The Development of Automated Archival Systems: Planning and Managing Change

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Introduction

AFTER ALMOST TWO DECADES of debate within the archival profession, there has been finally, in the last three years, enormous development and a transition toward archival automation. The archival profession has moved from the isolated and elitist position of a small number of archives using in-house, batch-oriented mainframe computer systems with cumbersome, locally developed software, to cooperative and integrated networks of archives using diverse mini- and microcomputer systems with commercial software, a variety of local, regional, national, and international databases, and automated bibliographic systems.

Two major factors have brought archives in the 1980s to this point. The first was the publication in 1984, of the MARC Archival and Manuscripts Control (AMC) format for standardized machine-readable archival description. The format, which is being increasingly accepted by archivists, has given archives a practical alternative to developing their own data format to describe their holdings, and a way to avail themselves of larger MARC-based bibliographic systems. The second factor is the rapid development of information storage and retrieval technology. With several inexpensive, expandable commercial options available for archival automation and networking, system configuration—while still a major consideration—no longer presents such overwhelming financial and technical problems.

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For the first time, archivists have reached a point where the theoretical and technical issues which once seemed so insurmountable—if or how archivists should develop a national information system and the methods and purposes of machine-readable description—no longer pose an obstacle to the development of archival automated systems. The profession is now blossoming in all areas of automation in a trend similar to the experience of libraries and other online information systems in the 1970s.

Professional archivists must now confront a whole range of new management, planning, and user considerations which arise as a consequence of automation. This paper will provide an overview of some of these issues and, since there is little guidance yet to be found in the professional archival literature, it will also draw upon similar published experiences of libraries and other areas of information management.

HISTORICAL PERSPECTIVE

MARC formats for standardized machine-readable description were first developed in the 1960s by the Library of Congress for traditional bibliographic materials such as monographs. These formats provided a vehicle for data exchange which could be used by automated bibliographic systems. Although a format for manuscripts was developed, it was not well adapted to the bibliographic description of collections of archival records and did not ever archive widespread use.[1]

The Online Computer Library Center (OCLC), the first regional bibliographic utility, was established in 1967 as the Ohio College Library Center and quickly became a national and international cataloging and information resource. Other bibliographic utilities such as the Research Libraries Information Network (RLIN), the Washington Library Network (WLN), and the University of Toronto Library Automated System (UTLAS) were subsequently formed.

With the resulting savings from resource sharing, the political strengths of consortia, and the enhanced public image, libraries had access to increased capital funds, and their automated bibliographic systems flourished. Automated cataloging was expanded to integrate other local library functions, such as the manual catalog, circulation, and acquisitions. The first online public access catalogs (OPACs), now familiar to many library users, were set up in the mid-1970s.

Although archival automation began in the mid-1960s, only now is it being recognized as a significant force in the information community. The delay was not so much a result of tardiness or lack of vision on the part of the profession, but rather a result of intellectual and financial constraints. Because of the discrete nature of archival collections, the incentives to automate archival systems were not resource sharing, integration, or outreach, nor was there interest in cataloging, circulation, and acquisition functions—at least not in the sense that these functions were understood by libraries. Likewise, an increased number of intellectual access points, although desirable as an aid to the archivist in reference functions, was not seen as crucial, and the shared processing of bibliographic information on collections did not seem especially useful given the uniqueness of most archival and manuscript materials. In fact, except for isolated examples, it is really only in the last two years that the provision of a public online access system similar to that of library OPACs has been seriously discussed, or integration with institutional library/information systems attempted.

In contrast to the needs of libraries, archives have been primarily interested in tighter administrative control over records (which is the main concern of the archivist as custodian). In the 1960s and 1970s, before the creation of the MARC AMC format, the need for records control spurred some larger archives toward pioneering developments of in-house automation systems. With these they were able to obtain better administrative management of their holdings and some archives even built in an indexing component. An assortment of archives in the United States and Canada used a software package, SPINDEX (Selective Permutation INDEXing), created by the Library of Congress, and the National Archives and Records Service (NARS, now the National Archives and Records Administration, NARA) for limited keyword indexing.[2] And the Society of American Archivists (SAA) National Information Systems Task Force seriously considered ways in which SPINDEX software could be developed as the basis of a national information system for archives.[3] Some of these early systems, put into use before the creation and widespread application of the MARC AMC format, are still operating successfully today, using locally devised formats, either on their own or in conjunction with parallel systems.[4]

