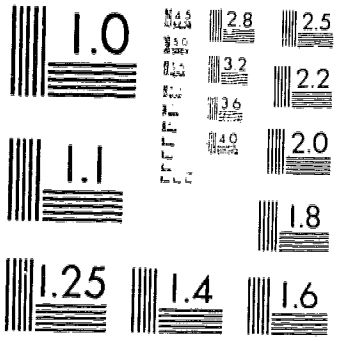

DOCUMENT RESUME

ED 128 014 IR 003 985

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TITLE Automated and Computerized Information Services for Libraries.
PUB DATE Jul 76
NOTE 11p.; Paper presented at the American Library Association Annual Conference (95th, Chicago, Illinois, July 18-24, 1976)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Computers; *Library Automation; Library Expenditures; Library Networks; *Public Libraries
IDENTIFIERS ALA 76

ABSTRACT

Though many of the functions of libraries are analogous to functions performed in the business world, public libraries have been disadvantaged by their reluctance to adopt computer technology. Though costs have previously been prohibitive and lack of uniformity in library processes has made the use of the new technology awkward, recently-developed specialized computers with flexibility to adapt to diverse library situations can economically and efficiently perform library functions. In the future, computer technology will play an increasingly large role in library services. (EMH)

AUTOMATED AND COMPUTERIZED INFORMATION SERVICES FOR LIBRARIES.

PAPER PRESENTED TO AMERICAN LIBRARY TRUSTEES ASSOCIATION - ALA MEETING - JULY 17, 1976 BY LEE HANDLEY

Although it is a somewhat trite observation to note that the public library is in the midst of sweeping, fundamental change, it is nonetheless true. The agents fomenting this change are many but by far the most significant factors seem to be economic pressures coupled with the library's changing perception of its proper role in the community.

With regard to economics, as libraries have continued to grow, costs have grown at an even faster pace. An inverse economy of scale is often operative. Why should this be? Why should the public library suffer from the effects of growth while other types of organizations, some even with missions comparable to that of the library, enjoy the benefits of increased size? Inflation? Restricted funding? Population growth? While these certainly are contributing factors, they alone do not explain the crisis facing so many public libraries today.

The funding picture for public libraries is difficult to see with perspective. Inflation and the desire to provide a broader scope of service have certainly squeezed the budgets of many libraries. Does this mean that libraries are underfunded? It is tempting to say "yes" and I must admit to having a certain personal prejudice in favor of increased financial support for the library.

There are many people more expert than I in making forecasts of future library funding levels. However, in order to establish a rationale for certain changes in library operation that will be proposed later, I'd like to cite some figures that give a fairly conservative dimension to the funding question.

If we look at funding over the last decade, we see that there has been an average growth of between 7 and 8 percent per year in terms of dollars whose value is uncorrected for inflation. While there have been fluctuations from year to year and temporary discontinuities in certain areas of the country, the overall trend is clear - 7 to 8 percent per year. It is enlightening to compare the library funding growth rate with a key economic barometer over the same time frame. We find that the gross national product, also expressed in dollars uncorrected for inflation, has risen at almost the same average annual rate, actually a bit lower.

Now, unless we can count on some positive shift in the nation's economic priorities in the direction of increased funding of library activities, it is unreasonable to expect that the library's medium and long term prospects for revenue growth can somehow exceed the expansion rate of the economy that provides the base for that revenue. While we can hope for a shift in priorities and certainly take every reasonable action to promote this shift, for planning purposes, we should not stake too much of the library's future on the prospect of a favorable change in the historical funding pattern.

So this question must be asked. What happens if the funding pattern does not change in years to come? What happens if the revenue picture changes only in approximate proportion to that of the general economy? A review of the impact of the recent fall-off of funding levels tells a disturbing story of the precarious financial condition of many libraries. Branch operations closed. Hours were cut. The general level of service declined. And, in some cases, materials

acqusition actually ceased because no funds were available. Clearly, many libraries have found themselves operating only a few budget line items from insolvency. And, the financial squeeze continues to tighten. All evidence points to the prospect of continued financial difficulty. Even when the present funding drop is reversed, the operational cost trends of the library indicate that relief is likely to be only temporary. As a whole, the library's revenue requirements have been growing more rapidly than the economy and, as a consequence, faster than the funding prospects a prudent library should depend upon.

In order to investigate just why the library should be disadvantaged by growth and why certain costs of operation seem out of control, let's compare the library of today with other types of organizations in terms of operational methods and the particular tools used to manage and control their various functions. In order to do that effectively, let's first identify the fundamental mission of the library. The oft-cited definition that the library's mission is to make information available to its patrons is clearly accurate but much too broad to be really useful in attempting to evaluate the library's operation at the level we are discussing. We'll need to do a bit of dissection in order to properly identify and evaluate the key activities.

