Decision Points in Small-Scale Automation

Don Beagle

Automation has traditionally been seen as the province of large libraries. Only recently have advances in mini and super-mini computers brought the potential benefits of automation within reach of small to medium-sized libraries. Software companies are increasingly attentive to this market segment and it seems likely that many smaller libraries will automate within the next ten years.

Networking is another "large library concept" now finding its way onto the agenda of smaller libraries, partly through the efforts of such agencies as the North Carolina State Library and its North Carolina Information Network. Large scale networks are sometimes compared to highway systems carrying traffic between cities. But highways rarely take people to their actual final destination. This vital task is left to rural roads and municipal street systems. The individual library's automated system thus corresponds to a municipal street grid where most of the library's "information traffic" will flow.

This article will describe some of the decisions facing the manager of a small public library during the course of automation, and will explore how those decisions may affect eventual interaction of that automated system with external networks. My examples will best represent choices made in Lee County, particularly the decision to run library software on an off-site central computer already serving other departments of local government. This is not the standard scenario for library automation, which I take to be the turnkey hardware/software package. But the large library with an on-site central processing unit (CPU) will probably extend automated operations to its branches, and large branches accessing main library computers may face problems similar to those of smaller central libraries using off-site equipment. In addition, the use of an off-site central computer creates a small-scale network potentially expandable to other libraries within a local jurisdiction, and I shall discuss the possibility of networking the Lee County Library and the Central Carolina Technical Colleage LRC. My local examples are not meant as ideal models, for we have learned some things through trial and error. They simply form a convenient case history of goals, achievements, compromises, and mid-course corrections.

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Why Automate?

Library managers must justify the decision to automate, and while specific arguments may vary, I would make some general observations. Justifications probably fall into two categories: problem-solving and service enhancement. By itself, the problem-solving approach may unnecessarily limit the potential benefits of automation. The most obvious risk is that one will simply turn snarled paper transactions into snarled electronic ones. Beyond this, the need to solve a current problem may narrow the manager's perspectives when considering the range of options available. Automation can help eliminate an overdues backlog or streamline circulation procedure, but it can do other things as well, and some options will allow greater flexibility down the road than others. This especially applies to small libraries with correspondingly small budgets. One hears of large libraries moving to their second or third automated system, which is another way of saying that money can re-open options for decision-making. The manager of a small library would do well not to think of initial decisions as being easily reversible or correctable. Finally, an orientation toward problem-solving may lead one to the conclusion that problems must reach crisis proportions before such a drastic step is taken. Automation as a last resort, in an operational crisis, might create more problems than it would solve.

Of course, the service enhancement approach offers some risks as well. There is rapid and continual innovation in the whole field of information processing. Today's finest system may seem overpriced and underequipped tomorrow. But to be too concerned may lead to what might be termed the surfer's syndrome: he who waits for the perfect wave can spend life treading water.

Our specific justifications included both solutions and enhancements. We started with the need for better access to, and control over, the book catalog. Our two small branches had never enjoyed their own catalogs, limiting their value to students. Our main catalog had never been coded to indicate branch holdings, causing extra steps in every book search and uncertainty about the whereabouts of missing volumes. These and related problems could have been dealt with manually, but automation offered solutions along with significant enhancements. Many libraries, for example, report that book selection based upon better analysis of borrowing patterns can lead to large circulation increases. Fine, but detailed feedback about book use is hard to obtain when staff already pressed for time must manually sort and count book cards and pieces of paper. Orrin B. Dow, Director of the White Plains Public Library, recently described automated circulation systems as providing "... definitive book-use data for the ultimate in responsive collection management."[1]

Figure I.

19 Jun 86 Lee County Library System 10:48 AM
CATLOGING MODULE

Call number table: DDC

#	Begin Call	#Group Description	Count
49	720	Architecture	81
50	730	Plastic Arts/Sculptu	113
51	740	Drawing, Decorative Art	604
52	750	Painting & Paintings	189
53	760	Graphic Arts/Prints	25
54	770	Photography & Photogra	65
55	780	Music	292
56	790	Recreational & Perform	1096
57	800	Literature	251
58	810	American Literature in	1126
59	820	English Literatures	455
60	840	French	33

—more—
#. New group, Delete (#), Quit, Up, <cr>:

A screen print showing relative collection size by Dewey #.

A glimmer of this promise is already discernible, even though we have only finished converting our adult non-fiction collection. Figure one is a print-out page showing titles held by Dewey number, giving us for the first time a statistical picture of collection strengths and weaknesses. A better view will emerge when automated circulation begins and we can compare circulation by Dewey number with respective collection size. Similar breakdowns will be available on patrons, including figures for library use by census tract.

Better book selection based on better analysis may increase circulation, which ordinarily translates into even more cards and slips of paper. Automation, of course, offers dramatic improvements here, with circulation and cataloging modules sharing a common data base of MARC records tracking the book collection and registration records describing the patron population. Such arguments may seem self-evident to librarians, but must be stated simply and effectively in the justification process. After some communication lapses, I found an effective analogy between libraries, supermarkets and banks. Like a supermarket, a library faces problems of inventory control. Just as a supermarket automates using bar code labels on goods, a library bar codes its books. But where the supermarket "forgets" an item after customer purchase, the library must continue to track it with a patron account, comparable to a customer's account in a bank. And just as a bank gives you a machine-readable card to access your account through an automatic teller, a library gives you such a card to access your library account.

