The Control of Electronic Records Having Archival Value

by **CANDACE LOEWEN***

The world of archives, and of machine-readable archives, has changed and archivists are wondering how to cope. They are being asked to deal not only with records in the still relatively new electronic medium, but also with constantly changing aspects of that medium itself. To emphasize the point, a recent survey of archivists and archival institutions in Canada revealed that most feel "frustration and lack of direction regarding electronic records," particularly when it comes to "accepting," "adequately preserving," and "making available" electronic records.[1] Today, in the 1990s, archivists have moved beyond the first generation of electronic records—those early machine-readable archives that operated essentially as data libraries, because they mainly collected one-shot social science data files[2]—and beyond the first stages of "theorizing and assessment"[3] of electronic records. Archivists now have more comprehensive mandates to acquire, preserve, and make available all kinds of electronic records. Having become more comfortable with appraisal and having actually acquired some electronic records, archivists are seeking guidelines on how to approach the accessioning of electronic records, encompassing both their processing and description.

Introduction

Several authors have noted "arrangement and description" of electronic records as the next major problem towards which the profession should turn.[4] The impact of recent appraisal discussions is already being felt in major comprehensive acquisition strategies developed in several countries, leading to the acquisition of more electronic records by archives. Now that the profession is relatively familiar with appraisal issues as they relate to electronic records, the next three logical questions concern the acquisition and control of those electronic records determined to have archival value. Should archives be the official repositories of electronic records with archival value? If yes, should archives acquire some or all electronic records having archival value? Of those electronic records acquired by archives, moreover, how should they be brought under control—that is, accessioned, processed, and described?

The first two questions are being addressed by the profession[5]; the third question has not been examined fully. Few procedural models exist; those that do are continually being reviewed in light of rapidly changing technology. There is also little foundation work at either the theoretical or the practical level that archivists can use to guide them, or even use as a

starting-point for processing and describing the newest electronic records. As the profession faces custody and control issues concerning electronic records, it is encouraged to recognize at least three conclusions based on the little experience that has accumulated to date.

1. Any treatment of electronic records having archival value requires an integrated approach, in which archivists work with technical computer experts in initial appraisal and acquisition, later processing and description, and then reference and retrieval. Moreover, there is often overlap among the traditional archival functions when it comes to electronic records. As an archivist comes to know more about certain types of electronic records, it may be necessary to go back and revise the information recorded about them when they first entered the archives. At the same time, it is helpful if archivists also have some idea of the potential research or "back-end" use of electronic records at the initial stages of appraisal for acquisition.
2. Theory and practice go hand in hand in the control of electronic records. Since only a few models exist and—as shall be seen—the extant literature on the subject is minimal, it becomes necessary for each archives to adapt existing procedures to meet its particular needs, while simultaneously building upon tried and true principles. At the same time, archivists should try to remain abreast of the growing literature on electronic records, including that produced by related professions, such as computer specialists and data user groups. However, given the volatile nature of electronic records and their relative unfamiliarity, even archivists possessing a sound knowledge of the literature should also be prepared to make mistakes and learn from them.
3. The importance of context cannot be stressed enough in the control of electronic records, especially as it concerns documentation.[6] Archivists have always known that an understanding of the contextual or provenancial environment in which records are created is crucial to all aspects of archival work; this is even more important when it comes to electronic records. Unlike paper records, electronic records can easily be erased or amended. More than that, however, most electronic records cannot even be read or understood without some knowledge of the evidential and technical information, which is often found in the supporting documentation.

Having raised these broad points, this article now goes on to introduce questions that archivists may have as they document the acquisition of electronic records. In addition to providing a brief overview of some of the literature on the custody and control of electronic records, the article discusses some of the issues concerning control of electronic records, various approaches to these issues, and the practical aspects of accessioning—using the National Archives of Canada, in particular the Government Archives Division, as an example. The article contributes to the ongoing discussion on the control of electronic records having archival value by speaking briefly to the practical aspects of accessioning—the procedures—within the larger context of some of the broader theoretical issues. Perhaps it will help bridge the gap between such issues and daily practice.

