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A BRIEF STUDY OF THE PLACE OF THE

COMPUTER IN THE LIBRARY

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A Paper

Presented to

the Faculty of the Department of

Library Science

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In Partial Fulfillment

of the Requirements for the Degree

Master of Library Science

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by

William Mitchell Andrews

April 1972

TABLE OF CONTENTS

LIST OF FIGURES

Section 1

INTRODUCTION

The computer is a complex, technical mechanical device which is becoming an increasingly important tool in our modern society. From its humble beginnings as a machine primarily utilized by scientists during World War II, it has achieved a position of importance never before equalled by a machine. It has been called both a panacea and an uncontrollable beast set out to destroy mankind, but it is evidently here to stay and will be used by all who consider themselves futuristic.

The first computers were basically glorified adding machines which could perform mathematical functions at a far greater rate than could be done manually. They were time saving devices created and used by scientists, physicists, and mathematicians who were involved in the development of new and better ways of waging war. But when World War II ended, American technology realized the potential of such machines and the computer became an integral part of the business world. The computer's capabilities were increased to a point that it could perform accurately the jobs of humans without needing rest or coffee breaks. Entire offices were replaced by machines which were unquestionably loyal to their employers, and employees became apprehensive whenever the word "computer" was mentioned. While the computer replaced workers it also created new vocations because of the level of expertise required to operate them. The field of computer programming came into being and a new industry was formed.

The initial utilization of computers was primarily in the fields of business and related large industries, but today education has taken a long look at its potentialities and decided in favor of its use. Initial application in education was found mainly in the administrative area, but as time progressed other departments wanted to have the opportunity to employ it or were forced to make use of the computer. Why were some areas forced into utilization? The reasons behind such a push lie in the administrative desire to cause total manipulation of the available computer time. With computers costing thousands of dollars and education being forced into a position of accountability, decision-making educational bodies were compelled to advise the lower echelons that they would, to the greatest possible extent, use the computer.[1]

At the same time that educators were being coerced into making use of the computer, computer experts were slowly realizing that it was much more difficult to apply the computer to education than it had been with the business and governmental world. The multifarious requirements which were delineated by educators caused programmers many headaches, but the computer people were unwilling to admit their inability to apply the computer to the field of education. Therefore the lowest ranking educators were the ones who had to contend with the almost impossible problems of relating their specific field to the computer rather than the computer relating to their field.

Educationally, the computer was best utilized in the areas of

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[1] Ellsworth G. Mason, "Great Gas Bubble Prick't; or, Computers Revealed —— by a Gentleman of Quality," College and Research Libraries, XXXII (May, 1971), 183-85.

finance and student scheduling. With the advent of flexible modular scheduling, the computer was considered quite necessary, but as time progressed teachers realized that all they had been promised was not possible. The computer will do only what the programmer understands and most programmers were unable to program all the requirements expressed by teachers. Even though teachers were disenchanted with the outcome of computerization, the administration was insistent that once the project was begun the only direction to proceed was forward. The difficulty (almost impossibility) of administrators to admit that an error in judgment had been made gave the public and the computer industry the opinion that all was well in learning land.

Computer experts, realizing that technical fields were best applicable to computerization, turned to the library as the next most obvious area for utilization. While cost seemed prohibitive at the outset, again, the administrative pressure was applied causing the time consuming process of changeover. Can the computer become an important tool in libraries? If so, what are the problems involved? These and other questions will be discussed in the remainder of this paper and hopefully an intelligible conclusion will be reached.

Definition of Terms

Acquisitions: Selecting and acquiring books and other material (excluding periodicals or serials) by purchase, exchange, and gift, and keeping of the necessary records of these additions.

Cataloging: Preparing a catalog or entries for a catalog. All the processes connected with the preparation and maintaining of a catalog, in whatever form, including classification and assignment of subject headings.

Centriod: | A dummy item which lies in the center of a group of related media which represents the average document in each group.

Circulation: | The activity of lending library materials to borrowers and keeping records. Also includes preparation of recall notices, overdue notices, etc.

Input: | The printed form, written record, oral interpretation, instructions needed to satisfy a requirement.

Off-line Operation: | Does not allow immediate communication with the computer concerning input and output of data.

On-line Operation: | Allows immediate communication with the computer concerning input and output of data.

Output: | The answer to the requirement of a system in the form necessary to convey or transmit information.

Programming: | Writing a list of detailed instructions for every task that the computer is to perform.

Serials: | The process necessary to handle serials, which are publications issued in successive parts, usually at regular intervals, and as a rule intended to be continued indefinitely. This includes preparation of initial orders, maintaining subscription lists, relations with jobbers, records of actual holdings of any given serial, etc.

