Background Paper

Teaching Archivists About Electronic Records and Automated Techniques: A Needs Assessment

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Abstract: This article assesses the knowledge and skills that archivists need to administer electronic records and apply automated techniques in archives. The author discusses how rapidly changing technology, ongoing debates about the relevance of archival theory, and evolving practices and methods present particular challenges for the development of a curriculum on automation. She outlines a curriculum organized into four broad areas: (1) archives and information technology, (2) basic concepts and terminology, (3) electronic records, and (4) automated techniques, ending with a discussion of the overall learning objectives for such a curriculum.

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MORE THAN TWO YEARS HAVE PASSED since I wrote the following article for the CART Curriculum Development Conference. In revising the article for this special issue of the *American Archivist,* I have resisted the temptation to start from scratch and bring my recommendations up to date with recent developments in archival theory and information technology. I reached this conclusion in part because the curriculum framework presented here informed the discussion of learning objectives during the conference and influenced the structure of the curriculum presented in the report of the CART project. Furthermore, I still consider the basic framework valid for organizing archival education in the area of automated records and techniques.

Were I to start from scratch today, I would approach the topic with a somewhat different emphasis. During the last two years, archival theory has matured and a consensus has begun to emerge among archivists regarding the strategies and tactics that can be used most effectively to support management and continuing access to electronic records.[1] I would place more emphasis today on the archivist's need to understand the nature of electronic records, the fundamental role of provenance and contextual information in archival administration of electronic records, and the need to exploit information technology and information systems concepts for management of elec-

tronic records. Much has changed in the area of automated applications as well. Emerging digital networks, client-server architectures, and search-and-retrieval software based on ANSI Z39.50 standards have the potential to liberate archivists from the insular world of stand-alone applications and the inflexible descriptive systems of the present.[2] These developments are a testament to the continuing need for archivists to catch up and keep up with innovation in information technology and evolving archival theory and practice.

Introduction

This article is based on a discussion paper prepared for the CART Curriculum Development Conference that evaluated the need to teach archivists about electronic records and automated techniques. The "needs assessment" focuses on what archivists need to know about automation but does not present a detailed analysis of the various audiences for this education and training. An underlying assumption is that archivists will need ongoing education and training for the foreseeable future in order to keep up with rapidly changing information technology, respond to evolving information-handling practices, and learn how to apply more advanced automated techniques. Evidence from several sources corroborates the perceived need among archivists for education about electronic records and automated techniques, including surveys of the profession about desired course offerings, large enrollments in courses and workshops on automation topics, and frequent remarks from employers about the difficulty of finding sufficient staff with experience and training in automation

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[1]Eight recent works are reviewed by Terry Cook in, "Easy to Byte, Harder to Chew: The Second Generation of Electronic Records Archives," *Archivaria* 33 (Winter 1991–92): 202–16. See also Charles M. Dollar, *Archival Theory and Information Technologies: The Impact of Information Technologies on Archival Principles and Methods,* edited by Oddo Bucci (Ancona, Italy: University of Macerata, 1992); United Nations, Advisory Committee for Coordination of Information Systems, *Strategic Issues for Electronic Records Management: Towards Open Systems Interconnection* (New York: United Nations, 1992); and *Information Handling in Offices and Archives,* edited by Angelika Menne-Haritz (New York: K. G. Saur, 1992), all of which were published since the Cook review essay was prepared.

[2]For an overview of network technology, see Avra Michelson and Jeff Rothenberg, "Scholarly Communication and Information Technology: Exploring the Impact of Changes in the Research Process on Archives," *American Archivist* 55 (Spring 1992): 236–315.

or electronic records. In the 1990 SAA Continuing Education Survey, for example, "electronic records" ranked second and "automation" ranked fifth of nineteen topics suggested by respondents as areas for continuing education workshops.[3]

It is not surprising that archivists frequently express concern about or interest in the knowledge and skills needed to work effectively with modern technology. Sociologists, labor economists, and others who study the impact of automation on work generally agree that the automation of almost any process changes knowledge and skill requirements. As automation progresses from discrete measures that simplify or speed up tasks to a fundamental transformation of work processes, organizations often experience a new division of labor; a demand for new managerial, professional, and technical skills; and a reassessment of the organizational mission and objectives.[4] It is unlikely that archives will be immune from these changes as they employ automated techniques for information handling and respond to the special requirements of electronic records.

