nearly twenty million location listings.

OCLC, unlike the MARC tapes available through the Library of Congress (LC), provides a service which uses the computer to facilitate the shared cataloging of materials. Records at OCLC are the product of

all participating libraries, whereas the MARC records at LC is the product of that single library.

Information from OCLC for the fall of 1977 carry some interesting statistics:

1. If a system did not have a large base of catalog records from participating libraries, about 40% of the time an existing MARC record from the Library of Congress (LC) would not be found. The failure rate for a catalog entry in OCLC is only 7.6%. Thus, based on this measure, OCLC is five times as efficient as MARC alone.

2. On the average, 32% of the monographs covered by the MARC files have been cataloged by some other library before LC. But 26% of MARC records had not been used by another library. Thus, of materials used, 43% has been cataloged first elsewhere. This clearly implies that slow processing at LC is a major national expense for libraries, resulting in much duplicative processing. (Ohio College Library Center Annual Report, 1977).

In addition to this catalog card production system, OCLC has completed its serial check-in system, and in 1977 it was being used by 29 libraries. Scott and Allison (1977) offers a report of this system.

While the OCLC complex is perhaps one of the most successful on-line cataloging ventures, it has not been without its problems.

Perhaps the largest OCLC problem area has been its governance structure. The Board of Trustees of OCLC have by law been Ohioans and this has led to concerns among network participants in other states. The major concern regarding the degree to which OCLC could be a national resource is described by Stevens (1977) from the viewpoint of the New England Library Information Network. In December, 1977, the network's name (OCLC) was changed to OCLC, Inc. to reflect the amended governance structure which allows for nationwide representation on the Board of Trustees.

While OCLC has by far been one of the most successful on-line cataloging operations, there have been, however, several new services developed in the past few years. Two such major systems have been BALLOTS (Bibliographic Automation of Large Libraries Using a Time-Sharing System) and WLN (Washington Library Network). BALLOTS is presently a strong competitor to OCLC. As of May, 1977, BALLOTS had 108 users, 25 using the shared cataloging services. BALLOTS and WLN offer one particularly capacity that OCLC does not offer. This particular capacity is a full subject search service on the catalog file generated by the participating libraries and a text search capability for words in the title of its MARC file. Levine and Logan present (1977) a detail comparison of OCLC and BALLOTS. Descriptions of WLN can be found in Reed (1975) and in Franklin and MacDonald (1976).

Circulation

Most libraries lend books and other materials to be read in places other than the library. This is convenient for all parties involved: it is convenient for the user; it increases the use made of the library's collection; and it reduces, to some degree, demands for reading space within library buildings.

After books and other materials have been loaned, records must be maintained of items loaned. There are, of course, good reasons for maintaining records: they reduce the loss of library materials and also help library staff to answer user questions regarding the location of materials not in their proper locations.

Out of such records has arisen a variety of recordkeeping systems. Perhaps in the large university library the most popular system is the circulation control by use of the computer.

The literature, however, points up the fact that libraries on the whole continue to use manual circulation systems. Usually, only libraries with very large collections or high levels of circulation activity such as the research-oriented university library, are likely to use computerized circulation systems. The continued use of manual circulation systems is illustrated through a 1971 survey by the Library Automation, Research and Consulting Association (LARC) on library automated activities in the United States. Of the 506 libraries responding to the survey, 197 reported automated circulation as follows: 80% were general batch processing circulation systems; 8% dealt with control of overdues; 4% were on-line circulation systems; the remaining 8% dealt with such aspects of circulation as registration, statistics, reserve book collections and faculty charges (Patrinostro, 1971).

Experimentation with computers in circulation control was recorded as early as 1930, when Dr. Ralph Parker made use of the IBM book cards. Because the equipment needed was unavailable at the time, Parker used the IBM card as a fast method of producing overdues. When the University of Missouri had its business office computer made available to Dr. Parker, he was then able to think in terms of a fully automated circulation system (Brown, 1933).

Computerized automated circulation systems capacity have grown tremendously since that period. Such present day systems can be

categorized into four groups based on the mode of operation: manual, semi-automated (non-computer), data collection (batch), and on-line (Surace, 1972). Fry in 1961 described more than 28 circulation systems which were variations of two basic types: The Neward self-charge system which originated around 1900 and based on a book card system and the transaction card system (Fry, 1961). For this writing, however, the two computerized circulation systems as described by Surace will be discussed.

The computerized circulation system is designed to capture and manipulate three kinds of information:

> Information about the borrower (such as name, address, telephone number, identification number and borrower category).
>
> Information about the materials being borrowed (such as call number, identification, author, title, and date).
>
> Information about the loan itself (such as date due or date of loan and in some cases, time of loan).

Most writers agree on a list of common features of computerized circulation systems depending on the degree of sophistication:

1. A current record of the location of all types of library materials in circulation.
2. A record of the location of all materials that are not in their usual storage sites in the library; e.g., reserve collection, long-term loans; interlibrary loan; bindery; technical services; and withdrawn items.
3. Automation processing of call-ins, renewals, reserves, overdues, preparation of fine notices, and notification of missing items.

4. Multiple copies of printouts of the circulation record by call number, due date, borrower, or other data elements.
5. Procedures for circulating uncataloged materials.
6. Provisions for serving various types of regular patrons who enjoy various borrowing, use, and loan-period privileges, and for dealing with special users and uses.
7. Programs that readily and economically compile an array of statistics to aid efficient library management, including analyzing the pattern of circulation activity.
8. Programs that present circulation records in formats to allow easy analysis for further acquisition, duplication, or weeding of library collections (Salmon, 1975; Palmer, 1973).

From the standpoint of the academic library, the ideal automated circulation system should preserve most of the advantages of a manual system and must also be less expensive, or more efficient in utilizing personnel, or more efficient in service. The off-line and on-line computerized circulation systems offer many advantages.

Results of several surveys indicate that most computer systems now used in libraries are off-line. In the off-line system, the IBM punched book card and the IBM punched identification badge are brought together to produce a third punched card. This record, in turn, is taken to a processing center such as a computation center once a day and an update of the printout file is returned to the library the next day. Most off-line systems provide means of sending out over-due notices. The

off-line systems does, however, have its disadvantages: the physical movement of records to another location (e.g., computation center); the amount of paper used daily (especially when outlying locations are involved); the lack of information on daily circulation until the print-out arrived.

On-line systems, that is, those circulation units which have direct access to a computer, have further improvements over the off-line system. Many writers have developed requirements for properly developed on-line systems: (1) provide for rapid charging and discharging as well as immediately available information on the status of borrowed material, (2) provide for processing overdue and fine notices, and (3) provide meaningful statistics without undue clerical manipulation.

Kimber in 1968 stated:

> Of all areas of library work capable of automation, circulation control is probably the one most suited to on-line working, and is likely to benefit most from this method of operation.

Perhaps the one area that the literature is lacking in terms of automated circulation system is in the area of cost effectiveness. More specifically, cost effectiveness of the various circulation systems in terms of the total collection, size of the circulation file, annual circulation activity, the conversion and equipment costs, etc. Some cost studies have been undertaken: Fry, 1961; Library Technology Reports, 1965; and Kimber, 1968; but they appear to be incomplete and provide little insight into cost trade offs which would have to be made when converting from one system to another. Only Fry in the

Library Technology Reports attempted any analysis of the different systems. These studies are not of current value, however, since they measured and compared the system at one point in time only.

Accurate predictions concerning the future use of computerized circulation system are difficult to make according to the literature. However, one has to admit that computers provide speed, accuracy, and convenience, and they can also maintain records involved in circulation control faster and more accurately than humans. In addition, new computer circulation systems employing light pens for input of book and borrower information can to a large extent solve the problems and cost of converting library records into machine readable form.

Some librarians, at Harvard University, for example, have found computerized circulation systems to be essential regardless of cost and other problems, because manual systems were inadequate to handle their library's volume and rate of circulation (De Gennaro, 1968). Librarians at the University of Michigan faced a problem a few other institutions shared. Their manual system took up too much space and they could not meet increasing demands. A number of library administrators have chosen to utilize a computer system because they believed that for additional expense they could provide significantly better service. Such decisions were made at Easter Illinois University and at Northwestern University (Rao, 1971).

Serials Control

The average librarian knows that serials are among the most difficult materials to control within a university library. Concerning the difficulty of automating serials records, Hammer is of the opinion that "serials is by far the most difficult area to automate." He further states:

> The problem with serials is, of course, the many variables and the lack of consistency. Very few serials seem to be published in like manner, and they often vary from issue to issue within the same title. . . . Another aspect of the same problem is that it is almost impossible to plan in advance for all such variations because of the enormous quantity of them hidden in the enormous quantity of serials themselves. . . . In short, it is almost impossible for planning purposes to get the overall view of all the variables (Hammer, 1965).

Similar views on the difficulties involved in the automation of serials are expressed by Stewart (1966), Jennings (1968), and Bryan (1967).

The technical core of the serials operation in large libraries compares very closely to the acquisition and cataloging operation for books. Serials control, however, is much more complex. The technical activities carried out in serials control are: placing and renewing subscriptions; checking in individual issues; posting to the master serials holdings record; claiming issues not received; maintaining binding records; departmental cost records; fiscal records; routing records; location and disposition records; vendor activity records; and title, subject and language indexes.

Many academic libraries are making use of the computer as an aid to solving the many problems involving serials. Such systems can provide the library with levels of detail and precision of timing for claiming, ordering, reordering, payments, etc., that manual systems cannot provide. The literature, however, constantly cites the fact that the problems in the very nature of serials will not disappear with the use of computer systems.

In spite of the problems that serials controls represents, several university libraries have developed automated systems to control their serials records. Perhaps the one most frequently reported in the literature is the project started at the University of California at San Diego (UCSD) in 1961. According to a report on the UCSD project, it was the "first operational computer application to the maintenance of serial records and to any aspect of library record keeping in a university library."

The report states that serials were selected for the initial project at UCSD Library for several reasons:

1. Serials records are among the most difficult and most costly to develop and maintain.

2. The resulting records, using traditional methods, are difficult to use and are not accessible to the library user except through a library staff member.

3. Serials are the most important materials in the sciences, with the emphasis on science on this campus, most in need of immediate improvement in records.

In addition to the advantages to the library user of this automated project, cost estimating shows the computer system to be more economical

than the former manual system. According to the Project Staff, the computer system can be justified economically without reference to the added services it provides; but even if it could not, the staff feels it would still be worth doing (University of California, San Diego, 1962).

The Project Staff of UCSD also expresses an opinion regarding whether similar systems should be developed in all libraries. They express a doubt that a library with less than 1,000 or 1,500 serials would find a computer system for serials worthwhile unless the library had access to computer facilities and those facilities were available at low cost.

Since the development of the automated serials system at the University of California at San Diego, individual libraries continue in their efforts to develop automated serials systems. An on-line computer-based serials system accommodating a relatively small list of serial titles at the Moranic Valley Community College is reported in the literature (Harp and Heard, 1974). The system is capable of generating claims and purchase orders. While it is not innovative, it is an example of a library's efforts to serve its automation needs in spite of limited resources.

Another well known automated serials control system is the one operating at Purdue University Library. This system was installed in 1964 and at that time was controlling more than 10,000 serials. The number of serials was expected to continue to grow because of "the additions of new subscriptions, gifts and exchanges" (Hammer, 1965).