In the past, attempts to compare the library's operation with functions that were seen to be equivalents in the business sector were often avoided as inappropriate. Today we have a somewhat different perspective. While it is clear that there are some aspects of the library's operation that are truly unique, the vast majority of activities do have parallels in business. And these activities have an enormous impact on both cost of operation as well as the level of service provided. What are they and what opportunities exist for progress? And just why should the library look to practices established in the business world for solutions to its problems? Let's look at some equivalent functions first and then examine why certain traditional practices of the library can benefit from change...and must.

The acquisitions function is in many ways clearly comparable to the purchasing operation found in many businesses. Are there any differences? Certainly, but they are generally very subtle.

Another library function with a close business parallel is circulation control. Here we find aspects of inventory control, some similarities with food market check out and also materials receiving activities.

Inter-library loan transactions are clearly related to circulation control but also introduce requirements analogous to those faced by multi-location inventory businesses of various types.

What of cataloging? There is a less well defined parallel between cataloging and common business activities but, by adopting some of the production tools of business, substantial opportunity for advancement exists.

Apart from cataloging, the problems which must be overcome in effectively presenting the catalog itself to the library patron are in many ways similar to those problems faced by organizations in private industry who also must deal with huge and diverse inventories and who also have the need to make the public aware of their holdings.

And finally we come to that difficult to define entity referred to as "collection management". In the context of our discussion today, collection management will mean the task of taking positive action to ensure that the holdings of the library are effectively acquired and used to support the real needs of the patron in much the same way that a merchant might carefully manage his inventory in a cost effective manner in order to make it responsive to customer demand. To do so with a large inventory absolutely requires clear and actionable feedback of collection performance information, information that has traditionally not been easy to come by in the library.

At this point, let me explain why it is proposed that the library look to techniques and tools taken from the business world. The answer is found in a close look at the history of automation development. There is little question that, in spite of its problems, frustrations and inadequacies, automation has become an indispensable tool of business and industry. Without it, many elements of our economic machine would become severely crippled or cease working altogether. The dis-economies of scale mentioned earlier would be an insurmountable barrier to healthy growth.

If one looks closely at the historical use of computers and related automation facilities, one finds that they were first employed in the solution of military problems. Later they were applied to scientific work. At that time, predictions for the continued growth of computer use were modest indeed. Many of the industry pioneers of the era saw a few dozen or, at most, a few hundred computers as being ample to eventually serve the needs of the entire nation. However, in the latter part of the 1950's, computers came into fairly common use initially in very simple business applications usually involving accounting and finance.

Primarily within the last decade computer installations have grown to the tens of thousands.

Why have most libraries not benefited in any substantial way from the so-called "computer revolution"? The answer is quite straightforward. To date, with very few exceptions, vendors of computers and computer related services have focused the majority of their attention and resource on the "easy" opportunities that offered substantial return without requiring significant investment in gaining insight into difficult problems in order to develop solutions. The only exceptions to this approach are found in market areas such as airlines and the insurance industry where the potential for sales are truly huge. Thus, although there are more than 9,800 public libraries in the United States, they comprise a fairly modest market at least in the eyes of the giants of the computer industry and, coupled with the fact that many library problems have difficult solutions, it becomes easy to see why developmental priorities have been established in markets that were seemingly more lucrative.

In the absence of ready made problem solutions, some businesses operating in markets not favored by the close attention of computer vendors have endeavored to employ their own resources in arriving at satisfactory systems. Why can't the library do the same?

A few can and have. But the true cost of these efforts is enormous and clearly beyond the reach of the majority of libraries just as it is too costly for the

majority of businesses. What about the cooperative sharing of systems developed by one institution with other libraries? The unfortunate reality is that most systems of this type are not transplantable from one library to another. The reasons for the failure of most systems to thrive in an environment other than that in which they were created is not peculiar to the library field. Many business organizations, having made major investments in systems developed for internal use, have attempted to recoup a portion of that investment by offering those systems to other organizations with similar needs. This seemingly rational approach has seldom met with success. The reasons are several. Perhaps the most important is that to achieve a successful transplant, the organization offering a system to another must be fully prepared to undertake virtually perpetual ongoing support of the system on the recipient's behalf. Even a brilliantly conceived and well executed system designed to solve a problem that is absolutely identical in two organizations (itself somewhat rare) will fail to survive if it cannot be made to adapt to changing requirements over time. Since no organizational environment, certainly including the library environment, is truly static, no automated support system can be both static and effective. This means that the originator of a system intended for use elsewhere must be willing and able to make an investment in ongoing support that often far exceeds the initial development cost. In addition, the organization must also face the need to tailor or adapt its system in some way for each new environment since problems shared between organizations are seldom absolutely identical and even less frequently perceived as identical. These requirements for adaptation and ongoing support mandate that any organization undertaking the supply of automated systems to others must make a permanent commitment of a significant portion of its resource. If the fundamental charter of an organization supports this type of commitment, the venture can succeed. However, most organizations, including the library, are hard pressed to justify a permanent diversion of resource from their primary mission to support this type of "extracurricular" activity. Attempts to engage in the supply of automated systems as a sort of part time sideline with less than full commitment inevitably result in failure that is almost always damaging to both the supplier and user.