How to Automate?

Our first opportunity to automate in Lee County actually came in 1984, when the county had available ports on its computer, a Microdata Reality. (A port is a piece of equipment which allows remote terminals to communicate with the central processing unit, or CPU.) I was placed on the county's data processing advisory committee, which consists of department heads whose employees used the system. I visited with the State Library's Operations Consultant, and long discussions followed. The committee was prepared to recommend a computer upgrade to the Board of Commissioners due to lagging response time. Some involved in the process viewed library participation as an opportunity to justify a major upgrade. Others expressed concern that since the system was already deficient, library participation would "eat up" any memory and response time improvements that an upgrade would provide. Attempts to document the likely effects of library use were difficult because library software for the Pick operating system was literally brand new and relatively untested. (Pick is a relational data base operating system designed for compact storage and flexible handling of large chunks of data.[2]) After viewing the limitations of installed hardware and lack of available software, the idea of library participation was tabled. But the experience had several positive results. My fellow department heads and the DP manager came away with a better understanding of a library's automation requirements. And I came away with a better understanding of how depart-

ments providing different services can effectively share a CPU. Central to that sharing is the inter-departmental computer committee, which in Lee County is now larger and more important than ever.

While the committee did win an upgrade to the more powerful Microdata Sequel, the question of library use remained tabled while alternative options were explored. The major alternatives included: 1. run library software on the county computer; 2. buy a turnkey package with a library CPU; or 3. install a micro-based system tied in with a service bureau.

A fair number of smaller libraries have already purchased service bureau equipment. A library microcomputer temporarily stores circulation records and uploads them each night into a remote CPU owned by the bureau. The bureau processes the records, and may even handle overdues mailing. Advantages apparently include low initial cost, transfer of some clerical work elsewhere, and a fairly painless conversion of records into machine readable form. Presumably a bureau could also provide public access catalog searching by way of Computer Output Microform (COM) or Compact Disc-Read Only Memory (CD-ROM). Disadvantages would include high on-going payments to the bureau, loss of immediate local control over certain clerical tasks, and perhaps limitations on checkout points, since checkouts are performed by smart, expensive microcomputers rather than by dumb, cheap terminals. Finally, any searching via CD-ROM cannot provide the real-time status of an item in question. Library materials are constantly in transit; the most popular ones are those most likely to be checked out at any given time, and also are the ones most likely to be searched by any given patron. Only a system which integrates public access and circulation can tell the searcher whether the item at that moment is on the shelf, checked out, at a branch, overdue, at the bindery, on reserve, on order, in the story hour, in the outreach program, and so forth. With a service bureau, this information is batch-processed and stored hundreds of miles away. Since maximum catalog access and control was our main justification, we elected not to consider a service bureau.

The question of an off-site versus an on-site CPU was the main issue for us, and apparently for others as well, because some local governments urge libraries to access central computers without careful consideration of the libraries' real needs. The obvious advantage of accessing an installed CPU lies in saving the purchase price, as well as on-going expenses such as hardware maintenance, insurance, and support staff. There is almost no cost advantage to an on-site CPU when adequate data processing is available elsewhere. But "adequate" is the vital adjective. Many, probably most, local government CPU's lack sufficient disk space, memory, and ports to accommodate even small libraries. Those which could accommodate on paper will suffer degradation of response time to all departments. Since this affects employee productivity it must be considered a cost. Local officials should take extraordinary care before inviting a library on-line; they will almost surely pay an indirect price in response time or a direct price for upgraded equipment to handle the load. Some central upgrades might cost as much as a smaller library CPU purchased under a favorable turnkey contract. But again, the governing authority may offset upgrade costs in the long run by limiting itself to one hardware maintenance contract, one insurance payment, and one office of operating personnel. It may also be able to negotiate large-scale purchases of peripheral equipment and installation fees as more users are added.

Some conventional wisdom about off-site CPU's needs rethinking. One frequently hears worries about departmental priorities: if something breaks down, won't the tax office get priority over the library? I would suggest that if the CPU goes down, it goes down for both the tax office and the library. It would be difficult to fix selectively a computer. If the CPU you share with the tax office does go down, the problem will probably receive rapid attention by local officials. The more likely question of priority would be that a library having trouble with its *own* CPU might not get the speediest possible help from local data processing personnel working on separate tax office support.

Library managers must justify the decision to automate . . .

Response time problems could be more difficult to resolve. A slow shared computer would inconvenience both the library and tax office, and if public complaints resulted, action would need to be taken. The obvious corrective would be an upgrade. But one can imagine a financially strapped Board of Commissioners asking one or more departments to go off-line during peak periods, and the tax office would not be a sacrificial lamb. Again, then, careful preparation is important. Lee County is currently upgrading for the second time in four years, partly to accommodate

use by the library. Each upgrade has involved the top-of-the-line Microdata available at that time. The County, under the leadership of its Manager and Board of Commissioners, has deliberately embarked upon a course of maximum use of data processing facilities and seems prepared to follow up on its investment. Finally, I would comment that response time is a relative concept. A computer must slow to a virtual crawl before it processes a circulation transaction more slowly than having a patron sign book cards while staff manually check registration files for overdue books. And no one should suppose that an on-site CPU is proof against response time problems; there are more than a few sad stories in the library literature proving otherwise.