Several factors came together to prompt archivists to develop and adopt MARC AMC as a standardized descriptive format—rather than develop a standardized software package. (Confusion still arises on the question of format *v.* software, since MARC AMC, because of its association with many automated bibliographic systems, is sometimes mistakenly identified as a software package rather than a data format.) The

most important factors were the publication of the *Anglo-American Cataloguing Rules*, 2d edition (AACR2) in 1978; the results of Elaine Engst's Survey of Data Elements,[5] which was published in 1982 and became the core of the MARC AMC format by the Society of American Archivists; the subsequent acceptance of the MARC AMC format; the development of a specific AMC segment for the use of archival repositories by RLIN;[6] and the availability of commercial archival software such as MicroMARC:amc and MARCON which were designed with varying degrees of MARC AMC capabilities.[7] These new conceptual, intellectual, and technological developments in archival automation enabled archives to glean the same advantages from data exchange as did other online systems.

AUTOMATION-RELATED ISSUES NOW FACING ARCHIVISTS

Apart from work by Kesner and Hickerson,[8] very little has been written about specifically planning for archival automation. Nor has much been written about the effect that automation will have upon the operations, staff, and patrons of archives. Although there has been some discussion at professional meetings recently about user studies[9] and system enhancements, these are areas that will require much more attention in the future, once patrons and archivists start to come to terms and feel comfortable with their systems.

Planning for Automation

Contrary to popular belief, automated systems are evolutionary and only sometimes revolutionary in nature. They are only as good as the planning and commitment that goes into them, and, once the systems are in place, they immediately become subject to concerns of obsolescence and upgrade requirements.

Planning is one of the most crucial aspects of the whole automation process, and poor planning will hinder a system long after it has been implemented, sometimes necessitating redesigning the entire system. Unfortunately, planning for automation is something at which many archivists are not adept since they have little or no formal management or administrative training; they are inexperienced in automation and unaccustomed to devising a long-term or flexible budget, writing grant proposals, or working with vendor contracts. They may also succumb to making whimsical or casual decisions—engendered by "go with the

herd" and "let's get it because it's there" syndromes—without sufficiently determining local requirements and objectives.

SAA Council recognized an overall deficiency in the profession in the area of planning skills, and in 1981 it established a task force to "formulate a major initiative in planning for the profession."[10] The present task force was appointed in 1982, and in 1986 it published its report.[11] The report covers every aspect of planning for the profession. It recognizes that automation sometimes overshadows and distorts other important archival functions and management issues because of its technological and somewhat glamorous aura. In the report, therefore, automation is placed in its rightful context; it is seen not as an end in itself, but rather as a tool with conceptual implications which might change the entire direction of the profession. It is worthwhile, therefore, to note here some of the findings of the report, since general attitudes toward planning will inevitably reflect on automation as one specific way in which professional goals can be achieved.

Among the basic assumptions underlying the report and relevant to the argument of this paper are:

1. That archival activity is under-funded and must receive greater support from outside the profession. For this, public awareness of the importance of archival records must increase.
2. The profession must make greater use of a few broad strategies: planning, cooperation and mutual assistance, research and development, and advocacy and public information programs. In addition, archivists must give more attention to better methods for obtaining and managing resources.
3. The responsibility of archivists is not restricted to their own repositories but includes working with other individuals and programs to improve the process by which automated records are selected, preserved, and used.[12]

Bearing these assumptions in mind, it is clear that planning for automation is a wide-ranging and continuous process which should not end with the acquisition and/or implementation of a particular system. Nevertheless, a start has to be made somewhere, and Kesner, in his book, *Automation for Archivists and Records Managers: Planning and Implementation Strategies*, suggests that a planning team be established.[13] At its smallest, this team would have representation in the form of an in-house professional archivist, a technical specialist (this might be a member of the parent institution's electronic or administrative data processing department or a microcomputer vendor), and a user (ideally,

both clerical staff and patrons should be represented). A larger team might also include representatives from different areas within the archives, and outside consultants or specialists.[14] There also might be representation from the administration of the parent institution, a tactical move to gain the involvement and commitment of management.