A few ill-conceived and almost half hearted attempts to bring effective automation facilities to libraries have been attempted by major computer manufacturers in the past. These attempts have suffered from two failings.

Responsibility for the first failing must be placed squarely upon the shoulders of the computer industry. Their failures stem from ignorance of the true needs of the library together with an insensitivity to the unique circumstances that often can inhibit constructive action.

The profit motive, so easily understood by vendors of computers and computer services, is not a direct factor in the library. However, its absence can not be an excuse for the lack of proper attention to cost effectiveness in the attainment of high levels of service. Unfortunately, it often has been and this brings us to the second failing which is a failing of portions of the library community itself.

The failure of the library to recognize and act upon ineffective practices has, in part, been caused by the library's lack of actionable knowledge of the appropriate specifics of its own operation. It is not an exageration to state that most libraries cannot accurately cite the number of titles that they hold. Questions regarding the cost of acquisition, circulation, cataloging or other fundamental operations often tend to be answered with only a partial accounting

for the resources employed in support of these functions.

Many practices have been perpetuated without deliberate, reasoned assessment of the benefit derived for the cost incurred in light of the library's financial resource. Millions of dollars are routinely expended in the performance of tasks that, at best, have only the most marginal impact upon the library's primary task of supplying information to the public. In light of this history, it is not surprising that decisions involving adoption of automated alternative methods have been fairly arbitrary. Some institutions have opted for automated systems almost solely because of a desire to be regarded as "progressive". Others have declined on the basis that automated facilities were "too expensive" without knowing what the cost-benefit offsets truly were.

In fairness, the rather bleak scenario I've described does not apply to some libraries. Unfortunately, it is an accurate description of the past performance of many, many public libraries.

My recent association with members of the management groups of many public libraries has convinced me that the basic limitations in perspective that inhibited progress in the past are no longer the cause of failure to act. For the most part, the leadership talent is now there. But the ultimate tools are not and the understanding of the benefits of the worthwhile tools available today is in many respects, quite limited.

To be sure, the state of the art in library automation has been difficult to accurately guage. So often, reports of successful solutions to fundamental library operational problems have appeared in various media and announced at numerous meetings. What has happened to these "breakthrough" systems?

Apart from their impact upon the sponsoring library, nothing has happened and nothing should have been expected. In many ways, one must view the pioneering work carried out mostly by specially funded large institutions as being analogous to the pure research activity common in the scientific environment. Viewed in this way, it becomes clear why the oft-heralded breakthroughs announced in the professional literature have had no measurable impact on the operation of the vast majority of libraries. These "breakthroughs" actually have been a reflection of progress made in increasing the basic body of knowledge concerning the topic not notifications of the availability of improved alternatives to general library operation. This does not suggest that the value of these specially subsidized research activities is somehow diminished. Quite the contrary since, without the foundation and framework that they provide, little could be accomplished. However, for reasons cited earlier, the institutions conducting these research activities are seldom equipped or, most importantly, motivated to carry out the product engineering and ongoing support operations that are required to make these systems successful in other libraries. It must be recognized that the next step, the engineering and deliverable product development step, almost always falls to organizations with motivations and capabilities substantially different from those of the research groups. To look to the research people for the final product is as unrealistic as to expect the engineers to conduct pure research.

Only recently have we seen the beginning of the engineering and product construction phase of the library automation development cycle. As the technology has matured, library problems have become somewhat easier to solve. This easing of problem solutions will begin to draw the attention and participation

of the major vendors of computer systems and services. Of equal significance, the vacuum created by the inattention of the giant computer vendors has drawn a number of companies into the market, vendors who specialize in the supply of systems expressly intended for library use. These vendors fall into two general categories; those organizations formed for the sole purpose of supplying automated systems to libraries and those companies already providing products and services to the library community, who have established specialized divisions to supply automation services. Neither is necessarily superior to the other as a source of required services. Generally, the library is wise to select the vendor most knowledgable of the realities of library operation.