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[3]Jane A. Kenamore, "Education Notes: Continuing Education Survey Results," *SAA Newsletter* (September 1990): 6–9. For a report on a successful seminar for administrators of state archival programs, see National Association of Government Archives and Records Administrators (NAGARA), *Archival Administration in the Electronic Age: An Advanced Institute for Government Archivists* (Pittsburgh: NAGARA, 1989), and *Archival Administration in the Electronic Age: An Advanced Institute for Government Archivists* (Pittsburgh: NAGARA, 1 August 1990).

[4]Shoshana Zuboff, *In the Age of the Smart Machine: The Future of Work and Power* (New York: Basic Books, 1988). For a discussion of recent scholarship on automation and skill requirements, see Margaret Hedstrom, "Deskilling or Upgrading? Social Choice in the Use of Information Technology," unpublished paper presented at the Annual Meeting of the Society of American Archivists, September 1987. Richard Kesner discusses many of the generic skills required of effective professionals and managers in his article "Teaching Archivists About Information Technology Concepts: A Needs Assessment" in this special issue.

This article first discusses some of the challenges that archivists face in developing a curriculum for electronic records and automated techniques. It then proposes a series of learning objectives and outlines the curriculum content in the areas of electronic records and automated techniques, reflecting what archivists need to know. The needs assessment draws on my experience developing electronic records programs during the last decade, a review of existing electronic records and automated techniques curricula, my experience as an instructor for numerous continuing education courses, my personal views, and, as a manager, my perspective on the skills sought in individuals assigned to staff electronic records programs or charged with development of automated systems. The tentative conclusions were intended to encourage discussion at the CART Curriculum Development Conference.

Special Problems in Electronic Records and Automated Techniques Curriculum Development

Developing curriculums is always a challenge for archivists because few archivists are familiar with curriculum development techniques or sound teaching methods. The subject area of electronic records and automated techniques poses several additional obstacles to curriculum development. Electronic records and automated techniques are relatively new endeavors for archivists. Information technology is changing rapidly, becoming more complex, and diverging from familiar manual information handling methods. Therefore, rather than working with established concepts and practices, archival approaches to many aspects of automation are either still being developed or have not yet been devised. As the technology continues to evolve, there is a danger that methods and approaches developed now, with today's technology in mind, will be obsolete

by the time they are disseminated widely to the profession.

Usually, curriculum is built on a well-established sense of mission for a field, discipline, or profession and on a well-defined body of knowledge. The archival profession has taken steps toward developing a sense of mission through such measures as the 1982 SAA Report on Institutional Evaluation, development of an examination and certification process for archivists, and the formulation of a curriculum for graduate education.[5] However, these measures considered electronic records and automated techniques marginally (if at all) and did not assess how fundamental changes in information technology might change the mission and methods of archives.[6]

Curriculum developers must bear in mind that the archival mission may expand and evolve away from custodial functions in response to automation. Several recent critiques question whether the traditional archival mission, centered around acquisition and custodianship of records, remains meaningful in a modern technology environment and whether current archival methods can be applied effectively to the management of electronic records.[7] No one has suggested that the application of automated techniques will have as profound an impact on archives, but the widespread use of automated information systems to support archival functions will require new knowledge and different managerial and technical skills. The challenge for curriculum developers is to strike a balance between teaching known methods and techniques—built around traditional archival functions—and preparing archivists for the unknown challenges that lie ahead.

Archivists face the need to develop curriculum and training materials that not only address the challenges of today's technologies but also can be changed, expanded, updated or replaced as new and more sophisticated technologies are introduced. Even if the curriculum and teaching materials were limited to current technology, the curriculum development process would be difficult because standard practices have not been established in response to many sophisticated automated applications. In the field of electronic records, for example, the profession has not developed sound practices for appraisal, description and preservation of databases, automated office documents, or digital cartography. Likewise in the field of automated techniques, there are few (if any) examples of automated systems for archival applications that exploit such recent advances as hypermedia systems or artificial intelligence.

Another area of concern, which is related primarily to electronic records, is the applicability of archival theory to records created with advanced technology. Archivists working with electronic records are not certain whether the basic theories of provenance and original order, or such concepts as evidential and information value, can be applied in a meaningful way to electronic records.[8] The resolution of this debate will be significant for curriculum

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[5]See Victoria Irons Walch's articles "Innovation Diffusion: Implications for the CART Curriculum," in this issue, and "Guidelines for Graduate Archival Education Programs," *American Archivist,* 51 (Summer 1988): 380–89.

[6]A new long-range plan for the Society of American Archivists, developed by the Committee on Goals and Priorities in 1992, includes providing leadership to archivists in the identification, preservation, and use of electronic records as one of four goals for the SAA.