Section 2

TO COMPUTERIZE OR NOT TO COMPUTERIZE

When considering adapting the computer to library use, there
appear to be four general areas where usage would be most practical.
The first area might be labeled "library housekeeping operations,"
which would include the ordering and receiving of monographs and serials,
circulation control of library items and preparation of catalogs and
listings of many kinds. The second area would consist of cataloging
and allied content analysis operations designed to assign to each item
subject identifiers, as well as call number or related classification
information. The third area would be composed of storage and retrieval
operations, which make it possible for the user to obtain access to the
desired informational items in response to appropriate requests. The
final area would comprise collection control operations designed to
insure an orderly collection development through additions and deletions
of materials and file changes when necessary.[2]

Housekeeping Operations

Computerization of library housekeeping operations is the
usage area which appears to be most adaptable and necessary if the
program is to prove satisfactory. By programming the computer to
accept relevant data which pertains to serials and monographs, a

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[2]Gerard Salton, "Computer and Libraries: a Reply to Ellsworth
Mason's "stamp out computers," Library Journal, XCVI (October 15, 1971),
3277.

5

listing of serials to be reordered on a yearly basis would be readily accessible, and deletions and additions could be reprogrammed with a minimum of computer time. Upon receipt of current periodicals a computer file could be formed which would allow the library staff to make frequent checks on publisher's delinquent in their mailings, and a ready reference would be provided to ascertain the specific back issues held by the library. On-line operations would be desirable, but not necessary to facilitate such a program as is presented above, but increased speed of information retrieval and accuracy of output might outweigh the cost factor (which could be quite high).

If the operation were on-line, circulation control of library items would be appropriate for any library, either school or public, if its collection size and circulation statistics were such that a manual record system was slow and time consuming. If this usage area were applied, the charging of library media would be facilitated by use of an user identification card similar to the plastic charge cards used by many businesses. Book cards produced on IBM cards would be necessary and would provide a final step in on-line circulation control. Charging information would be instantly transferred to the computer, which would allow an immediate check of where media was and who had it. Processing of overdue notices would not involve manual aid, for the computer would print out the necessary list in a fraction of the time. Circulation statistics would also be readily accessible. Such a system would remove the "controlled clutter look" which often is found at the library charging area and fewer staff would be necessary to provide identical services. The only time consuming task would be the dating of the borrowed media, which could be facilitated by predated book cards

kept at the charging desk and inserted in the card pocket when the book was checked out.

The preparation of catalogs and listings is another area where the computer can be of use, but present format of such catalogs has been in book form. While this form of media catalog would be far more portable than a card catalog, a sufficient quantity would be required so that users would have immediate access to them. Also, if the collection of the library was quite large the many catalogs would be necessary because of author, subject, title, and cross references found in them. These four divisions of cataloging present another problem, in that at present, separate catalogs are required for the first three divisions and as yet computers have not been able to formulate cross references into book catalogs or within separate book catalogs. This is another example of the basic inability of existing computers to make content analyses.[3]

While the advantages of computerization of library house-keeping may not outweigh the disadvantages of such a program, the present deficiencies in this area definitely warrant more experimental programs with goals based on alleviating the backlogs of media currently found in the largest public and educational libraries of this country. Increasingly difficult operations are being created for these libraries and the road to computerization appears to lead to the solutions. Whether mechanization is chosen by stated preferences or forced upon the libraries there is little question that computerization of library housekeeping operations is inevitable.

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[3]Ibid., p. 3279.

Cataloging and Allied Content Analysis Operations

Application of the computer to cataloging and related content
analysis operations is a source of difficulty for programming experts.
While it is possible for the computer to construct main entry information
in a given order, a programmer is required for the input of relevant
data. The chances that a programmer will have the necessary knowledge
required to select pertinent data from the media is slight and, there-
fore, a cataloger must perform the initial operations. Even with these
outstanding barriers, once the computer has recorded the proper cata-
loging data it is possible for it to print cards which will not vary in
content and format, and the operation would be done quickly. Commercial
catalogers, such as the 3C Company, have adopted this style to their
business and consequently are able to fill orders individually without
relying on estimates of the number of cards to be printed beforehand.
Computer printing of catalog cards has become increasingly popular due
to the ability of the cataloger to reprogram when changes are made in
either Sears Subject Headings or the Dewey Decimal Classification
System.

Existing computers are unable to make content analysis operations
which are designed to assign to each item subject identifiers as well
as call numbers or related classification information. Computers
have the ability to make objective judgments, but they are unable to
make the subjective judgments which are required to assign subject
headings and cross references. While this area appears to create an
insurmountable barrier, the probability that a solution might be forth-
coming from experts in computer application is high. For one to assume

that anything is impossible, is to negate the vast technical progress which has occurred in the past ten years. If an individual is capable of imagining something the creation may be technically feasible or quite probably the easiest part of the task.