One potential cost advantage of a shared CPU not often mentioned is that the library may be able to utilize software purchased for and by other departments. The procedure for logging off library software and onto some other module is typically one of keying in four or five commands and passwords at any terminal. The Lee County Recreation Department is considering an expensive package for meeting room bookings which could also be used by the library. Word processing and spreadsheet software purchased for other departments is available to library staff and can pull data out of the library accounts for such purposes as form letters and budget reports. Electronic mail among departments is a reality. The Lee County Elections Office is on-line and since library staff must register voters, we will consider training in this. The County Planner maintains a file of updated street and mailing addresses shared by several departments; library access could mean better updating of our registration files for overdues.

Security

Networking departments with shared software on a central CPU raises questions of security. What access to library accounts, if any, shall other county personnel have through their terminals? How can this access be restricted? When, if ever, should the library accept or divulge any data on county residents for or from its patron file? In public access searching, how are patrons prevented from entering overdues files, or for that matter, tax office software?

The DYNIX Automated Library System uses several levels of security which make it acceptable for shared CPU operations. The first and most powerful level is port access clearance. Any user with a terminal communicates with the CPU through a port. Each port is numbered, and port access to any module is blocked unless specifically cleared by the system administrator. Public access terminals are cleared for the on-line catalog module only. Any attempt to access the circulation module (which includes overdues accounts) from such a terminal has virtually the same result as pulling the terminal's plug. We have decided to allow other county departments access only to the on-line catalog if specific requests are made.

We started with the need for better access to, and control over, the book catalog.

If an outside user does find a terminal cleared for port access into circulation, that user must still log on through a system password followed by a personal ID number and password. Passwords and ID numbers for separate modules can be assigned separately. A volunteer with personal clearance into the cataloging module can still not enter the circulation module, even if using a terminal with port access to circulation. In addition, each staff member is assigned a security level one through five, with a sixth reserved for the system administrator. Once into a module, each staff member can access only those function menus appropriate to his or her security level. Within the menus, certain sensitive functions like global authority file changes require confirming passwords. If the system administrator does not agree with the layering of functional access under these levels, access can be customized for each password. No doubt the challenge for vendors is to incorporate such security features without making the whole system cumbersome to use. It seems that DYNIX and others have succeeded well enough that administrators need not be too concerned about interdepartmental security with a shared CPU. Of course, data sharing over computer networks should be subject to at least the same ethical standards applied to the sharing of other types of information involving both individuals' right to privacy and the public's right to know.

Beyond the interdepartmental level, however, a shared CPU does present some security problems with respect to software maintenance. DYNIX offers 24-hour software support from its headquarters in Provo, Utah. The vendor's technician uses a remote terminal and modem on the regular telephone network to access a dial-up modem hooked to the CPU. But to keep a dial-up modem active on an open telephone line 24 hours

per day would mean that any person with a microcomputer and modem who learned that telephone number could access the county computer and try to enter any department's software. The regular security measures described above are probably ample for public access terminals within staff view and for other departmental staff working under normal supervision. But hackers enjoying nightly unsupervised entry to a system through a dial-up modem might defeat any security measures. For this reason, our county asks DYNIX staff to signal a request for modem hookup. During regular business hours this presents no real problem, but our circulation software will be up and running on evenings and weekends when DP staff are off-duty. One solution might be for library staff to go to the DP office and hook up the modem when emergency software support is needed. Obviously, such concerns are less serious with an on-site CPU.

Software Options

The decision to access a county computer immediately restricts the choice of software vendor, since software packages are designed for specific operating systems. In June of 1985, with the county upgrade in place and at least two vendors offering Pick library software, I spent the ALA Summer Conference in the exhibition area, comparing systems with two questions in mind. First, would the restriction to Pick deprive us of any significant features offered by vendors using other operating systems? And if not, which Pick software seemed best for our needs?

A detailed comparison of software packages is beyond the scope of this article; both DYNIX and McDonnell-Douglas offered sophisticated systems fully competitive with any non-Pick software, in my opinion. (A third vendor, Advanced Library Concepts, has since entered the field.[3]) The decision in favor of DYNIX was based on a number of considerations, including visits to other DYNIX installations. (Accessing the county CPU eliminated the need for a formal bid procedure since software is considered a service and since our initial peripheral equipment totaled less than bid regulations required.)

Installation planning proved to be the most challenging aspect of the project, in that it presented us with a multitude of decisions which had to be made up front, but which would shape the course of the project for its duration. Since we were learning as we went along, it meant that some of the most important decisions had to be made at the point where we seemingly knew the least. The decisions included:

1. Should the project be phased in or implemented at once? It is possible to begin circulation immediately, and ask staff to input brief records for books and patrons during checkout and check-in. This has the advantage of getting the most popular items and the most active patrons into the system first, immediately easing some circulation paperwork. But it delays each circulation transaction and puts greater pressure on staff to master two software modules at once. It also would have meant patron orientation and new library cards immediately, which threatened to overwhelm our limited resources. We elected to spend a year with the cataloging/conversion module, allowing staff (some of whom had never touched a terminal keyboard) to feel more comfortable before circulation training began.

This also allowed us to stretch our yearly budget by purchasing the software over time. The DYNIX package includes modules for cataloging, circulation, and public access; they also offered a conversion module which actually was a limited training version of cataloging. Purchasing the conversion module in effect increased the price of the cataloging module, but this was offset by the fact that software maintenance is not charged during the conversion process.