[7]Challenges to traditional archival practices are raised in David Bearman, *Archival Methods* (Pittsburgh: Archives & Museum Informatics, 1989); Katherine Gavrel, *Conceptual Problems Posed by Electronic Records: A RAMP Study* (Paris: United Nations Educational, Scientific and Cultural Organization, April 1990); and David Bearman, ed., *Archival Management of Electronic Records,* Archives and Museum Informatics Technical Report No. 13 (Pittsburgh: Archives & Museum Informatics, January 1991).

[8]Dollar, *Archival Theory and Information Technologies,* published since the CART conference, presents an emerging consensus on several of these theoretical issues.

development because it will have considerable bearing on the use of existing theory as a foundation for the curriculum versus the development of a new and separate field of specialization.

The task of curriculum development for electronic records and automated techniques is further complicated by general deficiencies in archival education and the absence, until recently, of sound guidelines and standards for graduate archival education. Basic archival education, built (as Terry Eastwood has urged) on an understanding of the nature of archives and not primarily on the archivist's duties, could serve as a foundation or reference point for understanding automated records and techniques.[9] Without a context of shared concepts, terminology, and principles, it is impossible to teach archivists about electronic records, either to stress the continuity with more familiar types of records or to draw contrasts to them. In a continuing education setting, for example, it is difficult to teach someone who is unfamiliar with archival appraisal to appraise electronic records. Likewise, it is difficult to explain the advantages and disadvantages of various automated systems to someone who is not familiar with accepted standards and practices for archival description. This problem reflects the need to incorporate archival theory and principles into the curriculum and instructional materials on electronic records and automated techniques—not always as the answer to advanced technology problems, but as a reference point for understanding the continuity and change that accompany automation.

Specialization versus integration of electronic records and automated techniques into archival functions presents another area of concern. One of the recurring questions in electronic records program development is the degree of specialization necessary or desirable among staff. Should archivists specialize in archival administration of electronic records, or should every archivist be able to manage electronic records with as much confidence as they approach other media? Should all archivists be capable of developing and using automated techniques, or should automation represent a specialized field of practice? Is there a minimum level of knowledge about electronic records and automated techniques expected of all professionals, a level that could be taught in the graduate curriculum or included in the certification examination? The need for and degree of specialization required to handle electronic records or to apply automated techniques with proficiency will be a key consideration in designing and implementing a curriculum.

Archivists face difficult choices in selecting a direction for curriculum development in the area of electronic records and automated techniques. Many of the unresolved issues raised here will affect the nature of archival work by defining the knowledge and skills archivists need if they are to work effectively in a changing environment. If the profession acts now on the basis of current theory, practice, and technology, we risk developing a curriculum that is inadequate and that will rapidly become obsolete. If we wait until the archival and automation issues are resolved, until the technology stabilizes, or until specialists develop solutions to most automation issues, we may abdicate responsibility for determining the profession's response to automation to a small group of experts and drive a wedge between specialists in electronic records or automation and the rest of the profession.

Even though archivists have not developed model solutions to a wide range of

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[9]Terry Eastwood, "Nurturing Archival Education in the University," *American Archivist* 51 (Summer 1988): 246–47.

electronic records problems or ideal guidelines for developing automated information systems, curriculum development can and must proceed. Waiting until more automation issues are resolved or until there is more stability in information technology would be an ineffective response to the challenges that automation poses for archivists. Taking these concerns into account, the learning objectives and curriculum content outlined below are shaped by the following assumptions:

- Most archivists need to learn more about electronic records and automated techniques before they will be prepared to evaluate the impact of automation on the missions, policies, and practices of their institutions.

- The challenges of developing electronic records programs and planning for effective automated systems will require training in strategic planning and advanced management, in addition to a curriculum that addresses electronic records and automated techniques.

- The problem of rapid obsolescence can be reduced through an adequate theoretical foundation and careful curriculum planning. Nevertheless, obsolescence, change, and updating of the curriculum are unavoidable.

- The curriculum for electronic records and automated techniques should be grounded in archival theory, but it should also teach archivists how to evaluate, apply, and modify theory to address the changing needs of advanced technology.

- Education and training programs should teach state-of-the-art practices for electronic records and automated techniques, recognizing that they may not address the most complex and challenging problems.

- There will be a lag between leading-edge responses to advanced problems and the development and acceptance of practices that can be included in the curriculum. One goal of curriculum development is to reduce that gap.