Questions

The archivist accessioning electronic records in the early 1990s is asking a myriad of questions. Should accessioning procedures for electronic records from the "first generation" be abandoned in order to reflect more properly the recent rapid changes in technology and in the format and structure of electronic records—for example, office support systems (OSS) and whole relational database management systems (RDBMS)?[7] Should archivists adapt existing accessioning procedures for textual records to electronic records, in order to reflect as far as possible the shared provenance of all records, all information, from the same source?[8] Should

archivists try to stay abreast of changes in the electronic recording of information and attempt to prepare accessioning procedures in advance for all types of electronic records coming to archives in the future?

Archivists might find it helpful to consider these approaches on two levels—practical and conceptual. For example, on a practical level, it might be useful to maintain a proven system for cataloguing social science, one-shot data files; on a conceptual level, given today's knowledge of increased capabilities for electronic records, perhaps the approach of the former machine-readable archives should be abandoned. Data files are less and less considered as discrete items; even the flat data files of the early machine-readable archives are part of a fonds that includes records in other media, and this association should be reflected in their final description in finding aids and inventories. Furthermore, as archivists can never remain completely ahead of the rapidly changing technology, it would appear that it is practically impossible to prepare accessioning procedures for all future electronic records acquisitions. To emphasize the point, could the "first generation" of machine-readable archivists have foreseen that archives would some day be acquiring more than just flat data files? Electronic records systems of today often contain much more than just individual electronic records: they may also contain the structural and contextual "descriptive" information from which the electronic records derive their interrelational and evidential value, as well as their basic readability, and this makes them more archivally valuable.[9]

Archivists must consider these points as they make appraisal and accessioning decisions in the 1990s; the arrangement and description that archivists have undertaken in order to enhance the value of textual records in the past is now actually integrated into many electronic records systems. Hence, although it is likely impossible to prepare detailed accessioning procedures governing all future acquisitions, it is crucial that archivists think ahead about these issues—precisely by turning back to the sustaining aspects of archival principles—at the same time as they continue to experiment with various "live" accessions.

Literature

Discussions of appraisal, and especially appraisal of the newest magnetic media, abound, but few in the profession have addressed the issue of what to do once electronic records are inside archives. Indeed, well-known authors on the subject of arrangement and description have avoided discussing electronic records, for various reasons. Fredric M. Miller, for example, in his excellent manual in the SAA Archival Fundamentals Series, points out that the rapidity of changes in the technology requires archivists to change accessioning techniques continually; in addition, the very information inside electronic records is created and maintained differently from textual records, often requiring further computer systems to arrange and describe it.[10] The Australian archival handbook, *Keeping Archives*, mentions the acquisition of computers for use in archives but does not address the acquisition of electronic records themselves.[11] *Keeping Data*, while an important collection of papers from an Australian workshop on the appraisal of electronic records, addresses accessioning only by implication. Terry Abraham's recent article in the *American Archivist* on Oliver W. Holmes's five levels of arrangement and description notes how computer technology may affect the theory behind arrangement and description, but only as it applies to textual records, as in the USMARC-AMC format.[12]

Bruce I. Ambacher's otherwise very useful article on "Managing Machine-Readable Archives," in Bradsher's *Managing Archives and Archival Institutions*, assumes that archivists are still accessioning social science data files and not—quite possibly—entire database management systems, software-dependent data, compound or smart documents, and other new classes of electronic records in all their complexity.[13] This is generally true of most classic articles and books on machine-readable records dating from the 1980s: for example, Harold Naugler's *The*

Archival Appraisal of Machine-Readable Records: A RAMP Study with Guidelines (1984); Margaret Hedstrom's *Archives and Manuscripts: Machine-Readable Records* (1984); and Sue A. Dodd's *Cataloging Machine-Readable Data Files: An Interpretive Manual* (1982).

With but few exceptions, current scholars of electronic records archives have chosen to address appraisal issues and not control issues.[14] This is appropriate, for a greater understanding of the appraisal issues touching all the variations of electronic records will facilitate our approaches to accessioning and use. At the same time—more so than with textual records—a consideration of control issues relating to electronic records facilitates their appraisal: electronic records reveal greater overlap of the two principal archival functions. Logically, appraisal must nevertheless come first, as archivists continue to confront new aspects of the new medium. At some point, however, archivists need to ask themselves what is to be done when, if ever, these electronic documents come to the archives.

