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ABSTRACT

This paper examines the history of academic libraries with special emphasis on the beginnings, growth, and progress in the uses of technology in those libraries. The earliest libraries were maintained for the preservation of knowledge and information. Access to the items in these collections was limited. With the growth of higher education in the late 19th century, academic libraries became information resources to their campuses and their use increased. The standard catalog card was developed to allow access to these collections. Between World War I and the 1950s, academic libraries saw the beginnings of library automation, preservation microfilming, and computers. The period from 1960 to the present has seen rapid advances in technology use in libraries. Major developments in computer technology and telecommunications changed the services libraries provided their patrons. Abstracting and indexing services, computer networks, and machine readable cataloging (MARC) all contributed to changes in the academic library. Today, new advances in information technology continue the rapid pace of change. As a result, academic libraries are in a constant state of flux. (Contains 26 references.) (JLB)

A History of the Utilization of Technology in Academic Libraries

by

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I. INTRODUCTION

On a recent episode of the popular television series "Star Trek: Deep Space Nine", Odo, the shape shifter and head security officer for the space station, noted that the commander of the station had asked him to keep a log of the security activities on the station. He noted further his lack of understanding as to why, except that humans seem to have an overwhelming need to keep records of everything, so much so that they constantly are looking for new ways to keep those records in microscopic formats or the records would overtake their world (Berman & Piller, 1993). Obviously, twentieth century humans wrote these lines for a fictional character from a future that only exists in imaginations. Yet it is indicative of a present truth -- the desire to maintain records of man's existence, whatever the format. That information -- its organization, storage, and access to it -- are the bailiwick of libraries as we know them today.

Academic libraries, on college and university campuses, are often referred to as "the heart of the university," and as such act as leaders in technological advances and are at the forefront of uses for modern automation capabilities. Let us look back at the history of libraries, especially in the academic setting, with an eye on the beginnings, growth and progress in the uses of technology in those libraries.

II. THE BEGINNINGS OF LIBRARIES

According to Webster's Ninth New Collegiate Dictionary (1991), an archive is "a place in which public records or historical documents are preserved." By that definition, the first libraries in recorded history were basicly, actually archives. The formats of the material in early library collections were very different from those of today. As early as the third millennium B.C. clay tablets were gathered together in a collection which could be called a library in a town in Babylon (Chipman, 1988). Leather, and later, papyrus, scrolls followed clay tablets as the format of preference for library materials circa 350 B.C. With the introduction of parchment around 300 B.C. books came into existence, since several sheets of parchment could be bound together. Books began to consistently replace scrolls in libraries or archives around 400 A.D. (Welsh, 1992). Through the centuries the information in libraries has been stored in current state of the art formats. The importance of the materials is witnessed by the fact that libraries were often taken as the spoils of war or destroyed (Chipman, 1988).

As we look at the ancient and Renaissance period history of libraries we see the changes in format of the material, but little other change until the colonial period, or later, in America. Collections were maintained primarily for the purpose of preserving knowledge and information. The use of items in the collections was very limited.

Limited to those in positions of power, the aristocratic elite, religious leaders, and the educated elite (Williams, 1980). Limited also by the actual number of hours the collections were open and available for use. That use was usually limited to within the library itself. That state of affairs persisted for academic libraries well into the nineteenth century.

A widely noted story illustrative of this point tells of the Harvard librarian, John Langdon Sibley, who as he hurried across campus met Charles W. Eliot, President of Harvard, who inquired where he was going with such an intent and pleased expression on his face. Sibley answered that all but two of the library's books were in the library and he was on his way to retrieve those two (Holley, 1976). It seems strange to realize this event took place as recently as sometime between 1869 and 1877. In Sibley's defense, regulations at Harvard at the time would have meant a severe reprimand for any unaccounted for materials upon the annual inspection of a Visiting Committee (Rothstein, 1972/1989). Sibley was representative of the librarian as often thought of in the nineteenth century and even into the twentieth century, as "a collector and keeper of 'things' . . . . The Head Librarian knew the collections as well as we know the contents of our homes" (Hurt, 1992).

By the late nineteenth century in America, higher education was changing, academic library collections were

growing, and technological developments were on the horizon to accommodate both.

III. THE WINDS OF CHANGE: THE NINETEENTH CENTURY

Thomas Jefferson, whose private library was the basis for the beginnings of the Library of Congress, also played a role in the changes that would come in academic libraries. With the passage, in 1817, of his plan for a true state university at the University of Virginia, which encouraged the elective principle and broadened the scope of academic study, Jefferson indirectly influenced the need for expansion of the holdings in, and the uses of, academic libraries (Brubacher & Rudy, 1976). The German model of the university and its adaptation and modification in America contributed to this change as well (Williams, 1980).

The passage of the Morrill Acts of 1862 and 1890 and the Hatch act of 1887 gave further impetus for changes in higher education, and so, academic libraries. As the perception of undergraduates as real hands-on learners gained acceptance, the opening of the libraries to them followed naturally. The period of university-building following the Civil War not only meant more institutions of higher education came into existence and saw increasing enrollments. It also meant the academic libraries, the information resource for the campuses, were enjoying periods of growth and use. The concept of broad areas of study

meant more materials on those areas of study were needed and began to be produced (Brubacher & Rudy, 1976; Holley, 1976).