Learning Objectives

Listed below are a set of learning objectives for automated records and techniques. These learning objectives build on previous curriculum development efforts, but they have been expanded to take into account the need for flexibility in the face of rapidly changing technology and evolving practice.[10] The learning objectives are intentionally broad, and they are as generic as possible with regard to particular hardware, software, or applications in an attempt to limit technology-induced obsolescence.

The learning objectives for archivists completing the curriculum on electronic records and automated techniques are

- to understand trends in information technology and be able to analyze critically their implications for archival programs, theory, and methods.

- to understand the range of available information technologies and be able to assess (1) how organizations use information technology to create, maintain, and transmit records, and (2) how information technology can be applied in archives.

- to be able to design and implement policies, programs, and procedures that further the objectives of archives, regardless of the physical form of the records.

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[10]M. H. Fishbein, *A Model Curriculum for the Education and Training of Archivists in Automation: A RAMP Study* (Paris: United Nations Educational, Scientific and Cultural Organization, 1985); and Society of American Archivists, Automated Records and Techniques Task Force, "An Education Program to Train Archivists in Automation: Basic Concepts, Automated Techniques, and Machine-Readable Records. Learning Objectives and Course Content," typescript, n.d.

- to be able to develop effective information systems for archives that use available automated technologies and techniques effectively.
- to be able to communicate to others the significance of archives and the benefits of archival programs in a modern technology environment.

Curriculum Content

The last section of this article proposes the content that should be included in courses, workshops, and seminars designed to address the learning objectives listed above.

A. **Archives and Information Technology**
1. Legal issues
2. Information policy overview
3. Impact of information technology on the mission and organization of archives
4. Relationship of archival science to information-based disciplines
   a. Information science
   b. Information resource management
   c. Data administration
5. Users and user services in a modern technology environment

B. **Basic Concepts and Terminology**
1. Information system components
   a. Data and data structures
   b. Hardware
   c. Software/processing
   d. Storage media and methods
2. Logical organization of data
3. Physical organization of data
4. Information systems concepts and design
   a. Components
   b. Processes
   c. Systems design life cycle
5. Overview of information technology applications
   a. Numeric data files
   b. Databases

c. Text files/office systems
d. Geographic information systems
e. Imaging systems
f. Computer-assisted design
g. Bibliographic retrieval systems
h. Expert systems

C. **Electronic Records**
1. Impact of automation on individual and organizational recordkeeping practices
2. Primary and secondary uses for electronic records
3. Documentation and description requirements in automated systems
4. Identification of user communities and user requirements for electronic records
5. Physical preservation of magnetic and optical media
6. Information technology standards, compatibility, and migration

D. **Automated Techniques**
1. Overview of automated applications for archival institutions
   a. Word processing/office systems
   b. Database management systems
   c. Spreadsheets
   d. Bibliographic retrieval systems
2. Methods for analysis of current procedures
3. Needs assessment and development of functional specifications
4. Decision-making techniques for software purchase and development paths
5. Implementing automated systems
6. Standards and their significance
7. Systems assessment, expansion, and redesign

Discussion

Archives and Information Technology. This curriculum development proposal assumes that archivists will continue to play a unique role in highly automated

organizations, even though the methods and procedures used may differ considerably from those used by archivists to control records in traditional formats. The archivist should not become an information resources manager, a data administrator, or an information systems designer, although archivists must work closely with professionals from these disciplines. Rather, the archivist should continue to exercise a "broad range of administrative and cultural responsibilities for the selection, care, and use of records of enduring value."[11]

One of the challenges facing the archival profession is to define its role in a modern technology environment in relation to other information-based disciplines. The purpose of the first module is to provide archivists with a perspective on the unique functions of archives and their relationship to related institutions, disciplines, and services. This component would provide students with sufficient information about related disciplines to assess the relevance and singular contributions of archival theory and practice to electronic records management and development of automated techniques. It would also present information policy concerns and approaches that may support the archival mission. Finally, the component would help students become familiar with concepts and techniques from related disciplines which can be applied to electronic records management and information systems design. This portion of the curriculum is intended primarily for current and future managers with responsibility for policy and program development. Practitioners without managerial or supervisory responsibilities might find this portion of the curriculum of limited benefit.

Basic Concepts and Terminology. This portion of the curriculum is intended to teach archivists the basic concepts

and terminology associated with information technology and information systems. This knowledge is essential for practitioners and managers engaged in any aspect of archival work. It enables archivists to discuss modern information systems effectively with information technology specialists and users of advanced systems. It forms the conceptual basis for additional education and training in electronic records and/or automated techniques, and it provides tools that students can apply for self-edification outside a formal education or training environment.