2. Should we bring the main library on-line first and add branches later? Ordinarily we would have preferred to bring the main library on first, but branch catalog access was so central to our justifications that we felt obliged to include them from the outset. It is a less than ideal use of equipment because the small branch collections will be converted far in advance of the main library, and their equipment will essentially sit idle until the main library conversion is complete. On the other hand, the branches have proven to be excellent for trial and error test runs of certain procedures; their small collections mean that few records need revision when we correct errors or simply change our minds about form of entry. As we have proceeded through the non-fiction collections in shelf-list order, problems peculiar to each class (especially collective biographies) have been resolved at the branches well before their appearance at the main library. We now plan to implement circulation first at the Broadway Branch, where we hope to encounter and resolve any glitches with circulation procedure (especially holds and overdues) in a relatively slow, low-volume situation.

In addition to these broad decisions, we faced many specific questions as we worked through the DYNIX Pre-Installation Planning Guide. Software variables such as city codes, patron loan

types, item loan types, collection codes and tables, screen formats, and stop word lists are best resolved prior to installation. But again, the choices are challenging because they will affect both system performance and future policy. Item and patron codes and types, for example, will determine the content and format of statistical reports. Stop word lists contain those extremely common words (articles, pronouns, and so forth) which could "overload" system searching if included in key word indexing. Item and patron priority levels will determine restrictions in borrowing privileges; by assigning, for example, a juvenile card a 40 and a videocassette player a 50, one encodes into the system a page from the library's rule book. Many variables can be revised by the user, of course, but the initial installation virtually demands a wide-ranging review of circulation policy.

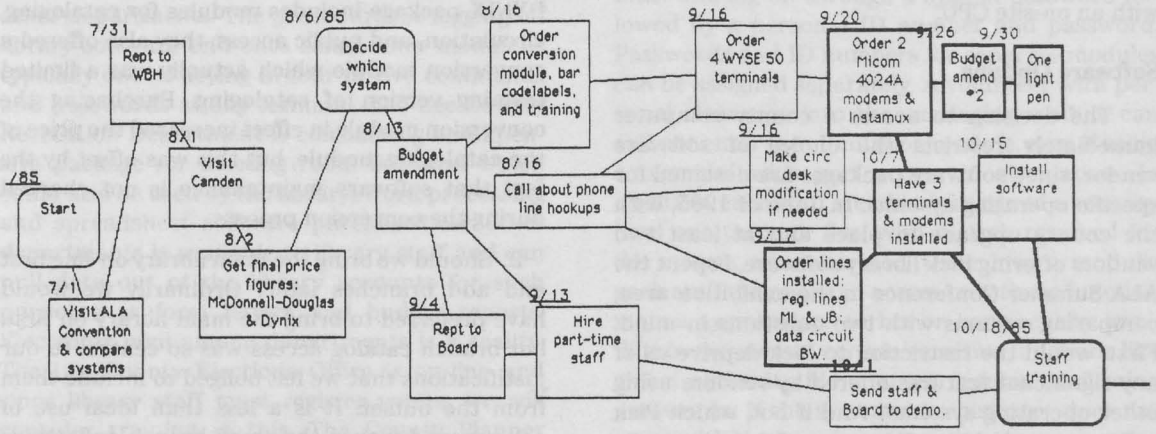

Figure II. A portion of the project plan laid out with MacProject, and meant to be continually reviewed and revised.

Hardware Planning

Unlike a turnkey package where one vendor can be expected to handle all arrangements, our contract with DYNIX is strictly for software, and responsibility for hardware selection and installation (which had to be completed prior to software installation) lay with us. This was complicated further by the fact that the DP office had dealt with one vendor for the CPU and with various other vendors for peripheral equipment. Add to this the installation by the local phone company of dedicated lines between the three libraries and the county office building, and problems with electrical power and protection, and a better picture of the challenges we faced emerges.

We faced so many problems with coordinating the sequential installation of power, phone lines, and peripheral equipment, as well as scheduling payments for these, that some formal outline was needed to organize it all. A tool which proved particularly effective, sometimes called 'critical path planning,' is taught in the County Administration Course at the Institute of Government in Chapel Hill. At its most basic, critical path planning requires only pencil and paper and is essentially a glorified flow chart. I used a microcomputer version called MacProject. Developed for the Macintosh, it is a powerful but simple planning and budgeting guide. One enters a series of tasks to be accomplished on a task entry table. Each task can be assigned a duration and a deadline. When the tasks are put in boxes on the flow chart, the computer calculates the total schedule. Lines between the boxes specify which tasks are dependent upon others, and which can be handled separately [see Figure two]. Boxes and lines can be added, deleted, or rearranged, and the computer recalculates the whole schedule accordingly. Another advantage of the software version is that each task can also be assigned a cost [and/or a revenue], and the computer will forecast the cash flow for the project over its future course. We have tried to enter our entire schedule as phased in over three fiscal years, and it has proven to be a valuable aid to planning and implementation.