Issues

Control of electronic records within archives is an important middle stage of a long continuum; the other stages along the continuum must take control into account, and it must be established with the requirements of those other steps in mind. Custody and control of electronic records involve processes that closely resemble those involved in the custody and control of textual records. While physical control may require the separation of related records during processing and preservation, intellectual control should not be sacrificed for physical control. For the purposes of this article, control of electronic records includes at least (a) their rudimentary intellectual and technical, or preliminary, level of control, (b) technical processing, (c) perhaps "selection" or an internal level of appraisal which may result in the destruction of electronic records, and (d) description or final archival integration, the intellectual process that finally unites all records emanating from the same creator, regardless of medium and physical location.

Because control is that broad span in the archival continuum that occurs after initial acquisition and before researcher use, almost all the issues concerning the appraisal of and access to electronic records also impinge on their control. (Moreover, the issues themselves overlap.) Any determination of issues to consider in accessioning electronic records should not overlook appraisal and access. Whole conference proceedings, articles, and even monographs have been devoted to discussing a single issue; it will suffice here briefly to note these issues as they relate to the control of electronic records.

1. *Appraisal.* For electronic records, there are three types of appraisal: contextual, content, and technical. Initial appraisal decisions are especially critical when it comes to electronic records; archivists' involvement in all aspects of appraisal, including the technical aspects—even though they may not necessarily do the technical processing itself—is important. Given the fact that complex electronic records today contain information on the "original functionality" of the system—including built-in data dictionaries and logical data models—appraisal decisions made by the archivist, such as the choice to reconfigure data files or database management systems so that they are operable in the archival setting, may have serious consequences for later processing and description. Other consequences may include the huge costs involved in subsequent processing and preservation. Another factor to take into account is that, at least up to now, appraisal or "selection" of electronic records rarely occurs once they have come to the archives; the only exception would be retrospective reappraisal followed by complete deaccessioning, due to obsolete technology or the inability to read the records. Appraisal decisions, moreover, often have to be made in conjunction with records in other media of the same provenance; decisions about which medium of information to acquire may be based on the existing programme at the archives for

processing and describing electronic and textual records and on the history of past accruals to the same fonds. The archivist must understand all such past acquisition activity and its implications for current and future acquisitions in either medium.

2. *Archives as Repository.* The debate about whether an independent institution should physically acquire electronic records at all, when the creators of the records may be better equipped to retain and service them, has engendered some lively discussion in the profession, and the issues are fully described elsewhere.[15] In terms of control and description, however, once the electronic records are determined to have archival value, they will have to be described for archival purposes regardless of where they are stored; moreover, due to increasing possibilities of sharing and transmitting records electronically, the issue of archival institutions as repositories for electronic records may become moot in some cases. Generally speaking, with provenancial information having become part of some electronic records systems, it may be beneficial to bring these systems into archives; then again, such descriptive information embedded in the system software may prove to be problematic, rendering the records highly dependent on sophisticated, complex software that an archives cannot afford to acquire or maintain. Furthermore, perhaps other systems, such as those containing enormous amounts of cumulative, scientific data, would be best left with those experts who designed and continue to manage them. Given current possibilities for merging and splitting data, archives might also consider taking only a copy of the documentation or metadata—so that researchers would at least be aware of the existence of the electronic records—and leaving the rest with the creating or custodial agency.

3. *Archival Custodian.* Assuming that some electronic records are acquired by archives, who should be the archival "custodian" of documents which one can neither see nor touch—or does it matter? There are several mini-custodians in the National Archives of Canada, each with important tasks along the control continuum: those who do the initial technical processing, those who attend to ongoing preservation concerns such as storage and rewinding of tapes, and the archivist who first accessions and then later describes the records, taking into account the context of their creation regardless of medium. In the Government Archives Division, this archivist usually has also covered the content and contextual aspects of appraisal, and has been involved in the technical aspects. He or she became involved with the records, if you will, long before they were determined to have archival value. It is the archivist, therefore, who has done the background research into the context of records creation and who continues to "understand" the records throughout the control process.