Storage and Retrieval Operations

Retrieval of information has long been the main consideration in application of the computer to the library. Initially, this concept was formulated by Dr. Vannevar Bush, Director of the Office of Scientific Research and Development during World War II and postwar years. At this time the computer was a time saving device created and utilized by scientists, physicists, and mathematicians. In 1945 Dr. Bush envisioned the aforementioned application as a natural outcome of the computer's prior use. He called for his fellow scholars to turn their creative interests toward development of computers which could store and disseminate the vast amounts of printed knowledge available so that future generations of scholars would be able to retrieve those bits of information they needed (see Appendix A). His futuristic ideas created the impetus needed for the computer industry to attempt to broaden the potential applications of computers, but the "memex" was and still is an idea rather than a reality.[4]

The possibility that a computer could be devised which would store vast amounts of printed matter in such a way that a request for all information concerning a given subject would elicit the precise data needed by the user is and must be a goal of library computerization.

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[4]Vannevar Bush, "As We May Think," The Atlantic Monthly, CLXXVI (July, 1945), 106-07.

Currently information retrieval is possible on a very limited basis.
Output is in the form of specific titles which might contain the desired
data. Nevertheless, all available evidence indicates that the retrieval
results provided by the usable automatic analysis methods are not
inferior to those obtainable at present by the best known manual
procedures.[5] A search is performed by matching the queries initially
only against the various cluster "centroids," that is, against dummy
items which lie in the center of each group and represent the "average"
document included in the group. For those centroids which are
sufficiently similar to a search request the corresponding classes are
then individually searched, but in every case only a few groups need to
be looked at, so that fast responses are obtainable.[6] Therefore it
would appear that retrieval is based on a very general concept and
output information might possibly include large amounts of data which
would not be germane to the initial request. Regardless of this draw-
back to the extant system, research should be continued in this field
if the goal of total information retrieval is to be reached.

Collection Control Operations

Orderly collection development through additions and deletions
of materials and file changes when necessary are included in the area
of collection control. The computer must be such that these changes
can be made without reprogramming. The library will constantly be
adding new media to its collection and the computer could ably serve as

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[5]Salton, loc. cit.

[6]Ibid., p. 3281.

a master shelf list or union catalog of the holdings of several
libraries, both educational and public. Problems in this area are few
and would be most easily caused by an inadequate computer or an incom-
petent programmer or key punch operator. Given a computer capable of
handling diverse programs and a programmer schooled in the manipulation
of such a machine this fourth and final area of computer usage should
easily be attainable.

Section 3

TECHNICAL APPLICATION

To a layman, the world of the computer specialist appears to be impossibly complex, and while the librarian who considers implementation of a computer need not have total cognizance of its workings, he must be able to comprehend the basic principles underlying its function. The computer is based on universal theories of logic, therefore one must be capable of sound reasoning if a working knowledge of the computer is to be gained. Although there are various types of computer systems, a rather simplified presentation will be given which will be concerned with only two types: simple and complex.

A system is a set of objects with relationship between the objects and their attributes. Therefore, a simple computer system deals with the least complicated form of function. An illustration of a simple system is shown in Figure 1. In this system there is usually found an input, a process of some sort, and an output.[7]
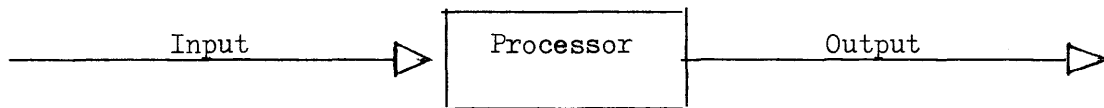
Input ▷ | Processor | Output ▷

Figure 1. A Simple System

A complex system, shown in Figure 2, is different than the simple system in that two new elements have been added: the control

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[7]Gloria L. Smith and Robert S. Meyer (eds.), Library Use of Computers: An Introduction (New York: Special Libraries Association, 1969), p. 21.