One concern about this aspect of the curriculum is whether a special curriculum is necessary, or whether archivists can obtain this knowledge from college or graduate courses in computer or information science, continuing education programs, or other instructional opportunities. There are two advantages to including this component as an essential element of the basic curriculum.

First, from a purely practical standpoint, students pursuing this education through general courses would find that much of the information presented is more relevant to future systems analysts, programmers, and information scientists than to archivists. Second, this portion of the curriculum needs to be developed with reference to archival theory, principles, and practices. The intent is not to teach all basic information systems theory, concepts, and terminology. Rather, this portion of the curriculum should present concepts and terminology that are directly relevant to archives. Ideally, this portion of the curriculum will prepare students to assess critically developments in information technology, determine their significance for archival practice, and propose effective responses to technology developments. This portion of the curriculum should be a prerequisite for more advanced or more specialized courses or training in electronic records or automated techniques, with rare exceptions for

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[11]Walch, "Guidelines for Graduate Archival Education Programs," 381.

individuals with a firm grasp of the content.

Electronic Records. The electronic records curriculum is designed to prepare archivists to provide a basic level of services for electronic records without regard to how the electronic records function is organized in any particular institution or archival program. The subject matter to be presented in this component is in many respects similar to the material presented in the series of CART workshops on administration of machine-readable records. However, rather than organizing the material according to traditional archival functions—appraisal, processing, description, preservation, and reference—the proposed approach organizes the subject matter around concepts that can be used to incorporate archival requirements into information system designs. For example, the component on "documentation and description requirements in automated systems" should explain the basic descriptive elements that permit secondary use of electronic records. Archivists can then apply this knowledge not only to the creation of "user's guides" or "documentation packages" for machine-readable data files, but also to the design of data element dictionaries and other metadata systems that must be included in information system designs. Likewise, rather than concentrate on appraisal per se, the proposed curriculum would teach archivists how the automation of recordkeeping changes the primary and secondary uses of records and alters users' expectations and requirements. With this knowledge in hand, archivists will be better prepared to apply existing archival theory and principles to the management of electronic records and to modify or develop new practices as needed.

One new element of the curriculum for electronic records is a section on "information technology standards, compatibility, and migration." This aspect of the CART machine-readable records curriculum is undeveloped because the flat file in ASCII or EBCDIC was used, until recently, as the de facto standard format for archival preservation. With more complex data structures and wider support for data interchange and migration standards within the data processing community, knowledge of information technology standards that support archival functions will be an increasingly essential element of the electronic records curriculum.[12]

Automated Techniques. The challenges facing archivists in developing automated systems are twofold: (1) developing the most effective automated tools within the context of organizational needs, available technologies, and resource constraints, and (2) developing information systems that conform to descriptive and other professional standards to permit current or future interchange of descriptive information through national databases and other means.[13] The purpose of the curriculum for automated techniques is to provide archivists with analytical and decision-making skills that help them select and develop effective automated systems.

The curriculum should build on the basic information systems concepts and design methodologies discussed above, augmented with an overview of available technologies that are particularly applicable to archival functions. The core of the curriculum should concentrate on the analytical and decision-making tools needed to procure, design, or develop effective information systems with a particular focus on

[12]For a discussion of standards relevant to the management of electronic records, see Victoria Irons Walch, "The Role of Standards in the Archival Management of Electronic Records," *American Archivist* 53 (Winter 1990): 30–43.

[13]"Special Section: Standards for Archival Description," *American Archivist* 52 (Fall 1989): 432–502.

descriptive systems for archival records.[14] Such methods are applicable across technologies and should outlive any specific generation of hardware or applications software. Finally, the curriculum should stress information systems development as an ongoing process in organizations that follow a systems development life-cycle model of needs assessment, requirements definition, design, implementation, maintenance, and planned obsolescence.

Conclusion

This proposal attempts to balance several competing needs for curriculum development. It recognizes that information technology is subject to rapid and frequent change, but it attempts to define core information systems concepts that are relevant to many different types of automated systems and applications. It assumes that archivists will continue to fulfill a unique need in a modern information environment and, at the same time, that they will be drawn closer to other information-based disciplines. It assumes that some aspects of archival theory and practice will need reassessment and modification, but that many basic principles—if they are valuable principles at all—must transcend changes in information technology. It may take years or even decades to learn whether these assumptions are correct. In the meantime, current practitioners and students of archival science deserve a well-structured curriculum to help them respond effectively to the challenges that automation brings to the archival profession.

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[14]Many of these methods are discussed in Richard M. Kesner, *Information Systems: A Strategic Approach to Planning and Implementation* (Chicago: American Library Association, 1988).