   Nevertheless the archivist cannot fully accession the records without the involvement of other technical and conservation experts. Each person along the control continuum lends her or his expertise. The challenge lies in building a working environment and in organizing the work; there should be a continuum of activity that is interactive at a number of points, each participant having a unique contribution to make. Archivists use their specialized knowledge to perform appraisal, selection, description, and specialized reference functions for both textual and electronic records in their care, while computer experts advise archivists and perform the technical aspects of electronic records appraisal, acquisition, accessioning, processing, and dissemination.

4. *Data Files as Discrete Items.* Should data files be described as discrete items, a level and depth of description which served quite well in the first generation of machine-readable archives—and, if so, to what extent? This issue must be considered in light of more recent integrated strategic approaches to appraisal and acquisition,[16] and the increased contextual importance of electronic records themselves. A related issue is the extent to which the first-generation cataloguing systems for data files—which treat each data file as a separate entity, rather than integrating it fully into a series or fonds level description—should be maintained, if at all.

Alternatively, should archives build upon the detailed descriptive information that archivists already have concerning data files, in order to recreate the larger context of information and thus enhance understanding of the records by researchers? The basic question is whether the older, library-oriented practices should be abandoned, reworked, or maintained, as newer and more complex electronic records are accessioned. Generally speaking, it might be necessary to undertake research into the benefits and drawbacks of retaining the data library model for electronic records archives.

5. *Metadata.* The term, which is used to describe data about data that is embedded in the electronic records system, refers to the explanatory aspects of a system—from the logical data model to the system's "rules" and other contextual information about the system. It is in the metadata that the evidential or highest archival value of a system may lie. Any archives considering the appraisal and accessioning of electronic records systems containing metadata must recognize the implications for their control procedures of at least two issues: (1) Should the metadata be formally accessioned at all? If so, should it be accessioned separately from the core data, just as archivists usually separate finding aids from textual records? Would core data ever be accessioned without the metadata that supports it? (2) Should metadata be accessioned alone, separately from the core data it describes—in other words, should archivists accession only a part of an electronic records system, even if it is the part containing the greatest evidential value? Furthermore, regardless of the decision taken at the initial acquisition stage, there may be choices to be made at the later "selection" stage about how much of the electronic records in the system to retain, how much to destroy. In the end, knowing about metadata may make custody and control decisions easier. However, metadata may also cause us first to reconsider our approach to archives and accessioning in general.[17]

6. *Archival Principles.* Questioning the very foundation of archives can be disconcerting. Some members of the archival profession are strong proponents of the continuing relevance of archival principles for the newest media;[18] another has stated that archivists "must cease to act as archivists in the traditional sense" when it comes to electronic records;[19] yet another, recognizing the challenge that electronic records pose for archival principles, states the importance of examining this issue in light of archival functions, but does not decide one way or the other.[20] Nevertheless, when the archival functions of appraisal, acquisition, custody, description, and reference are taken as a whole, archivists recognize the sustaining importance of basic archival principles—in particular, provenance. Information on the creators of records, regardless of medium, serves archivists in understanding appraisal just as it does in describing the records for access and use. Accessioning procedures and methods for electronic records ought, as far as possible, to allow for the importance of connections and linkages among records from the same creator.

7. *Media Myopia.*[21] Establishing control over electronic records is a challenge to institutions such as the National Archives of Canada, where the organizational entities responsible for the archival functions are separated along traditional media lines (except for the electronic medium, which is the responsibility of several divisions). Are accessioning and preservation concerns different for Geographic Information Systems (GIS) from what they are for Office Support Systems (OSS), or photographic and art images in electronic form? Who should establish control—never mind address initial appraisal and use questions—now that all the traditional media such as photographs, images, graphs, charts, plans, maps, text, forms, or data (and even voice) are appearing in a single electronic medium? These thought-provoking questions concern basic archival principles: they force archivists to consider to what extent the fonds, the largest descriptive entity in archives, should be divided both physically and intellectually. To take the point even further, such questions cause archivists to think about multi-provenancial issues when they accession those databases that contain

information shared among municipal, provincial or state, and national governments. This in turn raises questions about confidentiality, restricted access, and the legal implications of shared information, both before and after it reaches the archives.