While a number of individual libraries' efforts in automating serials is reported in the literature, it is appropriate to speak at this point to the extent of the automation of serials operations in large university libraries. Rosamond H. Danielson reports that a 1964 survey of member libraries of the Association of Research Libraries revealed that eleven of these libraries had automated some aspect of their serials operations; at least twenty more libraries indicated that they planned eventually to automate one or more of the serials processes; while others mentioned that automation of serials operations was under study (Danielson, 1966).

A similar survey was taken in 1971. The results of this survey revealed that most libraries have not attempted automated serials systems. Only 216 serial and periodical computer applications were reported by 506 libraries responding to the 1971 LARC survey. Of those that are applying computers to serial control, 94 have automated title listing; 71 have complete serial systems; 16 have subscription control; 12 have bindery control; and the remainder deal with other serial applications (Patrinostro, 1971).

Efforts toward serials control on the national level have been reported in the literature since mid-1960. A study by the Library of Congress begun in 1965, concentrated on the development of a comprehensive format for recording bibliographic information about serials in machine-readable form. By 1974, the project was viewed as "merging on the chaotic" and an "alarming threat."

Livingston (1975) in a paper presented to the Association of Research Libraries stated:

> By admission, CONSER would undertake in the area of serials to create a data base of serials according to standards which may or may not be acceptable or consistent with previous records or emerging standards. It would attempt to do this by setting up a legally complex entity, making use of bits and pieces of technology and files, and involving a number of librarians having widely differing objectives and standards. It might work, but then again it might not. A project as important as the building of a national serials data base must have a firmer base if it is to be effective and win the confidence of librarians.

Fasana (1974) expressed a particular concern that no authority control system was proposed for the initial conversion project, which had increased its goals from 200,000 to 300,000 titles and that insufficient consideration had been given to the conflicts between the Anglo-American Cataloging Rules for serials, the International Serials Data System (ISDS), and the International Standard Serial Number (ISSN). Fanana understood that "the sense of urgency that has fired recent serials developments is a reaction to the long years of study, deliberation, and inactivity that went into the original Serials Data Program, however, it is irresponsible to insist that getting something done is reason enough to forge ahead regardless of the consequences."

The literature revealed that the conflict surrounding the CONSER Project still remains. Observers on both sides of the controversy, however, seem to agree on one point: that the CONSER project was and still is the most significant and important development yet in automated serials systems.

Acquisition Systems

Most automated library acquisition systems are designed to handle the considerable amount of clerical functions involved in the purchase of library materials. These functions typically are:

> print purchase orders; maintain book funds account and print fund reports of various types; provide information on outstanding orders and sometimes on materials in process; and prepare forms of payment of materials received (Salmon, 1975).

Automated acquisitions systems may be of two types: off-line or on-line. The obvious advantages of the off-line system are speed, accuracy and the storage and manipulation of data. The on-line system because of its direct communication with the computer, however, can handle all of the activities of the off-line system and in addition, eliminates many of the steps involved in the use of less sophisticated systems (Hayes, 1965).

The literature revealed that most libraries continue to utilize manual acquisitions systems because their rate of collection building has not put excessive pressure on the acquisitions operations or because the complexity of acquisitions process prevents an inexpensive transfer of the process from manual to computer control. A survey taken in 1971 by Patrinostro appears to support findings in the literature. Of the 1,366 library computer applications reported by 506 libraries in this LARC survey, 215, or about 16%, were projects dealing with acquisitions. Of this 215, 107 were full systems, 40 were fund accounting, 28 were book ordering, 11 were acquisitions listing, and

the remaining 33 were systems dealing with special aspects of the acquisitions operation (Patrinostro, 1971).

Dunlap in 1967 in an address before an ALA preconference audience regarding the status of automated acquisition systems, indicated that no on-line systems were in use. She continued by stating that even though some such systems had been planned, it appeared that most libraries would find these systems too expensive. The picture has changed to a limited extent since 1967.

The automated acquisition system most commonly used today makes use of computers in an off-line mode. There appears, however, to be as many variations of this type as there are libraries using them. One of the earliest such systems was installed at Penn State (Minder, 1964). The Chicago campus at the University of Illinois implemented design for a total system in 1965 (Schultleiss, 1965). Also in 1965, the automated acquisitions procedure at the University of Michigan became operational (Dunlap, 1967).

According to Dunlap and other authorities in the field, relatively few libraries report the development of on-line systems for acquisitions primarily because of the high cost. Some university libraries that have designed total on-line systems through facilities at their institutions' computation centers have found that they can incorporate acquisitions functions include Washington State University (Burgess and Ames, 1968), the University of Chicago (Payne, 1967), Stanford University, and Columbia University.

Perhaps the earliest on-line automated system to be implemented in a large university library was in 1968 at Washington State University Library. This system used three IBM 1050 terminals on-line to an IBM model 67.

Since both on-line and off-line input are possible, Washington State University Library has made comparative studies of the two methods. The results indicate that operators prefer to work on-line, and make fewer errors as a result. According to Burgess and Ames, most errors are identified immediately by the computer, or are recognized by the operator, so that they can be corrected at once. As a result the amount of erroneous information flowing through the system is drastically reduced.

In 1971 Syracuse and Northwestern both implemented on-line acquisitions systems. Palmer (1975) makes comparisons of the two systems:

> Northwestern's (system) provides input from MARC tapes, converts foreign currency, and writes checks, whereas Syracuse's does not; on the other hand, Syracuse's system automatically issued cancellation notices, checks for duplicate billing and duplicate orders, assigns funds based on the subject matter of the item being ordered, produces accession lists and delinquent order lists, and provides a wide variety of other management information, none of which is provided at Northwestern.

Perhaps one of the most publicized acquisition systems is LOLITA (Library On-Line Information and Text Access), used by the Oregon State University Library. This system was developed over a three-year period at a cost of approximately $90,000. Spigni indicates that this low cost was made possible because of an existing time-sharing system at

the University's computer center, and that "programming efforts could be concentrated exclusively on the design of LOLITA and an earlier Pilot Project. No time was needed to debug or redesign the operating software" (Spigni, 1970).

One writer reporting on LOLITA states that:

> Acquisitions personnel have been transferred to other duties, bookkeeping loads on the college bookkeeping operations have been reduced, lists of new books are more complete and are produced with less labor, and the system provides input to the cataloging operation which has resulted in some further saving there. The fund accounting system is sound and is now accepted by the state for legal accounting purposes (Buckland, 1973).

Perhaps the most sophisticated automated acquisition operation is Stanford University's BALLOTS (Bibliographic Automation of Large Library Operations Using a Time-Sharing System). BALLOTS is a combined or "integrated" technical processing system, and includes both acquisition and cataloging function." By 1975, over $2.5 million in grants from the Office of Education, the Council on Library Resources, and the National Endowment for the Humanities had been spent on its development. Design began in 1967, but the first production operations did not occur until 1972, when the first part of the acquisition system (the MARC module) was implemented. The first segment provided the capacity of searching machine-readable cataloging data supplied by the Library of Congress. It was used to order and catalog books. During the first year only MARC titles could be handled, but by late 1973 other parts of the system had been implemented, and non-MARC titles could also be acquired and cataloged. Serials, standing orders, and approval orders are also now

handled by the system. Although in contrast to most other acquisition systems, fund accounting is not.

The searching capability of the system is perhaps its most important feature, with many indexes on-line and numerous automated hints and instructions from the computer as a search progresses. There is also a program for training new users of the system via the terminal itself (Stanford University Libraries, 1975).

Perhaps the greatest impact of automated acquisitions systems has been to reduce errors associated with manual sorting and with typing; to speed the flow of materials through library processes, to aid selection by providing fast access to central files, and to enable librarians to advise the patron of the exact status of a particular work.

Reference Services

Reference departments in academic libraries have perhaps made less use of computer technology than any other library area (Mathies, 1973). The major problem regarding this lack of usage is related to the technical limitations that prevents the rapid conversion of printed matter into machine-readable form.

As a result of recent technological advances in this area, many private and non-private organizations are making tremendous strides toward converting their printed indexes and abstracting publications, bibliographies and catalogs to machine-readable formats as a by-product of manuscript preparation.

The federal government generates a number of machine readable data bases. Some of these are ERIC, MEDLINE, CAIN and NTIS. Researchers also have access to such machine-readable data bases as Psychological Abstracts; the New York Times' Information Bank; Chemical Abstracts' CONDESATES; the American Institute of Physics' SPIN; Engineering Index: PENDWX; PREDICATS; and others.

College and university libraries' Reference librarians are expanding their ability to meet the bibliographic needs of their patrons through the increased availability of machine-readable data bases. The two form of machine-readable data base literature searching are SDI and retrospective searching.

SDI (Dissemination of Information) is described by Warheit (1965) as a process whereby the "computer can browse through the new literature and pick items of potential interest to an individual." He further states that:

> These systems essentially index documents and other information sources according to some predefined coding system. These codes which represent information contained in the information sources are compared through the use of a computer with similar codes that also define the interest patterns or profile of the individuals participating in the system. The individuals are then notified, sent abstracts, or provided copies of the information and documents that should be of interest to them.

SDI and retrospective literature searching differ with respect to the currentness of the files against which they are processed and the respect to the number of times the question is run against the files. Williams (1974) compares the SDI and retrospective searching: a retrospective question is one which is run against older, historical or

past files, whereas the SDI search is run against only the current or most recent files. A retrospective question is usually run once against a collection of many data base issues or volumes, a SDI profile is run many times--each time against a different issue of the data base.

The purpose for which SDI and retrospective searching is performed is a distinguishing feature between the two. The purpose of the retrospective search may be to provide the user with (1) an extensive coverage of the literature on a particular subject; (2) a few relevant sources as a means of becoming acquainted with a topic; (3) one or more references that contain answers to a specific question. These searches are conducted on demand and in "past" or retrospective files. In contrast, SDI searches are conducted in order to keep the user up to date with the published literature in his field.

The information explosion has placed great demands on professionals in terms of keeping up with the literature. If there is to be any coping with these demands, the machine-readable services should be used for retrospective searches as well as for SDI. Robinson (1972) discusses the use of external services for retrospective searching. One can buy or lease data bases for internal processing, buy answers to search questions from a search service, or buy access to an external store of information.

Retrospective searching, unlike SDI searching, can be done both on-line and in a batch mode. Many writers seem to agree that on-line is preferable. Rowlands (1970) and Robinson (1972) point out certain

problems associated with retrospective searching of data bases. Some of these problems are: (1) titles that are adequate for SDI do not provide sufficient discrimination for retrospective searching; (2) the size of retrospective collections is too large to permit serial search, thus file inversion is needed; (3) inverted files uncontrolled vocabulary terms, where a typical three-month collection includes more than 61,000 unique terms with 20,000 additional terms added in the next quarter, provides a basic problem of identifying terms; (4) inversion of free text data bases causes a problem in that left truncation is not possible; (5) the volume of output generated in retrospective searching is often excessive; (6) demand is low, usually one or two questions are submitted at a time; hence the cost per search is high.

In addition to technical problems faced by machine-readable data bases service, Williams (1974) indicates that these problems are also legal, political and psychological. They are perhaps most closely associated with the lack of national leadership, cooperative resource sharing, network arrangement, competition, marketing, copyright, standards, and continued viability.

Data base searching, even with its problems, may have impact on libraries in a number of ways: (1) either increasing or decreasing acquisitions by either pointing out the non-use of some journals or the need for other journals; (2) it may affect the interlibrary loan traffic of the library as either a borrowing organization or as a lending organization; (3) the library may expand or deepen its

services by offering data base search services from data bases it processes; (4) or the library may function as a referral center directing its clientele to the appropriate data bases and service centers (Williams, 1974).