12

and feedback. The control is the part of the system which oversees any operations which may take place. Feedback is the use of some part of the output of a system to influence the action of the whole system. This concept could be illustrated by the example of a thermostat used by the typical home heating system to regulate the temperature of rooms. The output, room temperature, would be transmitted back through the thermostat by the input. When the room temperature had reached the desired level this signal would cause the control (thermostat) to send an electrical signal to the furnace, stopping it. The computer is obviously found on the level of the complex system, and, while similar, it is usually far more detailed in its functions.[8]
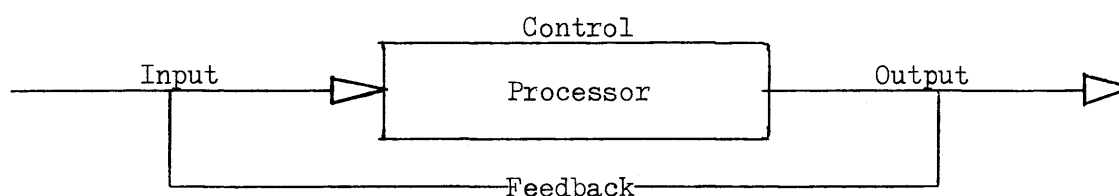
Figure 2. A Complex System

The addition of a computer to the library is similar to the hiring of a new, inexperienced clerk. To facilitate the effectiveness of the clerk, many librarians utilize a procedure manual which presents, in specific terms, the exact duties to be performed. The computer, like a new clerk, needs specific instructions for each job it is required to perform. The computer procedure manual is known as a "program" and is produced by a "programmer." These two elements are necessary, for by itself the computer has no innate ability to execute any task.

[8]Ibid., p. 21-22.

The programmer must meet three requirements when he begins work on a computer program for a specific task. He must first analyze the task to gain an understanding of how it might be accomplished on a computer. Second, he must relate this information to the capabilities of the computer, and third, he must construct a program which will direct the computer in the accomplishment of the job.

As the program is placed in the computer, each step or instruction is placed in the memory, which will later act on the data given to it for processing. While this process may appear slow and laborious, the computer can perform this task in mere microseconds. Each program is designed for a specific job, but the computer is capable of digesting many such programs and then recalling each when a different duty is required of it.

The type of language used by the programmer when "instructing" his computer depends on the complexity and cost of the computer. The two basic types of languages in use today are FORTRAN (FORmula TRANSlator) and COBOL (COmmon Business Oriented Language). FORTRAN is primarily a language for scientific computing, in which the problem may be expressed in statements that resemble mathematical notation. COBOL is similar in that it functions for business data processing, with statements written in a restricted natural language.[9] Library data processing objectives are similar to those of business data processing, therefore COBOL is usually chosen as the language to be implemented for libraries considering computerization.

Machine language must be conveyed to and stored in the computer.

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[9]Ibid., p. 6.

Tab cards are the common form of material used when transmitting instructions, information, and requests to the computer. They represent the middle-step between man and the computer. The items conveyed by the cards are placed on either "paper tape" or "magnetic tape" which perform the function of the computer's memory. Paper tape will usually hold ten characters per inch and is read by various computers at rates between ten and 1,000 characters per second. Magnetic tape, while in wide use, has no standard coding system, consequently, tapes written on one manufacturer's computer may not have meaning to another manufacturer's computer. There are special problems related to magnetic tape in that it is susceptible to stray magnetic fields, dust, shock, heat, and humidity. Obviously, a greater amount of care must be taken when utilizing magnetic tape than when using paper tape. While there are drawbacks to magnetic tape the speed capabilities are favorable. These tapes normally have five to fifteen tracks and from 100 to 1,000 pulses per linear inch. The transfer rates are from 25,000 to 200,000 pulses per second.[10]

The preceding paragraphs have contained brief descriptions of certain necessary ingredients which must be considered when implementing and purchasing a computer. The items discussed are only a few of many which might have been described when relating the complexities of the computer, but it is not the intent of this writer to present a detailed technical analysis of the computer. This writer hopes that the reader might realize that he, as a librarian, must place his trust in a computer expert for it is improbable that he will have enough time to gain a

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[10]Ibid., p. 39-43.

complete understanding of the computer.

The librarian should take an objective position when the decision to computerize the library has been reached. He must expect only the highest quality of operation from the computer and rely on the programmer and key punch operator to devise methods of achieving the desired results. Patience must also be developed by the librarian, for it will be a slow, troublesome task for the computer to be programmed to perform all the required duties. During the first months when the computer is operational the majority of the output will be little more than wastepaper. This is due to the fact that the programmer and key punch operator will be attempting to find out whether they have made errors in judgment concerning the program and other computer related activities.

The initial "trial and error" period will usually be a very disenchanting time for administrators and the librarian. During this stage of computerization the cost-output relationship will generally be out of proportion. The critics of library computerization will be given the opportunity to voice strong opposition because of the cost factor. Those directly involved must keep in mind the fact that the cost-output ratio will be unbalanced for as long as a year from the initiation of the project. All in all, the first years of computer use in any library situation will be a difficult period. One can only hope that those involved will not abandon the project because of the problems that have been described in the preceding paragraphs.