8. *Researcher Access and Use.* The level of "front-end" technical processing required to establish control over electronic records depends partly on the potential research use of the records, and partly on the various ways the records can be searched and manipulated. Although there has been some consideration of how archives can broaden the means of making data available, more thought is required as to how they should make complex electronic records accessible. At the National Archives of Canada the receipt of several formal access requests (under the *Access to Information* and *Privacy Acts*) has provided an impetus to pursue this issue further. In any case, researchers and archivists will only rarely be able to access electronic records that do not have the relevant supporting documentation. Once again, the documentation—this time for the "back end" of the archival continuum, researcher use—is eminently important.

These issues in electronic records accessioning—and there are others—are not easy to resolve, certainly not in one article. Research along the lines suggested by the National Historical Publications and Records Commission's *Research Issues in Electronic Records* should occur alongside practical attempts to establish an electronic records programme and related accessioning procedures.[22] From a combination of theoretical work and practical experience concerning the management of electronic records, the profession is already convinced that there is overlap of archival tasks as well as sharing of knowledge and expertise among the various functions. We now realize that the evidential information, including technical and contextual documentation, for electronic records may be as important as the electronic records themselves—without it the records cannot properly be accessioned, not to mention appraised and described. Finally, given the changing nature of electronic records, theory and practice will continue to develop side by side. Archivists should take reasonable action based on what is known from practice and theory, and then make the necessary adjustments to suit their particular circumstances.

Electronic Records at the National Archives of Canada

Although not all of the issues concerning the control of electronic records at the National Archives of Canada have been resolved, many have been tackled. In a nutshell, in late 1986 the National Archives abandoned the model of a separate Machine Readable Archives Division, where data archivists did the processing of data files. Since then, three electronic records programmes have developed: for private records, cartographic records (private and government), and other government records. For the latter in the Government Archives Division, the model now integrates electronic and textual media, with the assistance of an attached unit of computer experts who perform the technical aspects of appraisal, control, and reference service for electronic records.

Today in the National Archives of Canada, appraisal research precedes the accessioning, processing, and particularly description of both textual and electronic records created by the federal government. It is the archivist who maintains intellectual control throughout the management continuum, finally documenting the provenancial linkages and context in the description phase of accessioning.

Any archival programme for the control of rapidly changing electronic records must continually be reviewed. In the Government Archives Division, the process of acquiring textual records has been extended to include electronic records, producing an integrated approach to records in both media; nevertheless, this also will be reviewed in due course. In a report dated 10 July 1992, the Divisional Director indicated several new directions for electronic records, based on

a periodic review: the new comprehensive, planned approach to acquisition will continue to provide the means for identification and acquisition of electronic records having archival value; records in government office systems will be given more prominence in records appraisal; an in-house system, which has replaced the use of a service bureau since early 1991, will be tested and expanded for control and servicing of electronic records; and development and training of staff to cope with electronic records "will remain an important feature" of the Division's electronic records programme.[23] One activity planned for 1993-1994 includes writing guidelines for the creation of series-level descriptions for electronic records, so as to combine them with those textual records sharing the same provenance.

Very simply put, custody and control of textual and electronic government records at the National Archives of Canada can be seen as a cut diamond with four points of reference. At the top is appraisal, which includes initial research into the functions, programmes and activities, and structures that the records—regardless of medium—represent. At this point all media are integrated—at least conceptually. Once records of archival value are selected for transfer and enter the archives, they are separated by medium, in order to ensure adequate physical and preservation control: the processing of electronic records, arrangement of textual records, and the related conservation and storage activities. Thus the two points representing the sides of the diamond show this physical separation by medium (assuming that there are only two media; the diamond could be multi-faceted or three-dimensional in order to represent several different types of media from the same records creator). At the end of the control continuum, the lowest point on the diamond, the various media are again joined intellectually as they are described—in inventories and finding aids—according to the functions, programmes, activities, and structures of their creators.