A number of possible future trends in computerized literature searching have been gleaned from the literature. Some of these future trends may be: (1) more data bases, covering more subject areas, with more special purpose subset and merged data bases being developed; (2) the volume of data bases will increase; (3) more data bases will be made available on-line through networks and a larger share of the total data base use will be on-line; (4) there will be more involvement of librarians in data base services; and (5) there will be more emphasis on the man-machine interaction and systems will become easier to use through natural language communication.

CHAPTER III

METHOD OF PROCEDURE

Purpose of the Study

This study was designed to determine the automation tendency in university libraries in the United States; the nature of the problems involved in library automation; the future plans of libraries in relationship to automation; and the degree to which automation is assisting the librarian in the facilitation of instruction.

Delimitations of the Study

This study was limited to university libraries with 500,000 or more volumes, a minimum budget of $500,000.00, and that were members of the Association of Research Libraries as of December, 1978.

The American Library Directory and the membership list of the Association of Research Libraries was used to identify those libraries meeting the population criteria.

Statement of Hypotheses

In order to facilitate statistical analysis, seven null hypotheses were generated. These were:

1. There is no significant difference between the perceptions of the systems analyst and library directors in the way they perceive the problems involved with library automation.

2. There is no significant difference between current library automation and the following factors: acquisition budgets, number of holdings (books, serial titles and microforms), geographic location, and source of support (public and private).
3. There is no significant difference between future plans for library automation and the following factors: acquisition budgets, number of holdings, geographic location and source of support.
4. There is no significant difference between the general period in which librarians received their professional education (pre 1968, post 1968, or both) and the automation tendencies in libraries.
5. There is no significant difference between the general period in which librarians received their professional education and future plans for automation in libraries.
6. There is no significant difference between instructional facilitation and current library automation.
7. There is no significant disproportionality among libraries in terms of the number of holdings (books, serial titles, and microform collections) and the techniques used in displaying information (photocopy machines, typewriter terminals, microfilm readers, microfilm readers/printers, cathode ray tubes and video screens).

Definitions and Qualifications of Terms

Library Automation

Library automation is the application of computers and appropriate software to perform or assist in performing the administrative, technical and public service functions of a library.

Director

The director is the chief administrator of a library. The director will be, for the purpose of this study, any librarian at the top three levels of the library administration (director, assistant director, or department head) who has identified himself/herself as such on the questionnaire.

System Analyst

A system analyst is a person specially trained, experienced, and particularly skilled in the definition and solution of an automation problem. The analyst will usually seek a definition of the problem, develop an algorithm for the solution of the problem, seek its implementation or solution on a computer, and evaluate the results. The system analyst will be, for the purpose of this study, an individual who has identified himself/herself as such on the questionnaire.

Methods and Tools Used for Collection of Data

The data needed to carry out the purpose of this study were gathered through a survey questionnaire. The questionnaire included

items organized in sections. Section I sought background information about the institutions. Section II sought information about the libraries. Section III was designed to gather information regarding the automation tendencies in the libraries surveyed. Section IV was designed to gather information regarding problem areas with automation. Section V was concerned with general information about libraries and automation.

The questionnaire was tested for accuracy of question interpretation through a trial run. The questionnaire was revised according to comments made and was sent to the Human Subject Committee at Iowa State University for approval. Approval was granted on November 17, 1978.

Population

The population used in this study was the member institutions of the Association of Research Libraries (ARL) located in the United States.

ARL membership has always been on an invitational basis to major university libraries whose services are broadly based and recognized as having national significance. Major university libraries invited for membership are those whose parent institutions emphasize research and graduate instruction at the doctoral level. Thus, these libraries support large, comprehensive collections of materials on a permanent basis.

The Observational Unit

Questionnaires were sent by United States mail to all ARL member representatives located in the United States. The number of institutions totaled 87.

A follow-up questionnaire with a letter were mailed three weeks later to each ARL member representative who did not respond to the original mailing. A second and final follow-up was sent three weeks after the first follow up (see Appendix A).

Preparation of Data

The computer facilities at Iowa State University were used to transfer data from the returned questionnaires to IBM cards.

The Statistical Package for the Social Sciences (SPSS) was used for statistical analysis. The SPSS packet was developed through close cooperation of practicing social science researchers, computer scientists, and statisticians. At each stage of development, they attempted to satisfy the following criteria:

1. That the program design and code be computationally efficient.
2. That the logic and syntax of the system be parallel to the way in which social scientists approach data analysis.
3. That the system provide statistical procedures and data management facilities tailored to the particular needs of empirical social researchers.

4. That the statistical procedures be mathematically and statistically correct.

The forementioned goals of the SPSS packet were effectively satisfied through the contributions of experts in the fields of social science research, computer science, and statistics.

Statistical Analyses

The statistical methodologies used in this study were:

1. Descriptive analysis of categories and frequencies in terms of comparative percentages, proportions, and distributions.
2. Chi square to determine if a significant disproportionality existed among the categories characterizing the libraries suggesting the lack of homogeneity as a possible factor in the nature of responses.
3. T-test to discuss and evaluate differences between effects.
4. One-way analysis of variance techniques to test for group differences on the variables.

Specific statistical techniques as they were applied to each of the research hypotheses will be discussed as part of the analysis of data as results of findings.

CHAPTER IV

RESULTS AND DISCUSSION

In this chapter discussion of the findings is presented as well as conclusions which have been reached. These findings are set forth in the order of the program focuses. The findings and discussion are presented along with the appropriate analysis in the following sequence:

I. Summary of descriptive data
   - A. Background information about the institutions
   - B. Background information about the libraries
   - C. Automation of library functions
     1. Functions presently automated
     2. Functions for which automation is planned
   - D. Problem areas in library automation
   - E. Justification of library automation
   - F. Techniques used in displaying information

II. Tests for significance of hypotheses

Eight-seven (87) questionnaires were sent in the original mailing. From the original mailing, responses were received from 45 (51.7%) of the libraries surveyed. The first follow-up resulted in another 20 (22.9%) being returned. The second and final follow-up resulted in 15 (17.2%) additional returns and brought the total responses to 80 (92%).[1]

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[1]Sixty-eight (85%) of the respondents requested a summary of the results of the study.

The data were categorized and tabulated in terms of the major categories of the study. A general reference summary table of the descriptive information regarding the institutions in the study is presented in the Appendix: Table B.1. In cases where count of a category revealed that some cells contained few or no responses, these were combined. For example, the total number of volumes in book collections category was reduced from six to four groups; the first three groups being labeled "less than 500,000 to 1,000,000." Another was in the total number of serials titles in collections category, where groups one and two were combined making the lowest category "5,000 to 12,000." The size of the microform collections was eliminated from the analysis, since 74 of the 80 responses fell into the "more than 120,000" category. In the acquisition budget category, group one (less than $500,000.00) received no responses; consequently, only the remaining five groups could be analyzed. No additional combining of categories was deemed necessary.

Background Information about the Institutions

The information regarding institutions includes: administrative position of the respondent; major support of the institution; and geographic location of the institution. The results of the survey regarding these items may be seen in Table 4.1.

Table 4.1. Profile of the universities surveyed

Category	Number (N)	(Adjusted) % of category	Relative % of total (80)
Total responses	80	100%	100%
Library Position	80		100%
Administrators	67	83.7	83.7
Systems Analysts	13	16.2	16.2
Source of Support	80		100%
Public	52	65	65
Private	28	35	35
Geographical Region	79		98.7%
Region I	8	10.1	10.0
Region II	10	12.7	12.5
Region III	10	12.7	12.5
Region IV	12	15.2	15.0
Region V	15	19.0	18.8
Region VI	7	8.9	8.7
Region VII	3	3.8	3.7
Region VIII	5	6.3	6.3
Region IX	9	11.4	11.2
Missing	1		1.2

It can be seen that the library position of the respondents was predominantly administrators (directors 83.7%) and the largest group of libraries was public 65%. Geographically the responding institutions were predominantly from Regions I, II, III, IV, and V consisting of the states: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; New York, New Jersey, Puerto Rico, and Virgin Islands; Deleware, Maryland, Pennsylvania, Virginia, West Virginia, and District of Columbia; Alabama, Florida, Georgia, Kentucky, Mississippi, North

Carolina, South Carolina, and Tennessee; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin respectively. Over one-fourth of the respondents were in Regions IV and V which accounted for 34.2% (geographically this is largely the Southeast and Midwest).

Background Information about the Libraries

Library holdings, another aspect of the study, set forth information regarding library collections of books, serials, microforms, and acquisition budget. Results in the area of book holdings are shown in Table 4.2.

Table 4.2. Profile of book collections in libraries

Category	Number (N)	(Adjusted) % of category	Relative % of total (80)
Book Collection	79		98.7%
500,000-1,000,000	7	8.9%	8.7
1,200,000,1,400,000	33	41.8	42.2
1,600,000-1,800,000	16	20.3	20.0
over 2,000,000	23	29.1	28.7
Missing	1		1.2

The largest category was 1,200,000-1,400,000 volumes with 41.8% and the smallest category was 500,000-1,000,000 with 8.9%.

The findings in the area of serials titles are shown in Table 4.3.

Table 4.3. Profile of serials titles holdings in libraries

Category	Number (N)	(Adjusted) % of category	Relative % of total (80)
Serial Titles	78		97.5%
5,000-12,000	15	19.2%	18.8
13,000-16,000	14	17.9	17.5
17,000-20,000	15	19.7	18.8
21,000-24,000	7	9.0	8.7
25,000-27,000	5	6.4	6.3
over 27,000	22	28.2	27.5
Missing	2		2.5

The largest group was over 27,000, 28.2%. Two groups were identical with 19.2%: 5,000-12,000 and 17,000-20,000, while the smallest group was 25,000-27,000 with 6.4%.

Regarding microform holding, results revealed that 74 (94.9%) of the libraries held microform collections of over 120,000 units as shown in Table 4.4.

Table 4.4. Profile of microform holdings in libraries

Category	Number (N)	(Adjusted) % of category	Relative % of total (80)
Microform Collect.	78		97.5%
20,000-40,000	1	1.3%	1.2
40,000-80,000	1	1.3	1.2
80,000-120,000	2	2.6	2.5
over 120,000	74	94.9	92.5
Missing	2		2.5

In the area of acquisition budget as shown in Table 4.5, the largest category was $1,200,000-$1,400,000 with 33.3% and the smallest category was $1,600,000-$1,800,000 with 9.0%.

Table 4.5. Profile of acquisition budgets of libraries

Category	Number (N)	(Adjusted) % of category	Relative % of total (80)
Acquisition budget	78		97.5%
$500,000-$700,000	8	10.3%	10.0
$800,000-$1,000,000	18	23.1	22.5
$1,200,000-$1,400,000	26	33.3	32.5
$1,600,000-$1,800,000	7	9.0	8.7
over $2,000,000	19	24.4	23.7
Missing	2		2.5

The general periods (as shown in Table 4.6) in which professional library staffs received their education (pre 1968, post 1968 or both): 46.0% indicated pre 1968, while 41.3% indicated post 1968. Twelve (12.7%) indicated that their staffs were somewhat evenly divided between pre 1968 and post 1968.