Section 4

ELLSWORTH MASON VERSUS THE LIBRARY COMPUTER WORLD

"In one of the most massive public manipulations in history,
the computer has been joined to Motherhood, the True, the Good, and the
Beautiful."[11] Thus Ellsworth G. Mason, Director of Library Services,
Hofstra University presents his candid opinion of the feasibility of
computers in the library. Although the above quote is general in
nature it was made in reference to ten of the large university libraries
visited by Mr. Mason while making a study sponsored by a Council on
Library Resources. As is obvious from the statement, he has few, if
any, good words for those advocates of library computerization and he
has gained nationwide prominence in the library field for his critical,
censorious pronouncements. The reasons for his denouncements and the
reactions of others more in favor of computer usage will be discussed
in the following paragraphs.

Mr. Mason bases his conclusions on the comparative cost analysis
of library computerization versus hand or manual methods. He is quick
to point out that the computer is unlike other machines in that it is
totally impossible for the layman to gain a high degree of under-
standing of its operation. While experts in the industry are trained
in its manipulation, even programmers are often at a loss as to know-
ing, without a doubt, that programs are producing the evidence requested

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[11]Mason, op. cit., p. 183.

17

and when more capable computers, created to perform more complicated

tasks, are purchased it is inevitable that new programmers will be

needed.[12]

Once a computer is first purchased for use by a university or

large school system, administrators will press all areas of the school

to devise needs for computer time. The administration realizes the

high cost of these machines and, without considering the applicability

of these diverse areas, eventually comes to the library facility. It

must be remembered that no request is usually made by library admin-

istrators for computer time, therefore when confronted with a stern

request to "utilize" the computer, little thought is given to possible

costs of such operations and due to the overall complexity of large

libraries, both public and educational, problems immediately arise.

Mr. Mason presents an example where a large university when forced into

computerization went to the circulation system as the least wasteful

operation. He noted that the self-confidence of the computer experts

was jolted when they had to cope with this problem which was far more

complex than anything else they had had to handle with their machine.[13]

The situation and example stated by Mr. Mason in the above

paragraph may be honest, but is definitely hasty. In other words, it

would appear that he is expecting far too much from the computer.

Problems will always arise in library computerization until the experts

in the industry gain a thorough understanding of the workings of the

library. One answer to the problems may lie in the decisions made

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[12]Ibid., p. 184.

[13]Ibid., p. 187.

concerning computer use. Rarely are librarians consulted when a computer is purchased. Rather they are coerced into utilization of a machine which may be totally incapable of performing the desired tasks. If the experts in the field of library science had been consulted, a more judicious decision might have been reached which would have provided for rational utilization.

In 1969 a pilot project to determine if library automation was feasible was begun in the Springfield Public Schools in Springfield, Oregon. The procedure began with a time cost study of manual operations, which would have pleased Mr. Mason. The project members realized that integration of acquisitions, cataloging, and processing was essential if the program was to prove fruitful. The format utilized was based on the Library of Congress' MARC system because of its prior establishment, accepted quality, and high degree of compatability when applied to the Springfield situation. Priorities were established for planning, for it was apparent that ample time would be needed before the computer was operational. It was found that training of skilled library clerks in the procedures of data conversion was of primary importance because they would be most closely involved with the actual day to day manipulation of the computer. Data conversion involved the accurate translation of card information into machine-readable form.[14]

After the preliminary planning was completed, project LEEDS (Library Exemplary Elementary Demonstration of Springfield) became a reality which saved time for the librarian which could be spent in

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[14] John R. Blair, "Automated Library System; Project LEEDS in the Springfield Public Schools," _American Libraries_, I (February, 1970), 72-3.

service for the faculty and students. The project members felt that the most important realization was that both librarians and media personnel must be involved in the direction of the computer for library use. Future plans for the LEEDS project include possible application of the library computer principal to all the libraries, both public and educational, in the entire State of Oregon in the hope that a single automated system of libraries will become a reality.[15]

Obviously Mr. Mason neglected to study the favorable statements of project LEEDS when he made his aforementioned remarks, or the directions of his opinions would have been less negative. The LEEDS project was based on sound managerial decisions after a cost study of manual operations had been done which proved the feasibility of an automated library system in a public school system. The key to the projects' success was in the coordination of both library and media personnel in planning and operational stages. If such planning had been present in the ten universities evaluated by Mr. Mason the outcome would have been considerably different. Also, project LEEDS was requested by staff members and not forced upon them, making the probability of success much higher than in the highly coercible univeristy libraries.