Again, the key point to be recognized is that it has been only recently that we have seen the formal engineering of library automation products suitable for widespread use. In our economic system, this task is almost always undertaken by the commercial sector for it is only here that the willingness and ability to make the requisite ongoing investment and risk of funds and other resource exists. The checks and balances of the free enterprise system are mandatory to ensure successful systems. The library must have the freedom to "fire" an unsatisfactory vendor. It is difficult and, in some cases, almost impossible to "fire" an unresponsive cooperative or other non-profit organization.

Concerning library cooperatives, the phenomenon of bibliographic data networks for library use has given rise to much speculation concerning their impact upon the future of library automation. There has been a great deal of confusion about just what these networks truly offer and how their offerings can best be exploited by the library.

In understanding bibliographic data networks, it is helpful to first understand what they are not. Although a network facility can be a very supportive component of a given library's operation, of itself, the network can do nothing to directly improve the performance of the library. In fact, it has been convincingly demonstrated that the mere injection of a network facility into the library without careful consideration of the library's overall system requirements can have a negative impact on both economics and service.

A network facility is a utility; a utility much like that which provides electric, telephone and other services. It is characterized by some of the same semi-monopolistic behavior as other utilities and suffers some of the same limitations imposed by the need to provide an essentially uniform and somewhat inflexible general service to subscribers with differing specific needs.

It becomes evident that the task of gaining improvements that are available through use of a bibliographic network utility is one that must follow, not precede the design of the overall library automation system. To do otherwise is as pointless as to contract for electrical or telephone services without first having understood and planned the specific applications of those utilities.

Since we find ourselves at the beginning of the engineering and product development cycle of library automation tools, it is reasonable to ask how long it will be before meaningful advanced systems become available to the majority of libraries.

The answer is that worthwhile automated systems are available today. True, their scope and function are relatively modest when compared with that which will become available in the future. However, there are good reasons to seriously consider their adoption now rather than waiting until some indeterminate future time to take positive action.

Earlier, certain parallel functions between library and business operations were cited. In part, because of the extensive experience in these areas already gained in the commercial sector, many of these operations have become ripe for exploitation by the library. Today, the library challenged by the requirement to provide enhanced service with more cost-effectiveness should look closely at the following systems, all currently available from an increasing number of competent sources.

First, and in many ways providing the foundation for subsequent automation activities is the automated catalog. Today, most effectively published in microform, the automated catalog is especially attractive since it offers both improved collection access as well as more economical operation than the traditional card catalog.

Even more dramatically than in other areas of library automation today, the automated catalog demonstrates the economic advantages of computer support. It is no secret that the unit costs of data processing are and have been on a very significant downward trend, in spite of inflation. In comparison, most labor intensive operations are on an explosive upward course. Automation of catalog support can provide substantial relief from cost pressures and, at the same time, improve service.

Automated authority control capabilities can be a very worthwhile derivative of an automated catalog operation. With an automated catalog in place, the task of maintaining proper conformance to established subject and name authority becomes much less costly while producing results superior to manual systems. Detection of variant entries becomes fully automatic and reportable to the professional staff on an exception, action document basis. Replacing all occurrences of an obsolete term with an updated one requires only one instruction in an automated authority control system rather than the laborious one-by-one search and change procedure necessary for each entry in manual operations.

An important change has occurred in automated catalog operation in recent years. At one time, the conversion of a library's catalog to computer-processable form was a monumentally expensive and very time consuming task.

Today, the catalog conversion task is a good deal more agreeable and much more easily supported. The advent of the Library of Congress sponsored MARC subscription service together with the availability of large machine-readable bibliographic databases amassed by a number of libraries now means that new opportunities are available for simplifying the conversion task. Rather than facing the manual keyboarding of virtually 100% of its catalog, the typical public library can now expect to obtain between 60 and 80 percent of the required records from existing computer databases. This factor has substantially reduced both the cost and elapsed time required to accomplish a successful conversion.

In another area of library operation, circulation control is a function that is readily supportable by automated systems today, at least in some libraries.

Three basic types of systems are now becoming available. One approach is the so-called "on-line" or interactive system. In this environment, transactions are acted upon immediately, and the results of the action are reflected in the system's various files almost instantly. For example, while a book is in the process of being checked in, the system files can be automatically interrogated to determine whether a patron is waiting for that particular book. If so, the system issues a message to the staff member handling the book instructing that the book be diverted on the patron's behalf and not shelved.