During the last quarter of the nineteenth century technology came into its own in higher education and in academic libraries. Technology is defined as "a scientific method of achieving a practical purpose" (Webster's, 1991). Probably the most widely recognized leader in utilizing technology for libraries was Melvil Dewey. He, and his contemporaries, are credited with bridging "the gap between small collections arranged by size or order of acquisition .... to functional large collections in which users could pursue independent research" (Palmer, 1981). Dewey, of course, is recognized for development of his classification system which is still widely utilized, though not by as high a percentage of academic libraries as at one time. The first edition of that classification system was printed in 1876. That same year the American Library Association was founded with one of the first committees appointed being the Co-operation Committee. This led to much more uniformity, standardization, and cooperativeness among libraries. One example was the standard catalog card. Though there is varying views as to who gets credit for its standardization, we know it was and, where it is still used, is 7.5 cm by 12.5 cm or 3" x 5" (Bowker, 1926; Datz, 1951). Interestingly, the first card catalog cabinet was not made until over ten years after the standardization of the cards. The

first printed catalog cards were produced in 1895, about twenty years post-standardization (Datz).

The turning of the century saw more developments which had great practical use for libraries, especially academic libraries that were growing and trying to serve new subject areas and research needs. The Library of Congress began making printed catalog cards available to libraries at cost in 1901 (Bowker, 1926). Indexes to the burgeoning periodical literature began to be published. The interlibrary loan system had begun and was functioning effectively in academic libraries (Palmer, 1981).

The strides made during the latter half of the nineteenth century, and the utilization of technology and standardization in academic libraries were simple precursors of things to come.

IV. GAINING MOMENTUM: WORLD WAR I THROUGH THE FIFTIES

Modern technological advancements developed rapidly following the first World War, while World War II forever changed the way information was handled. Between the World Wars equipment in libraries was being analyzed and modified for better use, such as more functional and larger card catalog cabinets, and sectional circulation desks (Datz, 1951). Union catalogs, which had been suggested and talked about for many years, were finally established with support and funding from federal and foundation grants (Palmer, 1981). In 1928, the Library of Congress led libraries into

the age of format reduction with a program to microfilm books for preservation purposes (Welsh, 1993). By 1938, academic libraries in the United States were cooperating to share the cost of large microfilming projects such as "all books published in England between 1485 and 1550 -- about 4000 volumes" (Wilson, 1938). The late thirties also witnessed the beginning of library automation as the University of Texas library installed an automatic punchcard system (Palmer, 1981). Photocopying, or as it was first called -- xerography, was invented in the late thirties, but did not come into accepted use, especially in libraries, for a number of years after World War II (Hamlin, 1981).

World War II produced large numbers of documents which required organization, storage, and access. In the United States the federal government realized and encouraged the research capabilities of institutions of higher education during the war. Academic libraries benefitted, grew and progressed as a result. The data of war was produced in several formats. Microfilming became even more widely used to store that data in less space and a consistent format (Drake, 1989). One of the technological developments during World War II which would later impact academic libraries greatly, and in fact all our lives, was the automatic computer developed in 1942 (Welsh, 1993).

With the end of World War II and the passage of the Serviceman's Readjustment Act of 1944, better known as the "G. I. Bill of Rights," college campuses exploded with new

students, new programs, and a new view of who should attend college. Academic libraries continued to change to serve these needs and as those educated in this new system began contributing to advancements in technology and became librarians in academic libraries, technology became accepted as advantageous and necessary (Bonner, 1986; Moran, 1989).

The 1950s witnessed the growing academic libraries grasping at technologies enhanced by war-time research and development. Cooperative microfilm projects became accepted, cooperative purchasing projects such as the Midwest Interlibrary Center (later known as the Center for Research Libraries) were begun (Weber, 1976). According to Adams (1986) the use of computers for library tasks was first being considered. Libraries had at first been left out of early computer capability considerations due to the perception that libraries were not involved in doing computations, which were the first functions computers were designed to perform (Shaw, 1987).

V. INTO THE INFORMATION AGE

In researching the history of technological advances in academic libraries over the period 1960 to the present, two of the most interesting factors presenting themselves in the literature is the rapid advance of technology use in libraries, and the willingness of authors to predict the future of a constantly changing medium. Several sources list predictions which at the time written seemed logical,

but ncw provide insight as to just where technology was at that point in time and how quickly it has changed (Adams, 1986; Dupuy, 1968; Hamlin, 1981; Josey, 1975).

During the 1960s there were several major developments utilizing computer technology and telecommunications which would revolutionize the services academic libraries were able to provide their patrons. These projects and activities have been built upon in the succeeding decades with unprecedented progress and cooperation. Some of the most successful and durable computer applications for libraries begun in the sixties remain with us today by virtue of the fact that they were forward thinking and willing to embrace changes as technology, automation, communication, and computer applications have improved.