Table 4.6. Profile of periods in which professional staff received education

Category	Number (N)	(Adjusted) % of category	Relative % of total (80)
Professional ed.	63		78.7%
Pre 1968	29	46.0%	36.2
Post 1968	26	41.3	32.5
Both	8	12.7	10.0
Missing	17		21.2

Automation of Library Functions

In the area regarding tendencies toward automation in libraries, both current automation and planned automation, the nine library functions reflected were: administrative data processing; acquisition; serials control; circulation control; public catalog maintenance; lists production; computerized literature searching; microform storage and retrieval; and interlibrary communication. The findings regarding current and planned automation are presented in Table 4.7.

Table 4.7. Profile of present and planned automation in libraries

Type of function	Presently Automated		Planned Automation	
	N of 80	% of 80	N of 80	% of 80
Adm. data processing	28	35.0%	16	20.0%
Acquisition	41	51.2	28	31.0
Serials control	29	36.2	29	36.2
Circulation control	47	58.7	25	31.3
Pub. cat. maintenance	53	66.2	22	27.5
Lists production	47	58.7	7	8.7
Lit. search	70	87.5	1	1.2
Microform storage and retrieval	4	5.0	5	6.3
Interlibrary	13	16.2	25	31.3
None	23	28.7	36	45.0

This profile of library automation indicates that computerized literature searching (87.5%), public catalog maintenance (66.2%), circulation control (58.7%), and list production (58.7%) have the highest incidence of

present automation. In the area of planned automation, serials control received the highest number of responses with 36.2%.

The number of functions presently automated and the number of functions for which automation is planned are reflected in Table 4.8.

Table 4.8. Profile of the number of functions for present and planned automation in libraries

Number of functions	Presently Automated		Planned Automation	
	N of 80	% of 80	N of 80	% of 80
0	3	3.7%	8	10.0%
1	4	5.0	34	42.5
2	8	10.0	17	21.2
3	11	13.7	7	8.7
4	17	21.2	5	6.3
5	21	26.2	6	7.5
6	8	10.0	2	2.6
7	6	7.5	1	1.2
8	2	2.5	0	0.0

Three (3.7%) of the libraries in the study have no functions automated and 10.0% of the libraries have no plans to automate any functions in the future. Two (2.5%) of the libraries have 8 functions automated and no libraries have plans to automate 8 functions. No library had all nine (9) functions automated.

Problem Areas in Library Automation

Problem areas related to automation in libraries made use of a scale of one to ten with 1 being "no problem," 5 being "moderate

problem," and 10 being "a considerable problem." Problem areas being identified were: (1) control over shared personnel; (2) training of library personnel; (3) acceptance of computer by library staff; (4) staff shortages; (5) equipment failures; (6) machine shortages; (7) adequacy of program training; (8) adequacy of long-range planning; (9) coordinated approach to computer based library systems development; (10) sufficiency of computer capabilities; (11) sharing of computer systems with non-library users; (12) compatibility of systems; (13) adequacy of detailed program instructions; (14) conversion of data to acceptable computer format; (15) adequacy of system design; (16) adequacy of programming; (17) adequacy of debugging; (18) suitability of library organizational structure; (19) adherance to standards; (20) initial cost of implementation; (21) budget adequacy; and (22) adequacy of services from service bureaus. A reflection of the relative difficulty perceived by librarians in problem areas of automation in terms of the mean of the scale values given to problems is shown in Table 4.9.

Table 4.9. Profile of the means for the relative difficulty in problem areas related to library automation in libraries

Problem	Mean
Shared personnel	4.154
Training of personnel	4.285
Acceptance of computers	3.761
Staff shortages	5.657
Equipment failures	4.624
Machine shortages	4.703
Adequacy of training	4.183
Adequacy of planning	5.144
Coordination	5.232
Sufficient capability	5.662
Computer sharing	3.715
Compatability of systems	4.689
Adequacy of instruction	3.990
Conversion to computer	5.204
Adequacy of design	4.052
Adequacy of programming	3.837
Adequacy of debugging	3.184
Suitability of library structure	4.150
Adherance to standards	4.507
Implementation costs	5.905
Budget adequacy	5.968
Service adequacy	4.120

Scale: 1 = No problem; 5 = Moderate problem area; 10 = Considerable problem area

The findings reflect neither extremely high nor extremely low means in light of the rating scale from one (1) to ten (10). Two problems, however, were considered to be of least difficulty were adequacy of debugging (3.184) and computer sharing (3.715). Two problem areas considered to be of greatest difficulty were budget adequacy (5.968) and implementation cost (5.905).

Justification of Library Automation

Ninety percent of the respondents indicated that automation was justified in their libraries in relationship to facilitation of instruction, improving services and overall efficiency. Some comments made were:

> In the long run, automation is definitely cost effective, permitting as it does the concentration of staff time and energies on substantive rather than routine clerical activities. Increased user service is also provided by improved access to information.
>
> Extremely efficient. Saves staff and user time and expense.
>
> . . . We could not maintain the volume of circulation records, controls, and have the administrative records now possible with a manual system.
>
> It is justified negatively in the sense that if we fail to automate, the costs penalties of staying in manual mode are incredible.

Most respondents who made comments generally agreed on two points: that automation made its greatest impact in the areas of (1) improved access to information and (2) staff savings.

Another area of the study dealt with library automation in relationship to the facilitation of instruction.

Table 4.10. Automation and the facilitation of instruction

Category	Number (N)	(Adjusted) % of category	Relative % of total (80)
Facilitation of instruction	61		76.0%
Yes	36	59.0%	54.0
No	25	41.2	23.7
Missing	19		23.7

As shown in Table 4.10, it was found that 59% of the population felt that automation had greatly facilitated instruction and were in general agreement through comments offered that this facilitation was in the area of increased access to information especially through computerized literature searching.

Still another concern was in the area of techniques used in displaying information. The techniques reflected in use were: photocopy machines; typewriter terminals; microfilm readers; microfilm readers/printers; cathode ray tubes; and video screens. The incidence and extent of usage of various techniques in displaying library information are presented in Table 4.11.

Tablr 4.11 Profile of techniques used to display information in libraries

Category	Number (N)	(Adjusted) % of category	Relative % of total (80)
Display of info photocopy machines			
Use	68	85.0%	85.0%
Do not use	12	15.0	15.0
Typewriter terminals			
Use	29	90.0	90.0
Do not use	51	10.0	10.0
Microfilm printers			
Use	71	88.7	88.7
Do not use	9	11.2	11.2
Cathode ray tube			
Use	54	67.5	67.5
Do not use	26	32.5	32.5
Video screens			
Use	17	21.2	21.2
Do not use	63	78.7	78.7

It was shown that microfilm readers, microfilm readers/printers and photocopy machines were the techniques most often used for displaying information.

Test for Significance of Hypotheses

It was of interest to know if the perceptions of problems by library directors was significantly different from those of library systems analysts. With directors being labeled Group I and Systems Analysts Group II, hypotheses were formed as a basis for testing the significance of the difference of the mean assessment of problems by Group I and Group II.

Hypotheses 1 was: there is no significant difference between systems analysts and library directors in their perception of problems involving library automation.

The t-test was used to test the hypotheses supplied to each problem area identified. A comparison of the two groups in terms of the mean of their group's assessment of problem areas and the t-test for the significance of the difference in means is shown in Table 4.12.

The variation (see Table 4.12) between the two groups (at the .05 level) was generally insufficient to reject the null hypothesis. Only in one instance was there significance. This was in the problem area of adequacy of debugging. In Group I (directors) the mean level of problem assessment was 3.983 (standard deviation: 2.395). In Group II (systems analysts) the mean was 2.385 (standard deviation: 1.895) $t = 2.25$, $P < 0.028$.

Table 4.12. T-tests on professional responsibility: Group I = Directors; Group II = Systems Analysts

Variable	Number of cases	Mean	Standard deviation	Standard error	t-value	2-tail probability
Shared personnel	Group I 55	5.036	12.642	1.705	0.970	0.337
	Group II 11	3.273	2.149	0.648		
Training of personnel	Group I 65	4.185	3.836	0.476	-0.180	0.858
	Group II 13	4.385	2.468	0.684		
Acceptance of computer	Group I 65	3.215	3.689	0.458	-1.490	0.146
	Group II 13	4.308	2.057	1.570		
Staff shortages	Group I 63	6.238	8.557	1.078	0.870	0.390
	Group II 13	5.077	2.871	0.796		
Equipment failures	Group I 64	5.094	3.959	0.495	0.820	0.416
	Group II 13	4.154	2.641	0.732		
Machine shortages	Group I 60	4.483	6.369	0.822	-0.380	0.706
	Group II 13	4.923	2.929	0.812		
Adequacy of training	Group I 61	4.033	5.056	0.647	-0.330	0.744
	Group II 12	4.333	2.229	0.644		
Adequacy of planning	Group I 65	5.539	5.908	0.733	0.790	0.433
	Group II 12	4.750	2.340	0.676		
Coordination	Group I 59	4.797	2.531	0.330	-1.070	0.289
	Group II 12	5.667	2.774	0.801		

Table 4.12. (continued)

Variable	Number of cases	Mean	Standard deviation	Standard error	t-value	2-tail probability
Sufficient capability	Group I 57	5.632	10.438	1.383	-0.0040	0.969
	Group II 13	5.692	2.720	0.754		
Computer sharing	Group I 57	3.930	2.815	0.373	0.500	0.619
	Group II 12	3.500	2.111	0.609		
Compatability of systems	Group I 59	4.610	2.613	0.340	-0.190	0.853
	Group II 13	4.769	3.539	0.982		
Adequacy of instruction	Group I 55	4.564	2.463	0.332	1.480	0.145
	Group II 12	3.417	2.314	0.668		
Conversion to computer	Group I 61	5.639	2.633	0.337	1.080	0.284
	Group II 13	4.769	2.682	0.744		
Adequacy of design	Group I 62	4.258	2.290	0.291	0.600	0.551
	Group II 13	3.846	2.075	0.576		
Adequacy of programming	Group I 61	4.213	2.484	0.318	1.010	0.316
	Group II 13	3.462	2.184	0.606		
Adequacy of debugging	Group I 58	3.983	2.395	0.314	2.250	0.029*
	Group II 13	2.385	1.895	0.525		
Suitability of library structure	Group I 59	3.915	2.507	0.326	-0.60	0.551
	Group II 13	4.385	2.785	0.772		

*Significant at the 0.05 level.

Table 4.12. (continued)

Variable	Number of cases	Mean	Standard deviation	Standard error	t-value	2-tail probability
Adherence to standards	Group I 58	3.931	2.093	0.275	-1.700	0.094
	Group II 12	5.083	2.353	0.679		
Implementation costs	Group I 62	5.887	2.643	0.336	-0.04	0.966
	Group II 13	5.923	3.201	0.889		
Budget adequacy	Group I 63	6.270	2.411	0.304	0.800	0.428
	Group II 12	5.667	2.348	0.678		
Service adequacy	Group I 50	4.640	2.380	0.337	1.310	0.195
	Group II 10	3.600	1.713	0.542		

Hypothesis 2: there is no significant difference between present library automation and acquisition budgets, holdings (books, serials and microforms), geographical locations, and source of support (public and private). The one-way analysis of variance was used for testing this difference. The results are shown in Tables 4.13-4.18. Functions presently automated were compared with acquisition budget (see Table 4.13), book collection (see Table 4.14), serial titles (see Table 4.15), microform collections (see Table 4.16), geographical regions (see Table 4.17), and source of support (see Table 4.18). The one-way analysis of variance failed to reject this hypothesis at the .05 level for all comparisons.