Obviously, the size and composition of such a team should be suited to local circumstances. Sometimes an overly large and diversified team can be more of a hindrance than a help (as is the hierarchy of systems committees used by many libraries). Since they have a tendency to become too slow and too political, thus hampering the librarian or archivist in future developments, in responding to unanticipated situations, or in effecting relatively small, easily achieved system enhancements. From the world of Management Information Systems (MIS), Jerome Kanter writes of the results of a survey of top executives about the development of MIS; the survey showed that a top priority was the formation of an "Executive Steering Committee" of managers from the different functional areas of the organization that would be served by MIS. The committee would set criteria and priorities for allocating resources and for deciding upon the order of implementation[15] using a modular approach to systems development.

The Executive Steering Committee (the word "steering" is important because it represents an ongoing process, rather than an investigatory committee or task force) would produce a written overall plan for systems development, covering all the major functional areas and clarifying the interrelationships between applications. It would also work to ensure that top management made a long-term commitment to provide stable funding for system development and enhancement.

During the initial stages of planning for an automated system, the archive (or the team or steering committee, if one exists) must look at the whole range of activities and functions of the archive, and from these, target those which could or should be automated. This is necessary, since from these observations a primary list can be prepared of the capabilities that are required of a prospective system, as well as a secondary list of capabilities that are desirable for a system to have now or to add in the future.[16] The planning process should also establish specific time and budget requirements and take into account other resource requirements—such as subscriptions to bibliographic utilities, network access fees, equipment maintenance, retrospective conversion of existing manual data,[17] and staff training.

Before selecting hardware and software, planners must also determine the technical specifications required and whether any existing local resources can be used. The specifications include computer storage and processing capacity, indexing and sorting capabilities, compatibility and networking requirements (either now or in the future), upgrading, length of records and fields, and format. These will determine the size of computer required and the compatibility of its operating system. In past developments, in academic settings in particular, archives have been able to utilize their institutions' administrative data processing resources such as computing facilities and consultant programmers. This may not, however, be a viable option for many smaller institutions.

Another factor to consider is the level and means of support, both for fixing problems, and for installing upgrades and other system enhancements. The archives must also decide which descriptive standards to use, either in-house or MARC, or some combination of the two. This may require simultaneous development of an in-house thesaurus of subject headings and a local name authority file, or the purchase of such authority data from another vendor, either online, or in hard copy.[18]

Intelligible, relevant product and system reviews and evaluations are sometimes difficult to locate, and archivists—especially those with limited technical expertise—must be careful not to be at the mercy of vendors. Archivists should seek out product evaluations in archival, library, information science, and business literature, since these are likely to be the most relevant and the most comprehensible. Recently, a very helpful section was included in the *Midwestern Archivist*, written by people actually using the systems and discussing software applications in their archives.[19] There are now some journals specifically devoted to this area, for example, *Archival Informatics Newsletter*,[20] *Automated Data Processing in Archives (ADPA)*, and *Small Computers in Libraries*. The SAA Clearinghouse on archival automation, under the guidance of the Program Officer, is also a source of information on actual automated applications.

In order to avoid getting stuck with a bad contract or bankrupt vendor, most institutions seeking to install a major turnkey system develop a profile of their requirements for a system[21] and send out requests for proposals to would-be bidders. From the bids received, they balance the least expensive bid against the most promising systems package. The institution then negotiates a carefully constructed contract with one or more parties. The contract specifies exactly when

monies are to be paid, dates by which specific phases of the project should be completed, the capabilities that will be in operation at those times and those that may be implemented in the future, what hardware and software support will be supplied, and the conditions for staff training and systems development. There are penalty clauses for vendors that fall behind on deadlines or systems that fail to perform in the agreed manner.

The contract, however, also imposes a large financial burden upon the vendor in terms of capital outlay and cash flow since he must wait until successful implementation for final payment. This has resulted in many information system vendors going bankrupt. One company that has been particularly active in turnkey operations in archives has been the Toronto-based company, Geac, which developed the Smithsonian Institution and the Bibliotheque Nationale archival subsystems as components of institution-wide information systems.

The method of selecting an automated archival system naturally should be scaled to the budget and the objectives of the archives. Whether opting for a turnkey, or a locally devised mainframe or microcomputer system, the solidity of the investment is crucial to the (generally limited) resources available. Planners should discuss hardware needs and capabilities with local systems personnel and vendors; but to do this archivists may need to become familiar with some of the technical jargon to ensure that their needs are understood. They should also visit as many archival sites as possible where the vendor has installed the same system as the one being considered. Since administrative users at the site or vendors may not be completely objective in their comments, archivists should ask to see demonstrations of all the functions in which they are interested and, if possible, talk to some of the patrons using the system.