The accession control record for both media is the same. In addition, the final description in inventories, following standards for archival description, is to be organized by provenance (series) and not by medium, thus reflecting the importance of grouping together records from the same creator. The top and bottom points of the diamond are in place. During the technical processing stage of the continuum, or the body of the diamond, a unit of computer experts provides technical advice in the appraisal of electronic records and undertakes the actual processing, using specialized hardware, software, and methodologies. These specialists make sure the electronic records are duplicated, verify the records for readability and possible errors in the documentation or data, and forward the records to the Conservation Branch for proper preservation in cold storage. They also consult as needed with the original technical users of the electronic system in the creating institutions, and make copies of electronic records available to researchers in increasingly imaginative ways.

Conclusion

Various models for establishing control over electronic records exist in archives acquiring electronic records today. For those archivists who have a mandate to acquire electronic records but have not yet done so, there are options to consider and choices to be made. Any decision will be based partly on the availability of resources—such as data processing service companies or in-house computer systems and experts—as well as on the types of electronic records to be acquired and the existing organizational infrastructure. Nevertheless, archivists establishing electronic records programmes must seriously consider a number of fundamental archival issues relating to the control of electronic records before investing scarce resources. They must undertake research on aspects of the ever-diversifying electronic medium which impinge on archives, and on the processing and care of electronic records that become part of the archives' responsibility. At the same time, they should be confident that the accumulated experience of several institutions can, at the very least, provide some foundation for the practical aspects of a proposed electronic records programme. Once archivists have their own research in hand—

this includes an understanding of the proven approaches and methodologies of other archival institutions—they may decide which elements of existing procedures to abandon or integrate, and which new procedures to develop in order to ensure adequate custody and control, now and in the future.

The Government Archives Division of the National Archives of Canada has decided to maintain, as far as possible, the procedures already in place for the control of textual records. This reflects an integrated approach to appraisal and acquisition, control (including description), and reference—an approach based squarely on the founding principles of archives. Expertise is available and shared in this management structure. The technical processing experts, hired for their technical knowledge, are integrated into the archival continuum from start to finish in order to assist the archivist; the archivist's tasks are integrated to reflect a truly comprehensive, holistic approach to the records; and those records belonging to the same fonds are integrated intellectually along the entire continuum.

Notes

* This paper was first presented at the 56th Annual Meeting of the Society of American Archivists in Montreal, September 1992. Panellists Alan Kowlowitz, Nancy McGovern, and Tom Ruller (presenting a paper by Hugh Shinn) all contributed to the panel discussion; the published version of the paper reflects their contributions at the SAA session. The current version of the paper has also benefitted from valuable comments by Terry Cook, Eldon Frost, Nancy McGovern, and Cynthia Lovering. I am grateful to them and to the archivists with whom I work most closely—Brien Brothman, Patrick Burden, Danielle Lacasse, and Martin Tétreault—for their general insights and observations in many archival discussions.
After the article was written, I became aware of a doctoral thesis on the "Management of Electronic Records" by Hamza Kandur (London: University College, 1992); those who wish to read further on the topic might want to consult this dissertation. This current article does not necessarily represent the views of my employer, the National Archives of Canada.

1 Catherine Bailey, "Summary of the Survey Results: ACA Select Committee on Electronic Records," draft (August 1992), pp. 4-5. The published version of this paper appears elsewhere in this issue of *Archivaria*.

2 Terry Cook, "Easy to Byte, Harder to Chew: The Second Generation of Electronic Records Archives," *Archivaria* 33 (Winter 1991-92), pp. 202-16. See also Margaret Hedstrom's stimulating article, "Understanding Electronic Incunabula: A Framework for Research on Electronic Records," *American Archivist* 54 (Summer 1991), pp. 334-54.

3 "ACA Survey," p. 5.

4 Katharine Gavrel says that "it is in the arrangement of electronic records that the major impact of the new technology will occur": *Conceptual Problems Posed by Electronic Records: A RAMP Study* (Paris, 1990), p. 31.

5 The first question is addressed by Kenneth Thibodeau and David Bearman, and the second question by Margaret Hedstrom, all in David Bearman, ed., *Archives & Museum Informatics Technical Report No. 13* (1991) on the "Archival Management of Electronic Records."