The basic hardware installation works as follows: a library terminal is hooked to a modem which sends the signals over a phone line. In the DP office, a corresponding modem receives the signals and sends them into the CPU by way of a port. For installations requiring multiple users, the terminals send signals into a multiplexor or data concentrator, which packs the signals into a stream and sends them onto the modem; again, the DP office modem receives the stream whose signals are unpacked by a corresponding multiplexor. These signals then enter the CPU through a series of ports corresponding to the original

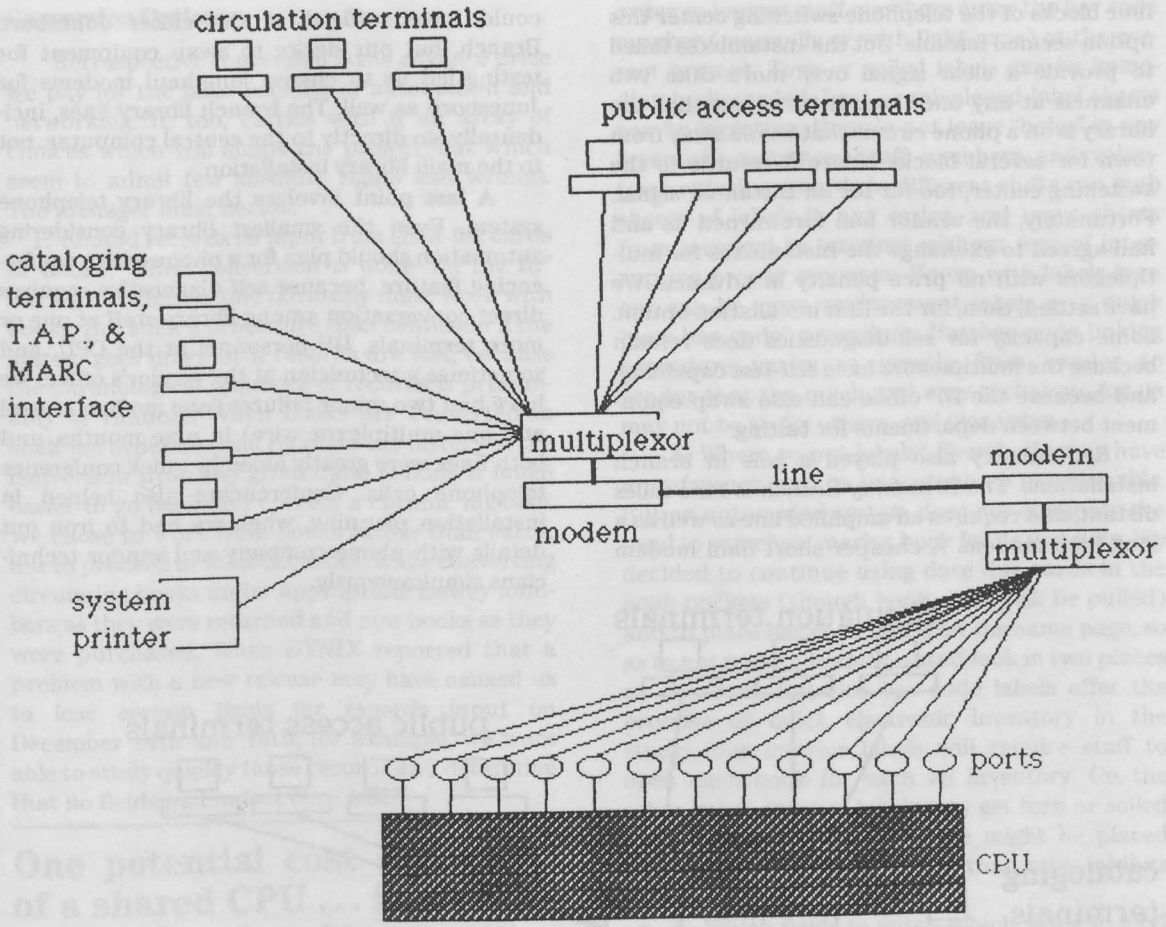

Figure III. Lee County Library's hardware installation layout.

number of terminals. (Our early estimate of port needs, made during the absence of a DP manager, was based on a mistaken assumption that because a multiplexor packs data for transmission over one line it would enter the CPU through one port. Far into our budgeting process we discovered that we would need not four ports but fourteen; an expensive discovery since a package of eight ports costs over five thousand dollars.)

Some of the decisions made during hardware installation planning involved staff and patron convenience, redundancy in case of failure, and capacity for future expansion. Figures four and five show the two main hardware options we considered, which I would like to discuss in some detail.

Figure three shows twelve peripherals wired to twelve-channel multiplexors whose signals travel over one phone line. Such an installation has five links: two modems, two multiplexors, and one telephone line. The failure of any link would bring down the chain. And a failure could be difficult to diagnose. We would have no backup modems or multiplexors to swap, because it takes two of each to complete the chain.

Figure four shows twelve peripherals hooked to one pair of four channel Instamuxes on one phone line and one pair of eight channel Instamuxes on a second line. An Instamux is a new multiplexor/modem combination, and is so much less expensive that four Instamuxes would be cheaper than two multiplexors. A further advantage would be redundancy. There would be two chains with each having three links. The failure of one chain would leave a second providing essential services. And Instamuxes could be swapped between lines in case of a failure, allowing us to do quick self-diagnostics. (When self-diagnostics are not possible, a vendor technician may need to make one trip to learn the cause of a problem and a second trip to repair or replace equipment.)