Once a system has been selected, whether it is software, hardware, or a mixture of both, if it is not vendor or institution supported, it will need to be installed. This is usually the case for microcomputer-based systems, and installation is not very difficult, even for those with limited technical computer skills. Michigan State University's MicroMARC:amc, in particular, comes with excellent documentation. The archivist may need some moral support, however, and this is a critical time to build personnel confidence in the new system. Rather than delaying installation, or floundering around—becoming more and more nervous and reluctant—archival staff should seek help from other more experienced archivists, library or office automation colleagues, or the vendor of the computer hardware and/or software.

Budgeting for Automation

Budgeting is a difficult problem for almost all who plan for, or maintain, automated information systems, but, as is recognized by the Goals and Priorities Task Force Report, it is a particular handicap for archivists, who have traditionally been among the lowest and most casually funded components of an organization. In addition to suffering from fiscal neglect, many archives contend with a poor public image and suffer a lack of technological expertise; these factors make obtaining the necessary additional funding even more difficult. In fact, the notion of technology being present in archives, or of the changing role of archives—from custodians of paper records to providers of information—actually conflicts with the way that archives are seen by many funders, theorists, and researchers.

Coming to grips with funding for automation will be essential for the many archives that will be brought into automation by the new microcomputers and software. Capital grants are available from Federal organizations such as the National Endowment for the Humanities and the National Historical Publications and Records Commission as well as from corporate sponsors. These grants require a comprehensive project proposal and/or skillful solicitation, as well as regular status reports should the project be accepted and implemented. Once they are received by the grant agency, proposals are reviewed and judged by many experts—including peer review—for detail, clarity, financial soundness, and technical feasibility. One of the benefits of seeking this sort of financial aid is that it virtually ensures that the initial project is properly planned, thoroughly evaluated, and carried through.

Another crucial point about budgeting is that financial resources will still be required (after a system is installed or a grant is accepted) for all the operational expenses mentioned earlier, and for upgrading and enhancing the system. Both hardware and software age or become obsolete as technology advances, and the more familiar users become with a system, the more sophisticated their demands will be.

Preparing for the Changes Brought by Automation

Automation, either of an existing manual process, or as the introduction of a new process, inevitably means change in an operation. The extent of disruption it causes, and the level of acceptance by users, will correlate directly with the amount of careful planning that was put into all of its aspects and implications in advance. Since this issue of *Library Trends* is looking at the development and impact of automation on

intellectual access in particular, change in this context must be anticipated in systems, methodology, work flow, staffing, personnel relations, financial and physical resources, archives image and profile, and patrons and usage.

There are a number of ways that planners can help to make automation-related change as smooth and acceptable as possible within their archives. As was outlined earlier, archivists should involve all parties in the planning process, explaining why automation is needed and the ways in which it will benefit each of them. Once implementation has begun, they should continue to consult them and keep them informed. Selling an automated system is often as important as all the decisions which go into implementing it—uncooperative or suspicious staff or patrons can cause difficult psychological and political barriers to a system's success. It also may be beneficial to contribute updates for institutional or local publications. This consciousness-raising will both prepare users for the new systems and help build some publicity and a progressive image for the archive.

Archivists should try to anticipate all budget requirements, in the short-term and the long-term; including in the budget the costs to expand memory or processing capacity, and to buy supplies such as printer paper and ribbons, backup disks and tapes, and surge protectors. Shortfalls which slow down or halt implementation, or which require money to be taken from other worthy projects can cause frustration and resentment among staff.

Greenspan and Gilheany, writing about an evolving data management system, argue that "periods of extensive change should not occur simultaneously in both hardware and software procedures;"[22] the changes "should happen in small increments and be spaced out so that the organization can plan for changes, adjust to them, and digest them."[23] This is a good rule of thumb for managing changes in automated systems, for instance from an in-house mainframe system to a turnkey or microcomputer-based MARC system. Similarly, it is sometimes possible to ease the change from manual control and local descriptive practices to automation and MARC description by familiarizing the staff with manual MARC cataloging in advance of full automation,[24] or by entering records into a test database where staff know that their errors are not fatal.[25]

A commitment to develop and adhere to local standards where necessary, and to incorporate national and international standards where available, will result in logical, standardized data that will be

much easier to convert to new or expanded systems later, or to exchange with other bibliographic systems.