The final outcome of Mr. Mason's pronouncements was the creation of an impression that his prior experience had clouded his objectivity. Hofstra University Libraries are not automated and Mr. Mason had not been directly involved with administration of an automated library during his career. Some individuals, no matter how

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[15]Ibid., p. 173.

progressive a facade they present, are subconsciously unwilling to
allow radical change. Ellsworth Mason could be easily placed in this
category. As has been stated in earlier sections of this paper, library
automation is a relatively new field with many questions to be answered
and problems to be solved. He participated in a study by setting the
highest possible goals concerning computer use, without allowing for
the relative infancy of the fields' application. Thus, by expecting
much and finding little he was able to form negative opinions.

While this writer tends to disagree with Mr. Mason's published
findings and opinions, the writer does realize that some of his nega-
tive points were well founded. One of his most legitimate concerns
dealt with the problem of coordinated planning and cost analysis as to
the feasibility of automation in the library. This concern is and must
be of primary importance for libraries considering implementation of
computers for library use. Without coordination in planning by those
that will eventually be responsible for computer manipulation, a great
unbridgeable gap is created which must not be allowed to form; and
without an accurate cost analysis concerning the savings caused by
computerization a mistake may be made which, once made, will be diffi-
cult to correct. Therefore, Mr. Mason's comments must be objectively
reviewed by media personnel and librarians and placed in the proper
perspective before a final judgment concerning the future of library
automation is made.

Section 5

THE FUTURE OF THE COMPUTER IN THE SCHOOL LIBRARY

School libraries have progressed somewhat during the past sixty years. Many school systems have seen the replacement of studyhall-libraries with libraries devoted to the needs of students and teachers. The elementary school library has developed from an unknown to a major thrust of most school systems. We have seen the introduction of the typewriter, telephone, mechanical eraser, charging machine, and many other technical, mechanistic aids, but the actual techniques applied in library science have changed only slightly. A 1930 copy of Margaret Mann's textbook on cataloging is still as adequate a guide to cataloging as it was in 1930.[16] Librarians must realize that there are a number of new tools available which have special capabilities that can be applied to existing library problems.

Implementation of a computer in every school library in the United States is an unrealistic possibility because of the great cost involved. Many schools are confronted with financial problems which were beyond the imagination of educators of the early 1900s. Some states have frozen tax monies available to local schools, causing administrators to make careful decisions concerning possible additions to the school program which would cause increased expenditures. Because of this fact and the probability of enrollment decreasing in most school

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[16]Ibid., p. 103.

districts, due to an increased consciousness concerning world population problems, federal and state aid to education have decreased rather than increased.

The public is becoming increasingly conscious of the amount of funds required for school operation and because of this groups have formed with the purpose of being the "taxpayer's watchdog." Such groups have forced a great degree of accountability on the public school community which has both positive and negative outcomes. By forcing accountability on education, administrators have become more aware of programs which have only marginal benefit to students. But on the negative side, administrators have had to bow to the will of the public by adding new programs which have great community appeal and dropping existing programs which have benefited a larger number of students. One area easily applicable to this problem is that of athletics. Public opinion is usually in favor of the athletic programs because they are able to take part in them as spectators, but being outside the actual school situation they will question the rationale of adding more academic courses or increasing the size of library budgets. Many taxpayers tend to feel that what was good for them in school will be good enough for their children.

If public school libraries are to hope for computerization, a case based on financial savings and educational gain must be presented to the public. Rather than attempting to computerize a school library with an enrollment of 1,000 students, efforts must be directed toward group participation in such projects. By combining the resources of several schools so that there will be a sharing of funding the cost factor problem might be solved. But even if this possibility were

attempted there would be an initial expenditure totalling many thousands

of dollars. The first step toward convincing the educational and public

communities must lie in sound research which will prove the feasibility

of such an approach to modernizing existing school libraries.

The research which must be done before a final decision is made

should encompass all aspects of a school library's operations. A cost

study of manual operations would be an important part of the study for

this will be the area which will generate the greatest concern by

administrators and the public. The library staff with the librarian as

a member of the research committee must be totally involved with the

study. They will have a deeper understanding of the fine points of

their daily responsibilities and will be best able to relate their

job descriptions to the experts involved. If the project is for

several schools the probability of acceptance would be greater, but

each school in the group must be totally committed to the project before

its implementation.

It is improbable that small or average size schools will be

able to automate their libraries, thus the need for pooling of resources.

But the larger public school systems with 30 to 100 or more school

libraries would find automation a distinct possibility for the future.