We preferred the Instamux option and installed these first on one line. But Instamuxes have an important limitation; they cannot send signals over long distances. Since both the main library and the county office building are within

four blocks of the telephone switching center this option seemed feasible. But the Instamuxes failed to provide a clear signal over more than two channels at any one time. It turns out that the library is on a phone circuit that winds away from town for several blocks before it returns to the switching center, too far for an Instamux signal. Fortunately, the vendor had forewarned us and had agreed to exchange the Instamuxes for multiplexors with no price penalty in advance. We have settled, then, for the first installation option. Some capacity for self-diagnostics does remain because the multiplexors have self-test capability, and because the DP office can also swap equipment between departments for testing.

Redundancy also played a role in branch installations. The Broadway Branch is nine miles distant, and requires an amplified line as well as a long-haul modem. A cheaper short-haul modem could have sufficed at the closer Jonesboro Branch, but our desire to swap equipment for testing led us to choose long-haul modems for Jonesboro as well. The branch library lines, incidentally, go directly to the central computer, not to the main library installation.

A last point involves the library telephone system. Even the smallest library considering automation should plan for a phone with a conferencing feature, because self-diagnostics requires direct conversation among library staff at one or more terminals, DP personnel at the CPU, and sometimes a technician at the vendor's office. We have had two minor failures (one modem crystal and one multiplexor wire) in nine months, and both fixes were greatly aided by quick conference telephone calls. Conferencing also helped in installation planning, when we had to iron out details with phone company and vendor technicians simultaneously.

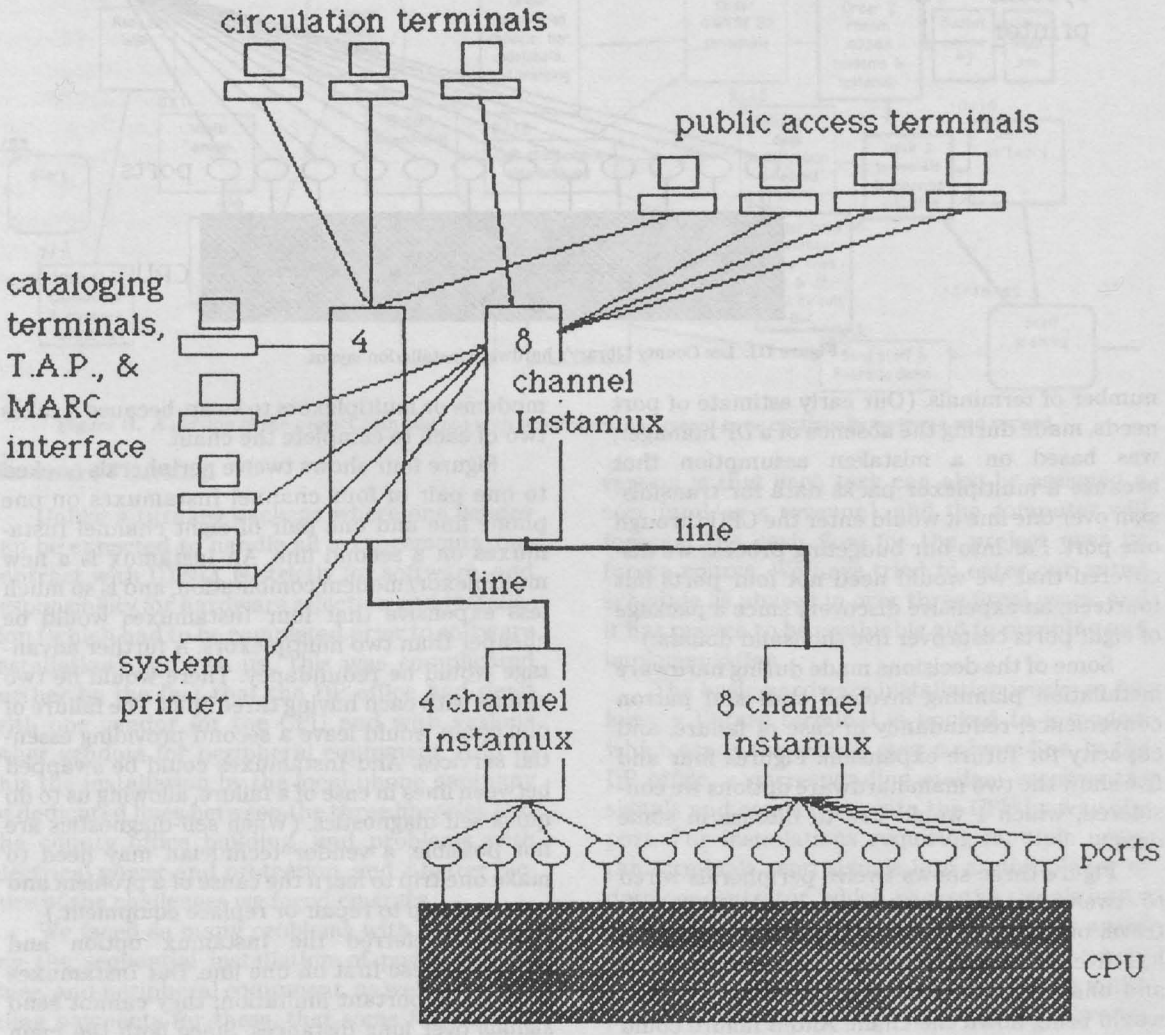

Figure IV. An alternative layout for greater redundancy. Instamux limitations made this unworkable.