A first basic technology was the acceptance of the widespread use of the photocopy machine, especially for interlibrary loan of journal articles rather than direct mailing of journals (Dupuy, 1968; Hamlin, 1981). The capability of reproduction from microform to paper was also made available (Dupuy).

Abstracting and indexing services began to use computers in photographic composition and typesetting of their printed publications. This would mean that later the information would be usable in machine readable databases (Lee, 1989). This is one reason databases such as ERIC are now available online, or on compact disk, back to the sixties (1966 in ERIC's case).

The first network, begun in 1961, was the National Library of Medicine's Medical Literature Analysis and Retrieval System (MEDLARS). Using batch processing, MEDLARS could produce bibliographies on subjects within Index Medicus, the index of the National Library of Medicine's holdings. MEDLINE (MEDLARS on line) grew out of MEDLARS. During the 1970s MEDLINE became, and still is, accessable via online database search services, such as Dialog and BRS (Hamlin, 1981). During the 1980s MEDLINE became available in CD-ROM (Compact Disk - Read Only Memory) format. End user search capabilities were also provided remotely via a system called Grateful MED. Interlibrary loans which provide for the ordering of materials via online, and now via the Internet, for authorized medical related education or professional research is called DOCLINE.

A major development during the sixties was the design and implementation of the MARC (MAchine Readable Cataloging) format by the Library of Congress. This set standards for cataloging around the country, and in fact the world, and was instrumental in the success of cooperative cataloging networks since that time (Hamlin, 1981; Lee, 1989).

The Ohio College Library Center (OCLC), later renamed the Online Computer Library Center, Inc., began as a cooperative cataloging device serving 54 libraries in Ohio in 1967. During the seventies, as OCLC membership grew, an online interlibrary loan system was under development and was implemented in 1979. The decade of the eighties saw

OCLC experiencing further growth, and working on network capabilities as Ohio University cooperated on an online locally integrated library system that allowed the networked stations to interface with OCLC for online shared cataloging and interlibrary loan (Lee, 1989). By 1988, OCLC was serving over 9400 member libraries. OCLC, Inc. never sleeps it seems, as the next projects now under refinement show. Those projects include: a statewide information system in Ohio to facilitate library resource sharing, now known as OhioLINK; end user access to the OCLC cataloging database, known as WorldCat; and end user subject searching of many indexing and abstracting databases online utilizing OCLC's own search software called FirstSearch.

Not every venture begun over the years has been successful, nor even survived until superceded by a more advanced technology. One such case was the Information Transfer Experiment (INTREX) at the Massachusetts Institute of Technology, begun in 1965. The concept was to put the full text of an entire body of knowledge on a computer and the data would then be available from terminals online around the campus. Over $4 million was spent to load less than twenty thousand reports. It was determined there was no economical method to do this at that time (Hamlin, 1981).

During the 1970s, online bibliographic database searching became available. This meant any library that could afford a small computer, which at that time had no monitor only thermal roll paper and an acoustic coupler,

could dial-in to a database vendor such as Dialog or BRS and access indexing services they might not otherwise be able to afford. Most academic libraries were eager to access this new technology and provide enhanced service to their patrons. Due to the costs involved for this service, it opened a still unresolved debate among librarians regarding services for free or for a fee (Boykin, 1991).

Also during this time period many academic libraries had implemented some form of an automated system, for acquistions or circulation. It wasn't until the late 1980s that reliable software systems were developed to accommodate the integrated systems needed by academic libraries to handle not only acquistions and circulation, but also an online catalog as well (Boykin, 1991).

The 1980s saw the advent of databases on Compact Disks which patrons could search themselves on computer stations in the libraries. Telefacsimile machines came into use for quick delivery of copies of interlibrary loans (Didier, 1986).

Now we are into the nineties, the twenty-first century that authors have been talking about for decades is only a few years away. The state of flux in which we find ourselves in academic libraries indicates the speed with which technology changes and information grows. It has been said that the knowledge base in our world doubles every two years (Waterhouse, 1991). Consider that the NREN (National Research and Education Network) Bill was signed less than

two years ago (Welsh, 1993). The Internet is a topic heard everywhere, and many of us use it everyday. The expansion of electronic capabilities seems to adjust weekly. Oh what a joy to be involved in the possibilities alive not just on campuses, as higher education was once limited to, but around the world!

VI. CONCLUSION

Academic libraries are in a state of constant change as they serve the needs of the academic community. In this presentation we have seen the parallels between the libraries and the campuses they serve. As we face the twenty-first century we can look back, and look forward, by considering a quote from Shaw (1987):

> It is clear that the application of technology in libraries has been and continues to be extraordinarily robust. Contrary to popular myth, libraries have collectively and enthusiastically embraced new technology when its use is appropriate, and created the research projects and experiments necessary to lead the transitions. It is also clear that the same process is causing a radical redefinition of the academic library, its role in the educational process, and its relationship to the rest of the institution.

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