The second basic type of automated circulation system in use today uses the "batch" approach. This scheme captures transactions that occur over a given time period and makes them available for computer processing as a group or "batch" at a later time. No system files are immediately available for interrogation at the time that each transaction actually takes place.

The third type of system is really a combination of the attributes of the first two. In supporting some, but not all of its functions, it borrows some interactive characteristics from the on-line type of system. Other functions are carried out by the batch processing of other data. This hybrid type of system usually provides only a modest amount of on-line file storage.

In addition to these three basic system types, there are two general approaches to implementation of each type. One involves the use of traditional, relatively large scale computer facilities. The other uses mini-computer hardware.

Large scale or "maxi-computer" based systems tend to use only a portion of a given computer's resource in support of circulation control. The remainder of this resource is employed in support of other non-related activities. Because the maxi-computer must be capable of dealing with a number of different application tasks, its design must, by definition, be somewhat general purpose. This factor can mean that, in order to allow a maxi-system to be generally competent, performance and economic compromises must sometimes be made regarding the support of a particular individual application. If the application compromised turns out to be circulation control, this means trouble for the library.

On the plus side, maxi-computer based systems can often be developed more easily than other types.

Mini-computer systems are usually designed to effectively support the limited needs of a particular application rather than the more diverse requirements of multiple applications. If the design is well executed, a dedicated mini-computer system can perform very well while being quite cost effective. On the minus side, successful mini-computer based systems are usually more difficult to develop than those employing large scale hardware. It is this factor that accounts for the fact that the majority of mini-based systems are developed by vendors who specialize in complete "turn-key" library systems. To date, it is rare for a public library to develop a mini-based system using only its own internal resources.

As an aside, in using computers controlled by other agencies, it is very important that the public library be mindful of an especially dangerous "opportunity". This is the opportunity for free computer time. There is no such thing. Although some data processing groups still regard currently excess computer time as having zero cost, this attitude shows an incredible lack of awareness of economic reality. Inevitably, all excess time is eventually used up and, although there is usually no significant increase in actual out-of-pocket expense as this excess computer capacity is consumed, there comes a day of reckoning. The computer becomes saturated and new support requirements cannot be met. A larger computer is needed and, the real price of the "free" computer time suddenly becomes clear and immediately payable in the form of a new, more expensive computer, assuming, of course, that funds are available for its purchase or rental. When the decision to upgrade the computer is made, a very close look is usually taken at the users who have been enjoying the free ride. At that point, it is common for these users to be required to pay for computer processing in very real budget dollars in order to help defray the added cost of the new equipment.

Another outcome of the saturated computer situation can be even more traumatic. If funding for a larger computer cannot be obtained, there have been cases in which computer support has been simply withdrawn from former users of free time.

It is not my intention to overdramatize the dangers of the artificial "free time" syndrome. If you should find that it is offered and you can plan not to be dependent upon its zero cost over the long term, by all means, take advantage of the opportunity. The key point is that the library must remain in control of the situation and be prepared to deal with withdrawal of or charges for this service without disruption or hardship.

Returning to the library automation systems available today, we find that automated tools for improving the book ordering process are being introduced.

They are offered in a number of forms ranging from electronic, on-line systems to economical microfilm reference services. Regardless of form, if well designed and used wisely, these systems can reduce the cost of the ordering process while significantly improving the speed with which new materials are made available to the patron.

What of the future? As mentioned earlier, we are at the beginning of the product engineering cycle of library automation system development. As the technology continues to mature and as the required capital is invested to make this improved technology available to the library, superior tools will come into use in the public library just as they have in other types of organizations. In time we will see affordable tools providing electronic collection access, fully automatic control of the acquisitions function, cost effective inter-library loan and many other applications of automation technology. The best of these systems will fully integrate the support functions of all automated operations in a manner that will allow one to draw from and provide support to another. The essentially autonomous systems today separately supporting each activity will gradually merge to provide a coordinated single facility.

If future systems are to be significantly superior to today's automated tools, why not wait until they become available?

First of all, it is likely that many libraries will not be able to cope with future cost pressures without seriously compromising their primary mission. Viewed in this way, the savings capable of being generated by today's systems may be required in order to avoid erosion of the library's ability to provide quality service.

But, perhaps the most compelling reason for not deferring automation action is that the entire process of moving to more effective systems is evolutionary and takes time. Although dramatic, wholesale change impacting a library's entire operation is occasionally discussed, in practical terms, a well managed ongoing program for progressively adopting new systems is usually the most realistic approach. If well planned, and if the library requires that any vendor undertaking to supply all or part of an automation product be truly knowledgeable of the library's needs, a building block approach is definitely practical today.