Conversion Options

Retrospective conversion is the advance price we pay for the later benefits of automation and networking. It, too, carries with it an array of choices which will shape the project, but which seem to admit few absolute rights and wrongs. The manager must decide:

1. Should records be input from shelf-list cards or books? When conversion is done "on the fly" during circulation, one obviously must work with books. But such a procedure risks confusion if the system goes down or if records are lost, because the chronological sequence of records is presumably at random. When books are converted in shelf-list order one can recreate the history of the conversion from any given date, making it much easier to go back and correct a chronic mistake. We chose to work from books rather than cards, but to proceed in shelf-list order, while converting circulating books under appropriate Dewey numbers as they were returned and new books as they were purchased. When DYNIX reported that a problem with a new release may have caused us to lose certain fields for records input on December 14th and 15th, for example, we were able to study quickly those records and determine that no fields had in fact been lost.

One potential cost advantage of a shared CPU ... is that the library may be able to utilize software purchased for and by other departments.

A conversion done from shelf-list cards would also have included records for many books which had "walked out the door" over the years. Our "hands on books" procedure essentially turned our conversion into a shelf inventory. The hope is that the on-line catalog will thus be as close as possible a representation of what a patron could actually expect to find on our shelves as of 1986. Finally, a shelf-list card conversion does not eliminate the need to handle books, since bar code labels must be affixed.

2. Bar code labels: smart or dumb? Smart labels tagged to specific titles can be generated for collections already having machine-readable records, but these require staff to pull and verify titles for labeling. I am not qualified to comment upon a conversion with smart labels, but dumb labels (not tagged to specific titles prior to being placed on books) do have certain clear benefits. Any labels may be placed on any books in any order so long as staff members enter the bar code number (manually or with light pens) at the correct prompt. Torn or soiled labels can be immediately discarded. Lost or misplaced label sheets can be forgotten; they do not leave "holes" in any inventory sequence. Staff members and volunteers entering records in different shifts can grab sheets of labels in any order, and move sheets from terminal to terminal without fear of interrupting proper sequence. Books with labels torn out can be given replacement labels in a quick "new bar code" procedure. But bar code linking procedure varies so greatly from vendor to vendor that the quick and easy technique for us may not be so for others, and vice versa.

3. Where to put labels? Everybody may have a preference, and its importance is questionable. But an automated system does not eliminate the need to somehow mark a book for its due date. We decided to continue using date due cards in the book pockets (though book cards will be pulled) and to place bar code labels on the same page, so as to not make circulation staff look in two places at checkout. Exterior bar code labels offer the promise of quick electronic inventory in the stacks; our interior labels will require staff to open each book for such an inventory. On the other hand, exterior labels may get torn or soiled more easily. Transparent tape might be placed over labels, but some report that tape inhibits code readings by light pens.

4. Which fields to enter, which fields to buy? We decided to streamline our work and enter the absolute minimum for each book: LCCN and title. This constitutes an abbreviated bibliographic record for the title which is then linked to a holdings record for the particular volume. The holdings record includes bar code, collection code (AF, ANF, and so on), item type (B for book, A-V for audiovisual, etc.), copy number, price, source, and location (M, B or J). We also asked DYNIX to customize our holdings records by adding fields for memorial and donor. These fields will be indexed so that, for example, we will be able to search all books donated by Dr. John R. Dotterer or given in memory of Douglas Wilkinson. (We have never accessioned books and probably would not enter accession numbers in any case; but contrary to what a speaker once stated at a conference in this state, it is perfectly possible to enter, index, and retrieve records by a local accession scheme.) Figure five shows the bibliographic record for the title *Fatal Vision*. This single bib record is linked in the system to nine different holdings records corresponding to the nine volumes currently held by the library. Figure

Bibliographic Record

Enter BIB # : 65

1	LCCN	82-24127
2	Title	Fatal vision
3	Added Title	
4	Imprint	New York : G. P. Putnam's Sons, 1983
5	Pub Date	1983
6	Author	1/McGinniss, Joe
7	Call Number	364.1M
8	Edition	
9	Contents Note(s)	1/
10	Collation	
11	ISBN	0-399-12816-6
12	Subject Headings	1/MacDonald, Jeffrey R. 2/Crime and criminals—United States—Biography 3/Murder—North Carolina
13	Series	
*	Added/Modified	1/10 Dec 85 2/23 Jan 86

End of Record

#, File, Quit, Delete, Update(#), <cr>:

Figure V. A sample bibliographic record for a title. Most records include only LCCN and TITLE until MARC matching is complete.

six shows one such holdings record; each is keyed to the bar code number affixed to its volume.

For books without LCCNs we enter nearly complete bibliographic records; consequently these are set aside by front desk workers for later work by professional staff. Otherwise all work on the conversion thus far has been done at the front desk by regular circulation assistants. When the new upgrade is installed, additional terminals will be placed in back rooms and other staff members and volunteers will begin work.

When our conversion is complete, copies of the records will be downloaded to tape and will be mailed to a vendor for MARC record matching. The tape will be returned with complete records for whatever percentage (we hope at least 80%) have matched. Work will then commence on completing the unmatched records. This procedure seems to have worked well with the adult non-fiction collection, but for fiction we are considering having staff also add author entries. This complicates matters due to the on-line authority file check for each author, but will greatly facilitate use of the computer catalog until MARC records can be purchased.