This evidence suggests there is no difference which is significant in regard to the categorical items among libraries in the study.

Table 4.13. One-way analysis of variance: current automation by acquisition budget

Source	d.f.	SS	MS	F	Probability
Between	4	22.4511	5.6128	1.782	0.1416
Within	73	229.9205	3.1496		
Total	77	252.3716			

Group	Mean	Group	Mean
$500,000- $700,000	2.88	$1,600,000-$1,800,000	4.86
$800,000-$1,000,000	4.61	over $2,000,000	4.16
$1,200,000-$1,400,000	3.85		

Table 4.14. One-way analysis of variance: current automation by book collection

Source	d.f.	SS	MS	F	Probability
Between	3	5.9861	1.9954	0.587	0.6251
Within	75	254.7476	3.3966		
Total	78	260.7336			

Group	Mean	Group	Mean
500,000-1,000,000	3.5714	1,600,000-1,800,000	4.4375
1,200,000-1,400,000	3.9394	over 2,000,000	4.3478

Table 4.15. One-way analysis of variance: current automation by serials titles

Source	d.f.	SS	MS	F	Probability
Between	5	27.8157	5.5631	1.784	0.1270
Within	72	224.5560	3.1188		
Total	77	252.3716			

Group	Mean	Group	Mean
5,000-12,000	3.5333	21,000-24,000	3.5714
13,000-16,000	4.7143	25,000-27,000	5.0000
17,000-20,000	4.7333	over 27,000	3.5909

Table 4.16. One-way analysis of variance: current automation by micro collection

Source	d.f.	SS	MS	F	Probability
Between	3	18.7740	6.2580	1.942	0.1301
Within	74	238.4050	3.2217		
Total	77	257.1790			

Group	Mean	Group	Mean
20,000-40,000	7.0000	80,000-120,000	3.5000
40,000-80,000	1.0000	over 120,000	4.1216

Table 4.17. One-way analysis of variance: current automation by geographical region

Source	d.f.	SS	MS	F	Probability
Between	8	46.9553	5.8694	2.056	0.0520
Within	70	199.8042	2.8543		
Total	78	246.7594			

Group	Mean	Group	Mean
Region I	5.3750	Region VI	3.1429
Region II	4.3000	Region VII	4.6667
Region III	4.7000	Region VIII	5.8000
Region IV	3.7500	Region IX	4.2222
Region V	3.4000		

Table 4.18. One-way analysis of variance: current automation by major source of support

Source	d.f.	SS	MS	F	Probability
Between	1	2.5405	2.5405	0.757	0.3868
Within	78	261.6589	3.3546		
Total	79	264.1992			

Group	Mean	Group	Mean
Public	4.0192	Private	4.3929

To determine if there was a significant influence possibly present in light of budget size, tests were made to determine if budget size had any appreciable effect on future automation planning. The following hypothesis was made: there is no significant difference between future plans for library automation and acquisition budgets, holdings, geographical location and source of support. This hypothesis was tested using the analysis of variance. The results of these tests are shown as follows: acquisition budget, Table 4.19; book collection, Table 4.20; serials titles, Table 4.21; micro collection, 4.22; geographic region, 4.23; major source of support, Table 4.24. The tests failed to reject the null hypothesis at the .05 significance level.

Table 4.19. One-way analysis of variance: future automation by acquisition budget

Source	d.f.	SS	MS	F	Probability
Between	4	11.6102	2.9025	1.113	0.3571
Within	73	190.3894	2.6081		
Total	77	201.9996			

Group	Mean	Group	Mean
$500,000- $700,000	2.1250	$1,600,000-$1,800,000	2.7143
$800,000-$1,000,000	1.4444	over $2,000,000	1.8420
$1,200,000-$1,400,000	2.2692		

Table 4.20. One-way analysis of variance: future automation by book collection

Source	d.f.	SS	MS	F	Probability
Between	3	8.9641	2.9880	1.155	0.3327
Within	75	194.0230	2.5870		
Total	78	202.9871			

Group	Mean	Group	Mean
500,000-1,000,000	1.5714	1,600,000-1,800,000	1.4375
1,200,000-1,400,000	2.2727	over 2,000,000	2.0870

Table 4.21. One-way analysis of variance: future automation by serials titles

Source	d.f.	SS	MS	F	Probability
Between	5	7.8281	1.5656	0.581	0.7147
Within	72	194.1716	2.6968		
Total	77	201.9996			

Group	Mean	Group	Mean
5,000-12,000	1.7333	21,000-24,000	1.8571
13,000-16,000	1.7143	25,000-27,000	3.0000
17,000-20,000	2.0667	over 27,000	2.1364

Table 4.22. One-way analysis of variance: future automation by micro collection

Source	d.f.	SS	MS	F	Probability
Between	3	7.0411	2.3470	0.905	0.4430
Within	74	191.9456	2.5939		
Total	77	198.9868			

Group	Mean	Group	Mean
20,000-40,000	1.0000	80,000-120,000	3.0000
40,000-80,000	0.0000	over 120,000	2.0270

Table 4.23. One-way analysis of variance: future automation by geographic region

Source	d.f.	SS	MS	F	Probability
Between	8	27.2575	3.4072	1.381	0.2202
Within	70	172.7423	2.4677		
Total	78	199.9998			

Group	Mean	Group	Mean
Region I	1.1250	Region VI	1.2857
Region II	2.4000	Region VII	2.6667
Region III	2.1000	Region VIII	1.0000
Region IV	1.7500	Region IX	1.0000
Region V	2.3333		

Table 4.24. One-way analysis of variance: future automation by major source of support

Source	d.f.	SS	MS	F	Probability
Between	1	3.7852	3.7852	1.475	0.2282
Within	78	200,1644	2.5662		
Total	79	203.9496			

Group	Mean	Group	Mean
Public	2.1346	Private	1.6786

To determine whether or not the difference in the views of those whose professional training was early or late differed significantly, the following hypothesis was tested: there is no significant difference between the views held by those of different general periods of professional education (pre 1968, post 1968 or both) and the extent of automation in libraries. The one-way analysis of variance was used. The variations failed to differentiate between the groups at the .05 level, and therefore, failed to reject the null hypothesis as shown in Table 4.25.

Table 4.25. One-way analysis of variance: current automation by professional training

Source	d.f.	SS	MS	F	Probability
Between	2	1.3592	0.6796	0.194	0.8238
Within	60	209.7199	3.4953		
Total	62	211.0891			

Group	Mean	Group	Mean
Pre 1968	4.2069	Both	4.5000
Post 1968	4.0385		

Whether or not there was a significant divergence of view regarding future plans for automation and period of training, the following hypothesis was formulated for testing: there is no significant difference between the general period of professional education and future plans for automation in libraries. The one-way analysis of variance was used

for testing, as outlined in Table 4.26. The variation found failed to differentiate between the groups at the .05 level, and therefore, there was insufficient evidence to reject the null hypothesis.

Table 4.26. One-way analysis of variance: future automation by professional training

Source	d.f.	SS	MS	F	Probability
Between	2	13.1214	6.5607	2.464	0.6936
Within	60	159.7355	2.6623		
Total	62	172.8569			

Group	Mean	Group	Mean
Pre 1968	2.3103	Both	0.8750
Post 1968	2.1154		

There were those librarians who felt that automation facilitated instruction, and those who held that it did not. The significance of the difference in the degree of automation in their libraries was assessed.

The one-way analysis of variance was used to test the hypothesis: there is no significant difference between the facilitation of instruction and present library automation. The results of the one-way analysis of variance failed to differentiate between the two groups at the .05 level as shown in Table 4.27. Thus, this constituted insufficient evidence to reject the null hypothesis.

Table 4.27. One-way analysis of variance: current automation by facilitation of instruction

Source	d.f.	SS	MS	F	Probability
Between	1	0.6508	0.6508	0.271	0.6406
Within	59	141.7907	2.4019		
Total	60	142.3605			

Group	Mean	Group	Mean
Does facilitate	4.2500	Does not facilitate	4.0400

There was interest in determining the significance of the proportionality among library holdings and the techniques used in displaying those holdings. The following hypothesis was set forth for purposes of this analysis: there is no significant disproportionality among libraries in terms of the number of holdings (books, serial titles, and microform collections) and the techniques used in displaying information (photocopy machines, typewriter terminals, microfilm readers, microfilm readers/printers, cathode ray tubes and video screens).

Chi-square was used to test the significance of this proportionality. The categories and cells for the holdings and techniques are shown in the following tables: book collection by photocopy machine, Table 4.28; book collection by typewriter terminal, Table 4.29; book collection by microreaders, Table 4.30; book collection by microprinter, Table 4.31; book collection by cathode ray tube, Table 4.32; book collection by video screen, Table 4.33; serial titles by photocopy

machine, Table 4.34; serial titles by typewriter terminal, Table 4.35; serial titles by microreaders, Table 4.36; serial titles by micro-printer, Table 4.37; serial titles by cathode ray tube, Table 4.38; and serial titles by video screen, Table 4.39.

Table 4.28. Crosstabulation of book collection by photocopy machines[a]

Book collection	Photocopy machines: Not used (12) N	%	Used (7) N	%
800,000-1,000,000	1	8.3	6	8.9
1,200,000-1,400,000	5	41.7	28	41.8
1,600,000-1,800,000	2	16.6	14	20.9
over 2,000,000	4	33.3	19	28.4

[a]Chi-square = 1.18087, 3 d.f., $p < .981$

Table 4.29. Crosstabulation of book collection by typewriter terminal[a]

Book collection	Typewriter terminal: Not used (51) N	%	Used (28) N	%
800,000-1,000,000	5	9.8	2	7.1
1,200,000-1,400,000	19	37.3	14	50.0
1,600,000-1,800,000	11	21.6	5	17.9
over 21,000,000	16	31.4	7	25.0

[a]Chi-square = 1.22244, 3 d.f., $p < .7476$

Table 4.30. Crosstabulation of book collection by microreaders[a]

Group	Microreaders: Not used (8) N	%	Used (71) N	%
800,000-1,000,000	1	12.5	6	8.5
1,200,000-1,400,000	2	25.0	31	43.7
1,600,000-1,800,000	1	12.5	15	21.1
over 2,000,000	4	50.0	19	26.8

[a]Chi-square = 2.33043, 3 d.f., p<.0.5067

Table 4.31. Crosstabulation of book collection by microprinter[a]

Volumes of book collection	Microprinter: Not used (9) N	%	Used (70) N	%
800,000-1,000,000	1	11.1%	6	8.6%
1,200,000-1,400,000	3	33.3	30	42.9
1,600,000-1,800,000	1	11.1	15	21.4
over 2,000,000	4	44.4	19	27.1

[a]Chi-square = 1.47030, 3 d.f., p<0.6891

Table 4.32. Crosstabulation of book collection by cathode ray tubes[a]

Volumes Book collection	Cathode ray tubes: Not used N	%	Used N	%
800,000-1,000,000	2	7.7	5	9.4
1,200,000-1,400,000	10	38.5	23	43.4
1,600,000-1,800,000	5	19.2	11	20.8
over 2,000,000	9	34.6	14	26.4

[a]Chi-square = .58428, 3 d.f., $p < 0.9000$

Table 4.33. Crosstabulation of book collection by video screen[a]

Volumes of Book collection	Video screen: Not used N	%	Used N	%
800,000-1,000,000	0	0.0 %	7	11.1%
1,200,000-1,400,000	8	50.0	25	39.7
1,600,000-1,800,000	4	25.0	12	19.0
over 2,000,000	4	25.0	19	30.2