Archivists should talk to colleagues, attend professional meetings, and read widely of professional and technical literature in order to learn from the experiences and mistakes of other users and managers of automated information systems.[26] Greenspan and Gilheany also emphasize this point, stating that "knowledge of past successes and failures is probably more important than new technology in assuring successful management of change."[27]

Finally, archivists should learn to feel comfortable with the idea that automation is never a finite project, nor is a computerized system ever a completed entity, but rather that the processes are constantly developing. Archivists are accustomed to using long-established processes and techniques; however, with automation, the technologies and the descriptive formats are likely to continue to evolve at a rapid pace for the foreseeable future. For instance, just when archivists were starting to come to terms with MARC AMC, serious consideration now is being given to merging all the different MARC formats into one all-encompassing format, and a universal MARC format, UNIMARC, has already been developed to facilitate international data interchange.[28]

Staffing

Implementing automated descriptive processes poses some staffing questions that are new to archivists; included among these are restructuring the work flow and the effect this will have on existing staff and on hiring new employees. Staff inevitably will be affected by the changes in practices and procedures that are brought about by automation, but this should be put to positive effect. Existing staff should be encouraged to learn as much as possible about the system's potential, and creativity and initiative should be rewarded. This will not only increase the acceptance and rate of implementation, but will also enhance the system and the service thereby provided.

In a paper on training library staff to use new software, Dayall makes the helpful observation that staff cooperation and willingness to learn will be greatest when there is general agreement on the need for a product or service—but the product *must* meet expectations. About training, Dayall suggests that each person should be made to work on their own on a real project, since people learn best through recovering from their own mistakes; Dayall further indicates that the eventual goal is to make the trainer obsolete.[29]

A colleague of mine observed that his archive had experienced very high staff turnover since the introduction of automation. Many of the staff felt automation had been "imposed" upon them as part of a larger institutional political process, with no attempt being made to explain what was happening, nor to allay staff fears. He wondered if this situation existed in more than one institution—given the fact that many archival staff members come from academic backgrounds (e.g., history) that are traditionally resistant to change and unused to computers. The issue of staff turnover and the acceptance of automation has not been addressed in any detail by professional archival literature, but it has been extensively treated in other technical literature and certain approaches are commonly suggested.

If staff are not computer-literate or are hostile toward the technology, try to win them over in advance. Encourage them to use word processing software for the many laborious and routine daily typing tasks performed in an archive; the preparing and revising of inventories will show them the immediate benefits of a computer. Starting on a microcomputer is often less intimidating than a mainframe terminal since it is self-contained. If an archive is a part of, or close to, an institution that has an online public access catalog, staff may want to use that to become familiar with the general concepts of information retrieval and supplying computer-assisted reference information to patrons. If a MARC-based system is planned, access to a cataloging department's OCLC terminal or that of any other bibliographic utility can help demonstrate to staff unfamiliar with MARC records the way in which formats work and why coding is necessary. Acceptance and learning rates will vary between individuals, but with the introduction of the system, archivists should ensure that comprehensive, intelligible documentation and ample training opportunities are available. Training should be aimed at different levels, from beginning to advanced, and can be obtained from vendors, professional meetings (national, regional, and local), and in-house programs. Continuity in staffing also should be a goal since the investment in time and money is wasted if high staff turnover persists; however, the experiences of some university archives have shown that student employees can be successfully trained to code and enter data in MARC and other formats on a more temporary basis.[30]

Regarding new staff, some archives may be large enough to justify hiring an archivist with expertise and specific responsibility for automated systems (that is, installation, implementation, training, networking, maintenance, and upgrading). Similar positions have been created

in libraries dedicated to systems development personnel.[31] This may seem like an ideal way to ensure that a system continues to be developed and maintained, but three significant problems should be anticipated. Finding an experienced archivist who also has the technical background may be difficult. In libraries, many systems positions are being filled with recent graduates of master's programs in library and information science; often they have extensive coursework in this area. If these graduates are employed in archives, salaries may become an issue. It may be necessary to offer a position with the same financial inducements as those offered by an equivalent library position—a difficult decision when many archival salary scales are established at a lower rate and filled with more seasoned archival staff. And finally, the management structure should be clearly established. Determine, in advance, how to fit a systems person into the reporting structure and give them enough authority to allow them to carry out their work successfully—particularly in the areas of long-range planning, budgeting, and networking. Avoid disrupting the existing management structure too much, and thus risk putting that person in an unworkable personnel situation.