A central computer with on-line hookup to all school libraries could

assume many of the present clerical duties. This computer could act as

a union list of all materials in all schools and could also function as

a circulation center. When libraries wished to request the use of titles

not in their own collections, a computer assisted survey or search

could be performed which would provide the pertinent information in

seconds. All ordering could be done by the computer which would allow

an immediate check on an order months after it was sent to a jobber.
The most important aspect of computerization must lie in the services
of each individual school library.

If by library automation the librarian will be better able to
fulfill the needs of students and teachers, then the increased expen-
ditures would be deemed worthwhile. Educational trends point toward
increased independent research on the part of the student and multi-
media rather than textbook oriented teaching methods. Such trends
would mean increased utilization of the school library as a resource-
research learning center. To meet the demands of students and teachers
for professional advice the librarian would have to be relieved of
current tasks or the possible outcome could be an increase in the size
of the professional staff. If the computer could free the librarian
from some of the "clerical" duties he must perform to keep the library
functioning smoothly there would be time available to better meet the
aforementioned demands.

While the preceding paragraphs have been favorable, it must be
realized that this situation is, for the most part, hypothetical.
Actual use of the computer in the school library is a reality in only
a mere handful of very large schools and the success of these existing
programs has not been very high. One possible cause for the poor
progress shown in these programs might be traced to the predominately
negative attitudes held by many practicing librarians in the United
States. Change, especially introduction of automation, has created a
fear that librarians will someday be entirely replaced by computers.
While this situation is an admitted possibility, the probability of
such a change is very low, at least during the next fifteen to twenty-

five years. And if this change does take place it must be remembered that the knowledge and expertise of library scientists will progress just as rapidly. The place of research and experimentation is worthwhile in all areas of education and must be encouraged, rather than discouraged.

Section 6

CONCLUSIONS

Throughout this paper both positive and negative aspects of
library automation or library computerization have been presented. The
writer has attempted to balance these aspects in the hope that one might
reach objective conclusions based on them. However, it must be realized
that this presentation represents only a cursory examination of the
situation and does not attempt to present all opinions which have been
published during the last twenty-five or thirty years. Therefore, the
question remains as to whether library computerization is here to stay
or only a short-lived fad which is soon to die.

This writer feels that, regardless of the current negative
aspects, library automation is and must be pursued. The public and
educational libraries of the United States are being forced to expand
into new areas of endeavor never before dreamed of. Information or
media is being produced in ever increasing quantities causing librarian's
problems in the areas of acquisition, cataloging, and processing. If
libraries are to be expected to solve these problems, certain processes
must be automated. The factor of time is working against, not for the
librarian. He must perform almost miracles on a daily basis if the
needs of users are to be met and if time can be saved, as studies have
proven, he must look to automation.

It is true that he will encounter new, complex problems when
implementing the computer, but with time these problems will be solved.
Experts in the computer field realize the economic importance of

educational use both to their industry and to schools, and they are
not willing to lose money because of these problems. As programmers
and librarians become more knowledgeable in library computer use the
potential of such use will increase beyond the present limitations of
the imagination. The day will come when the library will truly be a
readily accessible storehouse of information, not a place where infor-
mation is retrieved only after considerable time and effort have been
expended. The potential of the computer appears to be the tool which
will enable these goals to be met, thus, the only barrier confronting
librarians is a lack of initiative on their part to be an active
participant in the creation of a solution.

BIBLIOGRAPHY

A. PRIMARY SOURCES

Blair, John R. "Automated Library System: Project LEEDS in the
    Springfield Public Schools," American Libraries, I (February,
    1970), 172-173.

Bush, Vannevar. "As We May Think," The Atlantic Monthly, CLXXVI
    (July, 1945), 101-108.

Mason, Ellsworth G. "Great Gas Bubble Prick't; or, Computers Revealed
    —— by a Gentleman of Quality," College and Research Libraries,
    XXXII (May, 1971), 183-196.

Salton, Gerard. "Computer and Libraries: a Reply to Mason Ellsworth's
    "stamp out computers," Library Journal, XCVI (October 15, 1971),
    3277-3282.

Smith, Gloria L., and Robert S. Meyer (eds.). Library Use of Computers:
    An Introduction. New York: Special Libraries Association, 1969.

B. SECONDARY SOURCES

Barnes, Barry J. "Hardware, Software, Technique and Philosophy: A
    Primer on Data Processing and Computer Hardware," Drexel Library
    Quarterly, V (April, 1969), 63-72.

Blackburn, R. H. "Automation and Building Plans," Library Trends,
    XVIII (October, 1969), 262-267.

Breiland, Mildred. "Centralized Data Processing for Libraries in the
    Albuquerque Public Schools," Drexel Library Quarterly, V (April,
    1969), 92-100.

Burgess, Thomas K. "Old and New Design Philosophies Used in Library
    Automation," ALA Bulletin, LXIII (October, 1969), 1265-1267.