[a]Chi-square = 2.44278, 3 d.f., $p < 0.4857$

Table 4.34. Crosstabulation of serial titles by photocopy machine[a]

Number of titles	Photocopy machines: Not used (12) N	%	Used (66) N	%
5,000-12,000	2	16.7%	13	19.7%
13,000,16,000	1	8.3	13	19.7
17,000-20,000	4	33.3	11	16.7
21,000-24,000	2	16.7	5	7.6
25,000-27,000	0	0.0	5	7.6
over 27,000	3	25.0	19	28.8

[a]Chi-square = 4.14148, 5 d.f., p < 0.5292

Table 4.35. Crosstabulation of serial titles by typewriter terminal[a]

Serial titles	Typewriter terminal: Not used (50) N	%	Used (28) N	%
5,000-12,000	8	16.0	7	25.0
13,000-16,000	12	24.0	2	7.1
17,000-20,000	9	18.0	6	21.4
21,000-24,000	6	12.0	1	3.6
25,000-27,000	1	2.0	4	14.3
over 27,000	14	28.0	8	28.6

[a]Chi-square = 9.35652, 5 d.f., p < 0.0957

Table 4.36. Crosstabulation of serial titles by microreaders[a]

Titles	Microreaders: Not used (8) N	%	Used (70) N	%
5,000-12,000	2	25.0%	13	18.6%
13,000-16,000	0	0.0	14	20.0
17,000-20,000	1	12.5	14	20.0
21,000-24,000	2	25.0	5	7.1
25,000-27,000	0	0.0	5	7.1
over 27,000	3	37.5	19	27.1

[a]Chi-square = 5.35978, 5 d.f., $p < 0.3736$

Table 4.37. Crosstabulation of serial titles by microprinter[a]

Titles	Microprinter: Not used (9) N	%	Used (69) N	%
5,000-12,000	2	22.2	13	18.8
13,000-16,000	0	0.0	14	20.3
17,000-20,000	2	22.2	13	18.8
21,000-24,000	2	22.2	5	7.2
25,000-27,000	0	0.0	5	7.2
over 27,000	3	33.3	19	27.5

[a]Chi-square = 4.65745, 5 d.f., $p < 0.4591$

Table 4.38. Crosstabulation of serial titles by cathode ray tube[a]

Serial titles	Cathode ray tube: Not used (25) N	%	Used (53) N	%
5,000-12,000	4	16.0%	11	20.8%
13,000-16,000	5	20.0	9	17.0
17,000-20,000	5	20.0	10	18.9
21,000-24,000	5	20.0	2	3.8
25,000-27,000	0	0.0	5	9.4
over 27,000	6	24.0	16	30.2

[a]Chi-square = 7.87026, 5 d.f., $p < 0.1635$

Table 4.39. Crosstabulation of serial titles by video screen[a]

Serial titles	Video screen: Not used (62) N	%	Used (16) N	%
5,000-12,000	12	19.4%	3	18.8%
13,000-16,000	12	19.4	2	12.5
17,000-20,000	12	19.4	3	18.8
21,000-24,000	6	9.7	1	6.3
25,000-27,000	3	4.8	2	12.5
over 27,000	17	27.4	5	31.3

[a]Chi-square = 1.73494, 5 d.f., $p < 0.8845$

In all cases the evidence was not sufficient to reject the null hypotheses. Thus, there was no evidence of disproportionality among the factors of holdings and techniques used to display these holdings.

As to the significance to the commitment to future automation among public and private institutions, the t-test was used. In Table 4.40 the difference of the mean projections of private vs. public institutions is not significantly different. In Table 4.41 the difference in the mean projection of position with instruction showed no significant difference.

Table 4.40. T-test on source of support: Group I = public; Group II = private

Variable	Number of cases	Mean	Standard deviation	Standard error	t-value	probability
Current Automation	Group I 52	4.019	1.935	0.268		
	Group II 28	4.393	1.618	0.316	-0.870	0.387
Future Automation	Group I 52	2.135	1.704	0.236	1.210	0.228
	Group II 28	1.678	1.389	0.263		

Table 4.41. T-test on facilitation of instruction: Group I = does facilitate; Group II = does not facilitate

Variable	Number of cases	Mean	Standard deviation	Standard error	t-value	probability
Current Automation	Group I 36	4.250	1.538	0.256	0.520	0.605
	Group II 25	4.040	1.567	0.313		
Future Automation	Group I 36	1.861	1.477	0.246	-1.080	0.282
	Group II 25	2.320	1.819	0.364		

Discussion

Here discussed are the meanings and implications of the findings of this research which have been presented previously. The points discussed follow in the same order as presented in the findings, however, implications from and comparisons with previous studies are also made. To avoid confusion with other studies mentioned in this section, the investigation here reported is referred to as a Survey of University Library Automation.

Since only 13 systems analysts (16.2%) returned questionnaires, it might have been expected that the perception might be slanted toward the viewpoints of the administrators, while the viewpoints of the systems analysts, who would be expected to be most knowledgeable about libraries and automation, might not have been adequately represented. It was shown that there was no significant difference in the views of those responding to the questionnaire.

Two additional conclusions could be reached: (1) Since the original mailing as well as the followups were addressed to the directors of the libraries surveyed, it could be assumed that the library directors passed the questionnaires on to the systems analysts (or were systems analysts) for completion or (2) since only 13 respondents identified themselves as systems analysts, it is not known whether any of the other respondents had systems analysts' capabilities.

Regardless of which of the preceding assumptions may be valid, it is not conclusive from the findings here whether the picture of problem areas in university library automation could possibly have been better substantiated had a fuller representation of systems analysts been presented or the administrators who had training or previous experience as systems analysts. At present, the literature reveals little regarding systems analysts and their perception of library automation or their role in library automation. It would thus appear that the library field could benefit from research in the area of library automation problems as perceived by systems analysts. The problem of determining if there is a difference in the perceptions of a systems analyst who is not also a librarian, or vice versa, might throw light on this concern for future investigation.

The findings which related to information regarding the holdings of the libraries surveyed showed some interesting trends. In the areas of book collections, serials, budget and microforms, the majority of the responses were consistently in two categories which

illustrated a low and high effect. In the area of book collections: 42% of the responses were in the category with 1,200,000-1,400,000 books and 29% were in the category with more than 2,000,000 books. These two categories accounted for 71% of the responses. Similarly, in the area of serials titles: 56% of the respondents were in categories 5,000-20,000 titles and 28% were in the category with more than 27,000 titles. In the area regarding the size of the microforms collection: 94% of the responses were in category 4 (over 120,000). But irrespective of library size and area of support, no significant difference was found in relationship to problems or perception of automation possibilities and usefulness. It was not determined whether or not there are optimal or desirable conditions of research libraries for automation, but these conditions seem to characterize the type of libraries where automation is being used successfully. Efficiency and cost effectiveness were not parts of this study, but further research might address itself to determine such conditions.

The general period in which librarians received their professional training had two labels: pre 1968 and post 1968. The respondents suggested a need by a third category of "both" when 10% indicated their staffs were evenly divided between pre and post 1968. Thus, it would appear that some inquiry and study, designated for extended training or staff development, should be incorporated in any follow-up investigation.

While the previously mentioned findings revealed some interesting trends relating to library holdings, the pattern of responses perhaps illustrated a need for adjustment in the size and number of categories in a subsequent study. An excellent example is the area of microform collections: 94% of the respondents were in the highest category (over 120,000 units); consequently, the microform category should have started with 120,000 units and gone up from there. This would possibly suggest a preliminary inquiry to the libraries to be surveyed on such matters as holdings since the growth of microform collections is extremely rapid. This growth can easily be seen in the average library where file after file is filled with microforms.

The findings in the area of the extent of library automation was generally as expected as compared with general library trends with the exception of one: circulation. The literature revealed two views: (1) that most research-oriented university libraries were likely to use automated circulation systems because of its service implications and its ease of automation and (2) that libraries on the whole continue to use manual libraries circulation systems (Patrinostro, 1971). In this Survey of University Library Automation it was found that almost 60% of the respondents indicated that they had automated their circulation function, and plans are being made by an additional 31% to automate the circulation function. Thus, it appears that manual circulation systems are being rapidly automated.

In this Survey of University Library Automation it was found that a number of factors were perceived by the respondents to be from

moderate to considerable problem areas. These included: conversion of data to machine-readable format, budget adequacy, and cost of implementation. The conversion of data was perceived as a problem area by 41% of the respondents. Data conversion to machine-readable format remains one of the most costly and time-consuming processes in libraries. An excellent illustration might be converting a library's card catalog to machine-readable format: keypunching millions of catalog cards and transferring the information to tape, disc, or other forms of storage. Perhaps greater advancement in technology and lowering of the cost of computer time and software could make conversion less of a problem for libraries in the future.

Each of the cost-oriented items in the study appeared to have been perceived as a considerable problem area by the respondents. Seventy percent of the respondents indicated that "budget adequacy" was a considerable problem area while 46% of the respondents indicated that the "initial cost of implementation" was a moderate to considerable problem area.

The fact that libraries continue to have concerns regarding fundings for automation as well as for collection development would seem to imply that university administrators are not placing the highest priorities on their libraries. Libraries should be the major support unit for academic inquiry activities on any campus and should be able to provide adequate facilities and services to academic programs. To place less than top priorities on library facilities, collections, and access

to information would mean placing less than top priorities on keeping academic programs current and the quality of information concomitant with the expanding growth of knowledge to be made available to students and faculty in the academic areas. This issue, however, is a two-edged sword and has implications for librarians also. Librarians should make a commitment to their university administrator to make the best possible use of facilities, that only those materials are purchased which serve best the student, faculty and staff population and that materials no longer needed are no longer housed in their facilities.

The perceived problem area of cost by the respondents is indeed a realistic picture. It reflects the effects (in 1977-78) of what inflation has done to libraries in the United States. With the cost of library materials increasing and often doubling in the case of serials, librarians have had to fight to maintain adequate budgets for books, serials and other materials. These conditions have often placed library automation lower on the list of library priorities than acquisition budgets and library facilities.

The literature also highlighted other problem areas that librarians experienced in their automation activities. Salmon (1975), for example spoke of these problems evolving around three groups of people: (1) computer center and systems personnel, (2) suppliers of hardware, and (3) librarians; as well as three types of problems (1) poor planning, (2) poor design, and (3) poor implementation.

Interestingly enough, the problems related to library automation as perceived by Salmon were perceived as "no problem" by participants

in this study. For example, in the area of "control over shared personnel," 64% of the respondents indicated that it was a "no problem" area; 49% of the respondents reported that adequacy of systems design was a "no problem" area; 53% of the respondents indicated that equipment failure was not a problem; 74% indicated that librarians' acceptance of computers was not a problem; while 68% indicated that long-range planning was not perceived to be a problem.

In the lack of consistency between Salmon and this Survey of University Library Automation, consideration would have to be given to the time period in which the former's writing occurred. Perhaps in 1975 Salmon's list of problems were considered valid areas of concern for librarians, but it would appear that they are no longer considered so.

One item in the questionnaire sought the responses of the population surveyed regarding whether automation had facilitated instruction. Over half of the respondents (59%) indicated that automation had facilitated instruction especially in making their collection more accessible and in the area of computerized literature searching. Comments made by respondents supported these findings. Computerized literature searching has proven to be a time and labor saving device for research, and it often points to sources of information that are sometimes missed in a manual search. While facilitation of instruction was not perceived as an objective of library automation, it has occurred as a spin-off.