Users

Users are increasingly acclimatized to automated systems and the provision of electronic information, and consequently their expectations of the capabilities of these systems are also increasing.[32] Staff must be trained to anticipate and cope with increased and/or changed user and donor populations, and new user demands and expectations, and they also need to be aware of the inevitable biases and limitations of a computerized reference system.[33] All staff should know how to use the archival databases or subsystems (although not necessarily the details about how these work), and be able to train users on the system. Staff should also be able to answer simple reference questions and locate and understand descriptive data.

As more archives make access to their descriptive data publicly available, either through terminals in the archives or abbreviated records displayed in an OPAC, the way in which the reference archivist functions will probably change. More than likely, the automated systems will be able to answer many basic reference questions and to indicate to a researcher something of the extent of an archive's holdings. For more detailed information, however, the reference archivist will

still have to intervene and help the researcher to develop a more sophisticated search strategy and to use the actual materials.

Many researchers today are looking for increased subject access from automated systems, and a way to generate their own, or what Neufeld and Cornog call "hybrid" files.[34] Such files would be created by the researcher from searches performed horizontally and vertically through record groups in a single archival database, or through the electronic merging of primary and secondary sources in multiple databases. The development of transparent "gateways"[35] to other databases would facilitate this cross-fertilization and merging of database contents. These files could then be stored for as long as they were needed by the researcher in a separate database on the archival system. Some archivists argue that this form of research actually allows the researcher to come closer to the way that archival records were originally created than does their arrangement by provenance.

If this trend does indeed develop, the design and functions of archival databases increasingly will be more influenced by the access that users want and their research patterns, and less by traditional principles of archival arrangement. This holds true for administrative users as well as researchers and casual patrons. Rowlett notes that: "User selection will determine those species [of information systems] which best suit each environment and can adapt to that environment as it also changes."[36] Although archival materials are generally unique to any repository, archivists must consider, when deciding how much to cater to their users, that information has become a commodity, and that there are many other sources of electronic information competing for user attention. While fee-based systems do not yet pose as much of a threat to the survival of archives as they do to some library services, they may readily provide—through at-home computer terminals—at least some of the information that users require. Studies of types of users and their research patterns, and an openness to suggestions about additional access points, are the only ways that archivists can effectively gauge how well they are meeting their users' needs and how they can continue to enhance the service that they provide. As automated access systems develop, such studies will become essential tools for the archivist as a manager and planner.

The SAA Task Force on Goals and Priorities prioritized the use of automated databases and networks and encouraged wider external use of records by developing and linking "manual and automated data bases about archival holdings on institutional, regional, national, and international levels."[37] More specifically, it suggested that in order

> To encourage the use of records of enduring value, the archival community must play a greater role in providing users with information about the materials in repositories. Many manual and automated data bases have developed or are developing independently; often these have similar or identical descriptive information. Possibilities for linking these systems to increase public use and to eliminate costly duplication of effort need to be investigated....[38]

Links with systems such as RLIN and OCLC, as well as with local OPACs, will inevitably encourage new and nontraditional users as well as increasing the numbers of "absentee" patrons—those who communicate by mail, telephone, or electronically. In some cases, these users will be invisible, since they will be gleaning information from the larger bibliographic databases rather than through the local archival system. This means both contextual (local, national, and international) and conceptual (increased concentration on the informational content rather than the media) changes in usage. It also means, as Hensen has stated, that the descriptive practices of an archive are put in the public view and, therefore, archivists must be even more scrupulous in the accuracy and comprehensiveness of their data.[39]

Participation in such systems will inevitably lead to more integration of archivists with other information professionals, and concomitantly, will give them an increased voice in the development of standards and the construction of more comprehensive systems.

FUTURE DEVELOPMENTS

Archival automation has moved very rapidly to reach where it is today. Information technology, however, is moving even faster. The Linked Systems Project (LSP), involving RLIN, OCLC, WLN, and the Library of Congress, has worked to establish a common computer-to-computer protocol whereby records from any of these bibliographic utilities may be exchanged, and which eventually will make any record entered in any of these systems nationally and internationally available.[40] The Library of Congress has been investigating the potential of video discs as an interactive conservation medium for more than two years, and the National Archives has been looking into developments in voice and pattern recognition, digital raster scanning, and optical character recognition (OCR). Information scientists are researching the development of intelligent catalogs which would use artificial intelligence to determine which sources from a variety of databases and

formats would meet the user's information needs, and these catalogs would be the next step after OPACs.