6. What about customization? The initial installation seems a confusing time to consider customization. But if the vendor offers it, installation is the proper time because the vendor may include a deadline on free customization and because such refinements should be in place before too many records are entered. We asked not only for the memorial and donor fields described above, but also for contents indexing under keyword title searches. This means that collections can be retrieved by the title of any story, poem, essay or play included in the books. Collective biographies can be retrieved by name of any person listed. While it certainly lengthens the conversion process, the results while searching the catalog are already impressive. Figure seven shows how a keyword search for AMADEUS has retrieved a book which includes selections from the play, but whose title does not include the search word. Contents indexing can also produce some searching oddities. A Boolean "or" search using the terms BLACK and NEGRO retrieved all the expected titles, as well as a book on Rembrandt which included a contents note about black and white illustrations!

7. How will new records be added? The tape downloading procedure described above can be repeated periodically to add new records to the system, but this presents special problems for a small library. Most vendors require a minimum number of records (usually 1,000) for such a tape-run. Since we purchase only some 3,500 titles per year our catalog could only be updated quarterly.

DYNIX markets OCLC and MARCIVE interfaces which use an IBM PC to copy records over phone lines and enter them into the cataloging module. We are looking at these as well as a new Bibliophile interface which does essentially the same thing with MARC records on optical disks.

Local Networking Options

The Lee County Library and the Central Carolina Technical College (CCTC) LRC have a

Holdings Record

Enter Barcode : 3326200055712 33262000055712

*	Title	Fatal vision
2	Collection	Adult Non-fiction
3	Call #	364.1M
4	Copy #	C1
5	Volume #	
6	IType	Book
7	Price	$14.36
8	Source	CBS
9	Donor	
10	Memorial	
11	Agency-scndry	M
*	Agency-main	LCLS
*	IStats	1/Social Pathology & Services
*	Added/Modified	1/09 Jan 86 2/09 Jan 86
*	Use Count	0
*	Last Used	

End of Record

#, File, Quit, Delete, Update(#), <cr>:

Figure VI. A sample holdings record for a volume. Records may be revised and updated using FM (file maintenance) commands.

25 Jun 86 Lee County Library System 09:02AM
Cataloging Module

Call # 808.82B DYNIX #4937

Title The Best Plays of 1980-1981

LCCN 20-21432

Contents
1) A Lesson from Aloes
2) 42nd Street
3) Zooman and the Sign
4) A Life
5) Lunch Hour
6) Amadeus
7) Crimes of the Heart
8) Translations
9) The Floating Light Bulb
10) Cloud 9

Enter: Amadeus

Figure VII. An example of keyword title searching retrieving a contents note.

long history of cooperation. The two issued a combined book catalog for most of the 1970's. It was dropped due to increasing workload at both institutions. But automation is again bringing the possibility of a combined catalog to the point where managers at both libraries face some practical decisions.

Through fortunate circumstance, the CCTC computer (manufactured by PRIME) also runs the Pick operating system. CCTC administrators will soon have the option of running DYNIX software on their computer or on the central computer owned by Lee County.

It would be entirely possible to run both agencies discreetly on the same computer with the same software modules. Patron records could be maintained in one file, or two files could be partitioned. Similarly, the MARC database could be collective so that any search would retrieve titles in both institutions, or could be partitioned so that a search from one library would access the other's collection only with a secondary command. Patrons could enjoy one combined registration and could search either collection from any public access terminal. Borrowing privileges could automatically be suspended at both institutions pending resolution of overdues at either. Staff could exchange electronic messages. Because the Lee County Library software is already installed on the county computer, this option would require the LRC to access this same CPU with multiplexors and phone lines.

At first, it may seem strange that two libraries five miles apart, with a history of cooperation, would even consider running identical software on separate CPU's, but in fact there are sound arguments in favor of this option. It would allow the LRC to access other accounts in the college system including student records and budgeting. An on-site system would eliminate the need for costly multiplexors, phone lines, and ports. It would relieve the problem of response time restrictions should CCTC wish to place remote terminals in neighboring counties for extension classes. Nor would this option preclude cooperation. Each library could still place a terminal in the other's facility for on-line searching. Or, combined on-line searching could be possible by periodically cross-loading MARC tapes. And each could honor the other's bar-coded patron cards, relieving patrons from having to carry two cards (the patron's registration accounts would be separately maintained on the two systems, but would be tagged to the same bar-code number on the library card.)

The questions surrounding such local networking are now near the top of our agenda as each library completes its retrospective conversion. The decisions facing us in the near future will shape library service in Lee County for many years to come.

Conclusion

At the outset I stated that automation has traditionally been the province of large libraries. Managers of smaller libraries may be excused for feeling like proverbial poor cousins. But this may be changing. In fact, the smaller library may well turn out to be the most exciting environment for the innovative efforts at automation. Unencumbered by the massive collections of research libraries whose sheer size place enormous demands on computer memory, storage, and response time, small public libraries may be better able to explore such features as keyword contents searching, electronic inventories, and book circulation at remote locations with portable bar code scanners. Better indexing of children's literature by illustrator or reading level, better access to fiction by genre or historical period, better access to local history and genealogical material by bar coding vertical files—all these are real, practical options for smaller libraries in the course of automation. As smaller libraries automate they will also network, and their patrons will enjoy increased access to resources across the state. The process of automation and networking now under way may transform public library services in North Carolina in ways we cannot foresee.

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