Findings in the area of present and planned automation were not surprising. Of the nine possible areas for automation, 60% had already automated from three to five, and 74% were planning to automate zero to

two. Consequently, many libraries will have automated seven of the nine possible areas in the future, thus affirming the trend toward automation.

While the hypothesis testing in many cases did not reach significance at the .05 level, there are still some points that are worthy of discussion. The analysis of variance showed no effect between planned automation and acquisition budget. While there would have, on the surface, appeared to have been an influence, it should be noted that acquisition budgets in university libraries are rarely used for any purchases other than books and related materials. Funds for automation activities on the other hand usually come from current expenses funds and special monies provided by university administrations. Even though significance was not reached with functions presently automated and geographic regions ($p < .052$) regions IV and VI were Southern states and also had lower means. This could have proven interesting in light of traditional thinking in terms of libraries in the Southern states having less money and sophistication in technological advancements. However, the inclusion of region V in this finding does not confirm this thinking regarding Southern states, since it includes the midwestern area.

The t-test was used to compare the problem areas as perceived by administrators and system analysts. In the area of shared personnel the large standard deviation (12.642) indicates that directors as a group do not agree on the problems created by sharing personnel (i.e., computer center personnel). There also seems to be little agreement

within the group of directors regarding sufficiency of computer capability (standard deviation $<$ 10.438). The area of adequacy of debugging ($p < .028$*) was considered to be less of a problem by systems analysts ($\bar{X} = 2.3846$) than by administrators ($\bar{X} = 3.9828$). The reasoning behind this difference may well be attributed to the fact that directors usually are not so closely in touch with the automation activity of debugging as the systems analysts.

CHAPTER V

SUMMARY

The Problem and Its Design

The purpose of this research was to determine the automation tendencies in university libraries in the United States; the nature of problems involved in library automation; the future plans of libraries in relationship to automation; and the degree to which automation is assisting the librarian in the facilitation of instruction. This study was conducted with 80 university libraries which had 500,000 or more volumes, minimum budgets of $500,000.00, that were members of the Association of Research Libraries (ARL) and that were located in the United States.

There were seven hypotheses postulated in this study. These were:

1. There is no significant difference between the perceptions of systems analysts and library directors in the way they perceive the problems involved with library automation.
2. There is no significant difference between current library automation and the following: acquisition budgets, number of holdings (books, serial titles and microforms), geographic location, and source of support (public and private).
3. There is no significant difference between future plans for library automation and acquisition budgets, number of holdings, geographic location and source of support.

4. There is no significant difference between the general period in which librarians received their professional education (pre-1968, post-1968, or both) and the automation tendencies in libraries.
5. There is no significant difference between the general period in which librarians received their professional education and future plans for automation in libraries.
6. There is no significant difference between instruction facilitation and current library automation.
7. There is no significant disproportionality among libraries in terms of the number of holdings (books, serial titles, and microform collections) and the techniques used in displaying information (photocopy machines, typewriter terminals, microfilm readers, microfilm readers/printers, cathode ray tubes and video screens).

The ARL representative in each participating library of this study was mailed a questionnaire. Data were secured from each of the participating libraries by means of a questionnaire which provided:

1. Information about the institutions.
2. Information about the libraries.
3. Tendencies of the surveyed libraries toward automation.
4. Library problem areas with automation.
5. Other general information about libraries and automation.

Statistical Methodology

The statistical methodologies used in this study were:

1. Descriptive analysis of categories and frequencies in terms of comparative percentages, proportions, and distributions.
2. Chi square to determine if a significant disproportionality existed among the categories characterizing the libraries suggesting the lack of homogeneity as a possible factor in the nature of responses.
3. T-test to discuss and evaluate differences between effects.
4. One-way analysis of variance techniques to test for group differences on the variables.

The statistical analyses testing the hypotheses provided no evidence of significance at the .05 level which permitted the rejection of all the following postulated hypotheses:

1. There was no significant difference in the views regarding library automation between the directors (83.7%) and systems analysts (16.2%).
2. There was no significant difference between present library automation (highest incidence was computerized literature searching and public catalog maintenance) and the following: acquisition budget (highest was "$1,200,000-$1,400,000" with 33.3% and lowest was "$1,600,000-$1,800,000" with 9.0%), holdings (books where "1,200,000-1,400,000" volumes had 41.8% and lowest was "500,000-1,000,000" with 8.9%; serials where "over

27,000 titles" had 28.2% and the smallest group was "25,000-27,000" with 6.4%); geographic location (Southeast with 15.2% and the Midwest with 19.0%) and source of support (public 65% and private 35%).

3. There was no significant difference between general periods in which librarians received their professional education (pre 1968, 46.0%; post 1968, 41.3%; or both, 12.7%) and tendencies toward library automation (highest incidence was computerized literature searching and catalog maintenance).
4. There was no significant difference between general periods in which librarians received their professional education (pre 1968, 46.0%; post 1968, 41.3%; or both 12.7%) and future plans for automation (highest incidence was serials control).
5. There was no significant difference between the facilitation of instruction (does facilitate 59.0%, does not facilitate 41.2%) and present automation (highest incidence was computerized literature searching and catalog maintenance).
6. There was no significant difference between holdings (books where "1,200,000-1,400,000 volumes" had 41.8% and lowest was "500,000-1,000,000 volumes" with 8.9%; serials titles where "over 27,000 titles" had 28.2% and the smallest group was "25,000-27,000" with 6.4%) and the techniques used to display information (highest incidence was microfilm readers, microfilm readers/printers and photocopy machines).

Recommendations

Several recommendations are given for future study in this area as gleaned from the literature and from this study:

1. That a study of the perceptions of systems analysts as a group regarding automation in university libraries be conducted.
2. That some periodic survey of automation in university libraries be made to determine current trends.
3. That a study comparing the current status of automation between libraries in different geographic locations be made to see whether there is a difference in trends within regions.
4. That the tendencies toward automation in four-year college libraries be examined, and comparisons made with trends within large university libraries.
5. That a study measuring the effectiveness of computers and the facilitation of instruction be conducted.
6. That a study be made of the effects that the closing of the Library of Congress Catalog will have on library automation.
7. That a study be made of the use of automation in ARL libraries as compared to other libraries.

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APPENDIX A

Survey of University Library Automation

This questionnaire is completely confidential. However, to facilitate follow-up, the name of your institution is needed. At no time will respondent data be identified by institution.

Section I: Background Information About Institution

1. Name of Institution: _____

2. Administrative Position of Respondent: _____

3. Major source of institutional support: public _____ private _____

4. Geographic location of the institution: (please check)

Region I ____
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont

Region II ____
New York, New Jersey, Puerto Rico, Virgin Island

Region III ____
Delaware, Maryland, Pennsylvania, Virginia, West Virginia and District of Columbia

Region IV ____
Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee

Region V ____
Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin

Region VI ____
Arkansas, Louisiana, New Mexico, Oklahoma, Texas

Region VII ____
Iowa, Kansas, Missouri, Nebraska

Region VIII ____
Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming

Region IX ____
Arizona, California, Hawaii, Nevada, Guam, Trust Territory of Pacific Island, American Somoa

Section II: Background Information About Library

1. Check the range which most accurately reflects the total number of volumes in your book collection:

less than 500,000 ☐	1,200,000 - 1,400,000 ☐
500,000 - 700,000 ☐	1,600,000 - 1,800,000 ☐
800,000 - 1,000,000 ☐	more than 2,000,000 ☐

2. Check the range which most accurately reflects the total number of serials titles in your collection:

less than 5,000-8,000 ☐	17,000 - 20,000 ☐
9,000 - 12,000 ☐	21,000 - 24,000 ☐
13,000 - 16,000 ☐	25,000 - 27,000 ☐
	more than 27,000 ☐

3. Check the range which most accurately reflects the size of your microform collection:

less than 5,000 ☐	20,001 - 40,000 ☐
5,000 - 10,000 ☐	40,001 - 80,000 ☐
10,000 - 20,000 ☐	80,001 - 120,000 ☐
	more than 120,000 ☐

4. Check the square which most accurately reflects your acquisition budget:

less than $500,000 ☐	$1,200,000 - $1,400,000 ☐
$500,000 - $700,000 ☐	$1,600,000 - $1,800,000 ☐
$800,000 - $1,000,000 ☐	more than $2,000,000 ☐

5. Please indicate the number of library staff members in the following categories.

_____ Librarians (persons holding MSLS or MSL degree)

_____ Paraprofessionals

6. Check the square which, in general, best describes the period of library school training of your professional staff members:

☐ pre 1968 ☐ post 1968

7. Does your library staff include a systems analyst?

yes ☐ no ☐

8. If yes, is your systems analyst also a librarian (also holds MSLS or MSL degree)?

yes ☐ no ☐

Section III: Library Functions

Please circle the appropriate alphabet for each item which reflects automation in your library.

	Administrative Data Processing (cost account; inventory control; personnel information)	Acquisition (Purchase order generation; on-order file maintenance; accounting)	Serials control (bibliographic; check-in; bindery; accounting)	Circulation control	Public catalog maintenance (card production; COM; on-line access)	Lists production (union lists; accession lists, etc.)	Computerized literature searching (retrospective searches; current awareness)	Microform materials - storage & retrieval	Interlibrary communication	None
1. All functions which are presently automated.	a	b	c	d	e	f	g	h	i	j
2. The function which was first automated.	a	b	c	d	e	f	g	h	i	j
3. The latest function to be automated.	a	b	c	d	e	f	g	h	i	j
4. The funtion(s) which is presently experimental.	a	b	c	d	e	f	g	h	i	j
5. The function(s) which is not presently automated but which you plan to automate in the future.	a	b	c	d	e	f	g	h	i	j
6. The function which in your judgment has most increased or improved service to the patron.	a	b	c	d	e	f	g	h	i	j
7. The function(s) for which you feel manual methods are more effective than automated systems.	a	b	c	d	e	f	g	h	i	j
8. The functions for which the library owns equipment.	a	b	c	d	e	f	g	h	i	j
9. The function(s) for which the library rents equipment.	a	b	c	d	e	f	g	h	i	j
10. The function(s) for which the library uses equipment housed elsewhere (e.g., computation center, etc.)	a	b	c	d	e	f	g	h	i	j
11. The function(s) for which there is an authorized feasibility study underway.	a	b	c	d	e	f	g	h	i	j

Section IV: Problem Areas in Library Automation

Please indicate the severity of problems (if any) experienced in your planning, implementation and/or day-to-day activities of automated activities in your library.

For the following functional areas, please use this rating scale and circle the appropriate number.