The effect these developments will have upon most archives is yet to be seen, but as planners of automation, archivists must be able to anticipate and evaluate the changes in technological capabilities and in staff and user needs, in order to develop their systems in the most efficient and effective ways.

References

1. See Hensen's article in this issue for a more detailed comparison of the Manuscripts Format and the Archival and Manuscripts Format.

2. See Hickerson, H. Thomas, et al. *SPINDEX II at Cornell University and a Review of Archival Automation in the United States.* Ithaca, N.Y.: Department of Manuscripts and University Archives, Cornell University Libraries, 1976; and Hickerson, H. Thomas. *Archives & Manuscripts: An Introduction to Automated Access* (Society of American Archivists Basic Manual Series). Chicago: SAA, 1981 (for further reading about SPINDEX and other archival systems in operation during this period).

3. Bearman, David. "Toward National Information Systems for Archives and Manuscript Repositories: Problems, Policies and Prospects," and Lytle, Richard M. "An Analysis of the Work of the National Information Systems Task Force." Papers presented at the National Information Systems Task Force Conference on Archival Information Exchange in March 1983. Np: 1983; Palm, Charles G. "Prospects for Archival Information Exchange: NISTF Conference Report." *American Archivist* 47(Spring 1984):205-13; and Brener, Richard C. "Toward National Archival Priorities: A Suggested Basis for Discussion." *American Archivist* 45(Spring 1982):164-74. All discuss the need which was seen at this time for the development of a national information system for archives.

4. A good example is PARADIGM, the system devised by the University Archives at the University of Illinois at Urbana-Champaign which was first developed in 1971 and is still in operation today. PARADIGM, resident on an administrative mainframe, was programmed by the university's administrative data processing services and was initially designed to run in a batch, rather than an online, environment. The system, which went online in 1976, contains both control and administrative data in linked databases and can generate accession, shelf and subject descriptor lists, as well as subject indexes. See Brichford, Maynard. *The Extension of Intellectual Control through Subject and Name Access to the Archives of the American Library Association: Final Performance Report to the National Endowment for the Humanities* (on Grant No. RC-24935-76-1198). Urbana-Champaign: University of Illinois, University Archives, 1979.

5. Engst, Elaine D. *Standard Elements for the Description of Archives and Manuscript Collections: A Report to the SAA Task Force on National Information Systems.* Ithaca, N.Y.: Department of Manuscripts and University Archives, Cornell University Libraries, 1980. Engst reported her findings of common descriptive data elements in use throughout many different archives surveyed. These were subsequently published in 1982 by the Society of American Archivists as the *SAA NISTF Data Element Dictionary.*

6. For more detail concerning the history of the development of archival automation up to the implementation of the AMC Format, see Hickerson, H. Thomas. "Archival Information Exchange: Developing Compatibility." In *Academic Libraries: Myths and Realities* (Proceedings of the ACRL Third National Conference, Seattle, Wash., 4-7 April 1984), edited by Suzanne C. Dodson and Gary L. Menges, pp. 62-68. Chicago: ACRL, 1984; and "Archival Information Exchange and the Role of Bibliographic Networks" in this issue of *Library Trends.*

7. For highlights of these developments and a discussion of microcomputer applications, see Sahli, Nancy. "Automation and Archives/Records Management." In *Bowker Annual of Library and Book Trade Information* (Special Report), compiled and edited by Filomena Simora, pp. 74-80. New York: R.R. Bowker, 1986. See also articles by Dürr and Honhart in this issue of *Library Trends.*

8. Kesner, Richard M. *Automation for Archivists and Records Managers: Planning and Implementation Strategies.* Chicago: ALA, 1984; and Hickerson, H. Thomas. *Archives and Manuscripts: An Introduction to Automated Access* (Society of American Archivists Basic Manual Series). Chicago: SAA, 1981.

9. For example, William J. Maher's paper, "The Use of User Studies," presented at SAA Annual Meeting in 1985, and subsequently published in revised form in the *Midwestern Archivist* 11(no. 1, 1986):15-26.