Chapman, Edward A., Paul L. St. Pierre, and John Lubaus, Jr. (eds.).
    Library Systems Analysis Guidelines. New York: John Wiley & Sons,
    Inc., 1970.

Cox, N. S. M., J. D. Dews, and J. L. Dolby (eds.). The Computer and
    the Library. Connecticut: Archon Books, 1967.

Darling, Richard L. "A Comprehensive School System Materials Program,"
    Drexel Library Quarterly, V (April, 1969), 110-116.

Harris, Jessica L. "Programming the Library Catalog," _Drexel Library Quarterly_, V (April, 1969), 84-91.

Hayes, Robert M., and Joseph Becker (eds.). _Handbook of Data Processing for Libraries_. New York: John Wiley & Sons, Inc., 1970.

Jacobs, James W. "Applying Automation to the School System Media Program," _Drexel Library Quarterly_, V (April, 1969), 117-123.

Kaplan, Louis (ed.). _Reader in Library Services and the Computer_. Washington, D.C.: The National Cash Register Company, 1971.

Kent, Allen (ed.). _Library Planning for Automation_. Washington, D.C.; Spartan Books, Inc., 1965.

Kimber, Richard T. _Automation in Libraries_. New York: Pergamon Press, 1968.

Mason, Ellsworth G. "Along the Academic Way," _Library Journal_, XCVI (May 15, 1971), 1671-1676.

Matthews, M., and S. B. Sherman. "How to Computerize your Serials and Periodicals When You Don't Know How," _Wilson Library Bulletin_, XLIV (April, 1970), 861-864.

Salton, Gerard. "On the Development of Library and Information Centers," _Library Journal_, XCV (October 15, 1970), 3433-3442.

Stone, Walter. "Improved School Library Service Through Automation," _Drexel Library Quarterly_, V (April, 1969), 73-79.

Swanson, D. R. "Interrogating a Computer in Natural Language," _Science_, CLXXI (May, 1960), 1099.

Swanson, Mary Ann. "Computer in the School Library," _Drexel Library Quarterly_, V (April, 1969), 101-103.

Walker, Nancy C. "Automation and Acquisitions," _Drexel Library Quarterly_, V (April, 1969), 80-83.

Wasserman, Paul. _The Librarian and the Machine_. Detroit: Gale Research, 1965.

A "memex" is a device in which an individual stores all his
books, records, and communications, and which is mechanized so that it
may be consulted with exceeding speed and flexibility. It is an en-
larged intimate supplement to his memory.

It consists of a desk, and while it can presumably be operated
from a distance, it is primarily the piece of furniture at which he
works. On the top are slanting translucent screens, on which material
can be projected for convenient reading. There is a keyboard, and sets
of buttons and levers. Otherwise it looks like an ordinary desk.

In one end is the stored material. The matter of bulk is well
taken care of by improved microfilm. Only a small part of the interior
of the memex is devoted to storage, the rest to mechanism. Yet if the
user inserted 5000 pages of material a day it would take him hundreds
of years to fill the repository, so he can be profligate and enter
material freely.

Most of the memex contents are purchased on microfilm ready for
insertion. Books of all sorts, pictures, current periodicals, newspapers,
are thus obtained and dropped into place. Business correspondence takes
the same path. And there is a provision for direct entry. On the top
of the memex is a transparent platen. On this are placed longhand notes,
photographs, memoranda, all sorts of things. When one is in place, the
depression of a lever causes it to be photographed onto the next blank
space in a section of memex film, dry photography being employed.

There is, of course, provision for consultation of the record

by the usual scheme of indexing. If the user wishes to consult a certain
book, he taps its code on the keyboard, and the title page of the book
promptly appears before him, projected onto one of his viewing positions.
Frequently-used codes are mnemonic, so that he seldom consults his code
book; but when he does, a single tap of a key projects it for his use.
Moreover, he has supplemental levers. On deflecting one of these levers
to the right he runs through the book before him, each page in turn being
projected at a speed which just allows a recognizing glance at each.
If he deflects it further to the right, he steps through the book ten
pages at a time; still further at 100 pages at a time. Deflection to
the left gives him the same control backwards.

A special button transfers him immediately to the first page of
the index. Any given book of his library can thus be called up and
consulted with far greater facility than if it were taken from a shelf.
As he has several projection positions, he can leave one item in position
while he calls up another. He can add marginal notes and comments,
taking advantage of one possible type of dry photography, and it could
even be arranged so that he can do this by a stylus scheme, such as is
now employed in the telautograph seen in railroad waiting rooms, just
as though he had the physical page before him.