1	2	3	4	5	6	7	8	9
no problem				moderate problem area				a considerable problem area

N = Don't Know

1.	Control over shared personnel (i.e. computer center personnel)	1	2	3	4	5	6	7	8	9	N
2.	Training of library personnel	1	2	3	4	5	6	7	8	9	N
3.	Acceptance of computers by library staff	1	2	3	4	5	6	7	8	9	N
4.	Staff shortages	1	2	3	4	5	6	7	8	9	N
5.	Equipment failures	1	2	3	4	5	6	7	8	9	N
6.	Machine shortages	1	2	3	4	5	6	7	8	9	N
7.	Adequacy of program training prior to implementation	1	2	3	4	5	6	7	8	9	N
8.	Adequacy of long-range planning	1	2	3	4	5	6	7	8	9	N
9.	Coordinated approach to computer based library systems development	1	2	3	4	5	6	7	8	9	N
10.	Sufficiency of computer capability	1	2	3	4	5	6	7	8	9	N

11.	Sharing computer systems with non-library users	1	2	3	4	5	6	7	8	9	N
12.	Compatibility of systems	1	2	3	4	5	6	7	8	9	N
13.	Adequacy of detailed program instructions	1	2	3	4	5	6	7	8	9	N
14.	Conversion of data to acceptable computer format	1	2	3	4	5	6	7	8	9	N
15.	Adequacy of system design	1	2	3	4	5	6	7	8	9	N
16.	Adequacy of programming	1	2	3	4	5	6	7	8	9	N
17.	Adequacy of debugging	1	2	3	4	5	6	7	8	9	N
18.	Suitability of library organizational structure for integrated library atuomation systems	1	2	3	4	5	6	7	8	9	N
19.	Adherance to standards	1	2	3	4	5	6	7	8	9	N
20.	Initial cost of implementation	1	2	3	4	5	6	7	8	9	N
21.	Budget adequacy	1	2	3	4	5	6	7	8	9	N
22.	Adequacy of services from service bureaus	1	2	3	4	5	6	7	8	9	N
23.	Other (please specify) _____	1	2	3	4	5	6	7	8	9	N
24.	Other (please specify) _____	1	2	3	4	5	6	7	8	9	N

Section V: General

1. What plans are being made by your library in anticipation of the closing of the Library of Congress Card Catalog? (e.g., study groups). Briefly comment:

2. Even in light of the postponement of L.C. card catalog closing and of the adoption of AACR2, which of the following card catalog alternative is being considered in your library:

(a)COM catalog ____ (c)On-line catalog ____

(b)Book catalog ____ (d)Neither a, b, nor c ____

If "d" was checked what action(s) is being considered? Briefly comment:

3. If your library presently provides a book catalog for its patrons, does it also maintain a card catalog?

Yes ☐ No ☐

Briefly comment:

4. In your opinion, has automation of your library facilitated instruction?

Yes ☐ No ☐

Briefly comment:

5. Does your library include (CAI) computer assisted instruction as part of its program?

Yes ☐ No ☐

If no, does the library plan to include CAI as part of its program?

Yes ☐ No ☐

6. From the point of view of facilitating instruction, improving service to the user, and increasing the overall efficiency of the library program, do you think that the cost of using data processing equipment is justified for each of the library functions you have automated?

Yes ☐ No ☐

Briefly comment:

7. Please check below those techniques which your library uses to display information or to provide it in a form suitable for individual use:

Photocopy machines ____	Microfilm reader/printers ____
typewriter terminals ____	Cathode ray tubes ____
microfilm readers ____	video screens ____

8. Is your library part of a computerized library network (e.g., OCLC)?

Yes ☐ No ☐

Please specify:

We appreciate your time and cooperation and look forward to receiving your completed questionnaire! Please print your name and mailing address below if you would like to be sent an abstract of the results of this study.

Mailing Address: _____

_____

_____

_____

P-634

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Research Institute for Studies in Education
College of Education
The Quadrangle
Telephone 515-294-7009

November 27, 1978

Dear ARL Representative:

The information explosion, more than ever before, is producing some profound effects upon libraries in the United States. These effects are evidenced in the rapid growth of library collections; the growing inadequacies of many library facilities; backlogs of unprocessed materials; and new demands made by patrons for rapid access to materials.

Many library authorities feel that automation is one means of dealing with the problems created by the tremendous growth of information. And there is, of course, an interest in knowing the extent to which libraries are involved in automation; their future automation plans; and the extent to which automation is assisting libraries in providing services to their patrons. The enclosed questionnaire has been designed to gather information from you in the above areas as well as on other key issues relating to research libraries and automation.

This reasearch project is undertaken as part of a Ph.D. program and is directed by Dr. William A. Hunter, Director of the Research Institute for Studies in Education at Iowa State University

Your cooperation in completing the enclosed questionnaire and returning it to me by the middle of December, 1978 will be deeply appreciated. The questionnaire has been so designed that you can staple it and place it in the return mail.

Your attention in this matter is appreciated.

Sincerely,

Myrtle Cooke Bennett

Myrtle Cooke Bennett
Ph.D. Candidate in
Higher Education

William A. Hunter
Director, Research Institute
for Studies in Education

Iowa State University of Science and Technology Ames, Iowa 50011

Research Institute for Studies in Education
College of Education
The Quadrangle
Telephone 515-294-7009

December 20, 1978

Dear ARL Representative:

We are in the process of concluding the data collection phase of our study on university library automation. As of the above date, we had not received your completed questionnaire. We are eagerly awaiting its return.

We believe this to be an extremely valuable study. If however, you believe that some parts of the questionnaire are not relevant to your library, please feel free to leave those sections blank. For your convenience in responding, a second questionnaire has been enclosed. We would appreciate receiving the completed information by January 12, 1979.

Your time and cooperation in this matter are deeply appreciated.

Sincerely,

Myrtle C. Bennett

Myrtle Cooke Bennett
Ph.D. Candidate in
Higher Education

Iowa State University of Science and Technology Ames, Iowa 50011

Research Institute for Studies in Education
College of Education
The Quadrangle
Telephone 515-294-7009

January 17, 1979

Dear ARL Representative:

We are in the process of concluding the data collection phase of our study on university library automation. As of the above date, we had not received your completed questionnaire. We are eagerly awaiting its return.

We believe this to be an extremely valuable study, and we would very much like to have your library included. If you believe that some parts of the questionnaire are not relevant to your library, please feel free to leave those sections blank. For your convenience, in responding, a third questionnaire has been enclosed. We would appreciate receiving the completed information by January 26, 1979.

Your time and cooperation in this matter are deeply appreciated.

Sincerely,

Myrtle Cooke Bennett

Myrtle Cooke Bennett
Ph.D. Candidate in
Higher Education

William A. Hunter

Dr. William A. Hunter, Director
Research Institute for Studies in Education
Iowa State University
Ames, Iowa 50011

IOWA STATE UNIVERSITY

(Please follow the accompanying instructions for completing this form.)

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1. Title of project (please type): A Survey of Computer Application and Usage Problems in Library Processes of Large University Libraries in the United States.

2. I agree to provide the proper surveillance of this project to insure that the rights and welfare of the human subjects are properly protected. Additions to or changes in procedures affecting the subjects after the project has been approved will be submitted to the committee for review.

Myrtle Cooke Bennett — 11/7/78 — Myrtle E. Bennett

Typed Named of Principal Investigator — Date — Signature of Principal Investigator

ISU Library; Room 157 — 294-3642

Campus Address — Campus Telephone

3. Signatures of others (if any) — Date — Relationship to Principal Investigator

William Meinecke — 11/15/78 — MAJOR PROFESSOR

4. ATTACH an additional page(s) (A) describing your proposed research and (B) the subjects to be used, (C) indicating any risks or discomforts to the subjects, and (D) covering any topics checked below. CHECK all boxes applicable.

- ☐ Medical clearance necessary before subjects can participate
- ☐ Samples (blood, tissue, etc.) from subjects
- ☐ Administration of substances (foods, drugs, etc.) to subjects
- ☐ Physical exercise or conditioning for subjects
- ☐ Deception of subjects
- ☐ Subjects under 14 years of age and(or) ☐ Subjects 14-17 years of age
- ☐ Subjects in institutions
- ☐ Research must be approved by another institution or agency

5. ATTACH an example of the material to be used to obtain informed consent and CHECK which type will be used.

- ☐ Signed informed consent will be obtained.
- ☐ Modified informed consent will be obtained.

6. Anticipated date on which subjects will be first contacted: Month 11 Day 16 Year 1978

Anticipated date for last contact with subjects: Month 1 Day 16 Year 1979

7. If Applicable: Anticipated date on which audio or visual tapes will be erased and(or) identifiers will be removed from completed survey instruments:

Month ____ Day ____ Year ____

8. Signature of Head or Chairperson — Date — Department or Administrative Unit

[signature] — 11/1/78 — Professional Studies.

9. Decision of the University Committee on the Use of Human Subjects in Research: 11-17-78

☒ Project Approved ☐ Project not approved ☐ No action required

George G. Karas — 11/17/78 — G G Karas

Name of Committee Chairperson — Date — Signature of Committee Chairperson

Copies to: (2) Bennett, Ahmann

Revised 6/78

APPENDIX B

SUMMARY OF RESPONSES FROM

THE SURVEY OF UNIVERSITY LIBRARY AUTOMATION

Table B.1. Summary of responses from the survey of university library automation

Category	Number (N)	(Adjusted) % of category	Relative % of total (80)
Total responses	80	100%	100%
Library Position	80		100%
Administrators	67	83.7	83.7
Systems Analysts	13	16.2	16.2
Source of Support	80		100%
Public	52	65	65
Private	28	35	35
Geographical Region	79		98.7%
Region I	8	10.1	10.0
Region II	10	12.7	12.5
Region III	10	12.7	12.5
Region IV	12	15.2	15.0
Region V	15	19.0	18.8
Region VI	7	8.9	8.7
Region VII	3	3.8	3.7
Region VIII	5	6.3	6.3
Region IX	9	11.4	11.2
Missing	1		1.2
Book Collection	79		98.7%
500,000-1,000,000	7	8.9%	8.7
1,200,000-1,400,000	33	41.8	42.2
1,600,000-1,800,000	16	20.3	20.0
over 2,000,000	23	29.1	28.7
Missing	1		1.2
Serial Titles	78		97.5%
5,000-12,000	15	19.2%	18.8
13,000-16,000	14	17.9	17.5
17,000-20,000	15	19.7	18.8
21,000-24,000	7	9.0	8.7
25,000-27,000	5	6.4	6.3
over 27,000	22	28.2	27.5
Missing	2		2.5

Table B.1. (continued)

Category	Number (N)	(Adjusted) % of category	Relative % of total (80)
Total responses	80	100%	100%
Microform Collect.	78		97.5%
20,000-40,000	1	1.3%	1.2
40,000-80,000	1	1.3	1.2
80,000-120,000	2	2.6	2.5
over 120,000	74	94.9	92.5
Missing	2		2.5
Acquisition budget	78		97.5%
$500,000-$700,000	8	10.3%	10.0
$800,000-$1,000,000	18	23.1	22.5
$1,200,000-$1,400,000	26	33.3	32.5
$1,600,000-$1,800,000	7	9.0	8.7
over $2,000,000	19	24.4	23.7
Missing	2		2.5
Professional ed.	63		78.7%
Pre 1968	29	46.0%	36.2
Post 1968	26	41.3	32.5
both	8	12.7	10.0
Missing	17		21.2
Facilitation of instruction	61		76.0%
Yes	36	59.0%	54.0
No	25	41.2	31.3
Missing	19		23.7
Display of info photocopy machines			
Use	68	85.0%	85.0%
Do not use	12	15.0	15.0
Typewriter terminals			
Use	29	90.0%	90.0%
Do not use	51	10.0	10.0
Microfilm printers			
Use	71	88.7%	88.7%
Do not use	9	11.2	11.2

Table B.1. (continued)

Category	Number (N)	(Adjusted) % of category	Relative % of total (80)
Total responses	80	100%	100%
Cathode ray tube			
Use	54	67.5%	67.5%
Do not use	26	32.5	32.5
Video screens			
Use	17	21.2%	21.2%
Do not use	63	78.7	78.7