10. Society of American Archivists. *Planning for the Archival Profession: A Report of the Society of American Archivists Task Force on Goals and Priorities.* Chicago: SAA, 1986, p. 3.

11. Ibid.

12. Ibid., p. 4.

13. Kesner, *Automation for Archivists,* pp. 53-55.

14. Such a team is discussed in Kanter, Jerome. "The Role of Senior Management in MIS." *Journal of Systems Management* 37(April 1986):10-17.

15. Ibid.

16. Rush, James E. *Library Systems Evaluation Guide: Public Service,* vol. 3. Powell, Ohio: James E. Rush Assoc., Inc., 1983 includes a methodology for systems evaluation together with a table of functions and features of an automated public service system and the data elements it requires.

17. See Cloud's article in this issue of *Library Trends* for further discussion of retrospective conversion costs.

18. For MARC AMC cataloging, copies of the Library of Congress Name Authority Files (LCNA) are required. There are also various commercially available thesauri of subject headings for specialized areas.

19. Maher, *Midwestern Archivist,* pp. 69-83.

20. Bearman, David, ed. *Archival Informatics Newsletter* 1(Spring 1987).

21. Rush, *Library Systems Evaluation Guide.*

22. Greenspan, Donald K., and Gilheany, Stephen J. "Managing An Evolving Data Management System." *Journal of Information and Image Management* 19(July 1986):16.

23. Ibid.

24. This approach was taken by Stanford University Archives for a year prior to commencing the RLIN RECON project.

25. This was tried at the University of Cincinnati Archives and Rare Books Department, where the special educational module of MicroMARC:amc was used by students of an archival administration course as a pilot database prior to full implementation of the software package.

26. Encouraging discussion of mistakes is an interesting idea which was attempted by a Data Processing Clinic at the University of Illinois at Urbana-Champaign some years ago. Soliciting information about mistakes or failures, however, is not always an easy task.

27. Greenspan, and Gilheany, "Managing an Evolving Data Management System," p. 12.

28. A discussion of standards as they relate to MARC formats can be found in "RLG: An Organization with Standards." *RLG News* 9(Jan. 1986):3-5.

29. Dayall, Susan A. "No Easy Task? Training Your Staff to Use New Software." *Library Journal* 112(1 May 1987):LC4-6.

30. Students have been successfully trained at both Michigan State University Archives and the University of Cincinnati Archives and Rare Books Department to code and input MARC AMC data with only a minimum of professional supervision required to check the coding prior to data entry.

31. For a discussion of job descriptions for a position of this nature see Gilliland, Anne J. "Online Catalogs and Library Users." In *Human Aspects of Library Automation: Helping Staff and Patrons Cope* (Proceedings of the 1985 Clinic on Library Applications of Data Processing), edited by Debora Shaw. Urbana-Champaign: University of Illinois, Graduate School of Library and Information Science, 1986.

32. See Kesner, *Automation for Archivists*, p. viii.

33. Hensen, Steven L. SAA MARC AMC Workshop, 11-12 July 1987, Cincinnati; and, in a paper entitled "Non-Neutrality of Information Technology," delivered at the ASIS Mid-Year Meeting in Cincinnati in 1987, Thomas Froelich of Syracuse University argued that the intrinsic features of an information system such as design, limitations on capabilities, and modes of production, as well as accidental features, streamlining, and simplification procedures, and technological and cultural paradigms build inherent biases and restrictions into the way in which an automated system stores and retrieves information compared to a manual system.

34. Neufeld, M. Lynne, and Cornog, Martha. "Database History: From Dinosaurs to Compact Discs." *JASIS* 37(July 1986):183-90.

35. For an overview of design requirements for transparent information retrieval see Williams, Martha E. "Transparent Information Systems Through Gateways, Front Ends, Intermediaries, and Interfaces." *JASIS* 37(July 1986):204-14.

36. See Neufeld, and Cornog, "Database History."

37. Society of American Archivists, *Planning for the Archival Profession*, p. 32.

38. Ibid.

39. Hensen, SAA MARC AMC Workshop.

40. See Grosch, Audrey N. "Computer-to-Computer Protocols." *Bulletin of the American Society for Information Science* 12(June/July 1986):8; and McCoy, Richard W. "The Linked Systems Project: Progress, Promise, Realities." *Library Journal* 111(1 Oct. 1986):33-39.

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