6 David Bearman elaborates this point, contrasting "rules for archival description" with "alternative principles for documenting documentation": "Documenting Documentation," *Archivaria* 34 (Summer 1992), pp. 33-49.

7 The distinctions may not be quite so stark in practice, as is implied later in the paper. Given increasing opportunities (in terms of software and methodologies) for sharing, exchanging, and massaging information—including the supporting documentation in electronic form—different electronic records, such as RDBMS's and one-shot surveys, may indeed look very similar to the user.

8 For a commendable piece on the implications of appraisal, see Glenda Acland, "Archivist — Keeper, undertaker or author: the challenge for traditional archival theory and practice," *Keeping Data: Papers from a Workshop on Appraising Computer-Based Records* (Sydney, 1991), pp. 115-19.

9 David Bearman, "Archival Principles and the Electronic Office," revised version of a paper presented at the National Archives of Canada (26 February 1991), pp. 1-2; see also David Bearman and Richard Lytle, "The Power of the Principle of Provenance," *Archivaria* 21 (Winter 1985-86), pp. 14-27.

10 Fredric M. Miller, *Arranging and Describing Archives and Manuscripts* (Chicago, 1990), p. 4.

11 Ann Pederson, editor-in-chief, *Keeping Archives* (Sydney, 1987).
12 Terry Abraham, "Oliver W. Holmes Revisited: Five Levels of Arrangement and Description in Practice," *American Archivist* 54 (Summer 1991), pp. 370-77.
13 Bruce I. Ambacher, "Managing Machine-Readable Archives," in James G. Bradsher, ed., *Managing Archives and Archival Institutions* (London, 1988), especially pp. 131-32.
14 Recently, some authors have noted how electronic records cause archivists to rethink control, and especially description, of records having archival value. See Margaret Hedstrom's article elsewhere in this issue; Charles M. Dollar, *Archival Theory and Information Technologies: The Impact of Information Technologies on Archival Principles and Methods* (Macerata, 1992); Terry Cook, "The Concept of the Archival Fonds: Theory, Description, and Provenance in the Post-Custodial Era," in Terry Eastwood, ed., *The Archival Fonds: From Theory to Practice* (Ottawa, 1992).
15 For example, see David Bearman, ed., *Archives & Museum Informatics Technical Report, No. 13* (1991), "Archival Management of Electronic Records."
16 This is the "new planned approach" to the acquisition of government records currently in practice at the National Archives of Canada. On acquisition strategy see, for example, Eldon Frost, "A Weak Link in the Chain: Records Scheduling as a Source of Archival Acquisition," *Archivaria* 33 (Winter 1991-92), pp. 78-86; National Archives of Canada, "Disposition of the Records of the Government of Canada: A Planned Approach," (3 July 1990); and Helen Samuels's work on documentation strategy, especially *Varsity Letters: Documenting Modern Colleges and Universities* (Metuchen, 1992). On appraisal see David Bearman, *Archival Methods* (Pittsburgh, 1989); Terry Cook, "Mind Over Matter: Towards a New Theory of Archival Appraisal," in Barbara L. Craig, ed., *The Archival Imagination: Essays in Honour of Hugh A. Taylor* (Ottawa, 1992), pp. 38-70; and Richard Brown, "Records Acquisition Strategy and Its Theoretical Foundation: The Case for a Concept of Archival Hermeneutics," *Archivaria* 33 (Winter 1991-92), pp. 34-56.
17 Charles Dollar says that "increasingly, archivists will have to rely upon metadata in order to understand and capture the provenance of electronic records": *Archival Theory and Information Technologies*, p. 74. A detailed discussion of metadata is the subject of an article by David Wallace, elsewhere in this issue of *Archivaria*.
18 David A. Bearman and Richard Lytle, "The Power of the Principle of Provenance," pp. 14-27; David Bearman, "Archival Principles and the Electronic Office," pp. 1-2; Catherine Bailey, "Archival Theory and Electronic Records," *Archivaria* 29 (Winter 1989-90), pp. 180-96.
19 Richard Kesner, "Automated Information Management: Is There a Role for the Archivist in the Office of the Future?" *Archivaria* 19 (Winter 1984-85), pp. 162-72.
20 Gavrel, *Conceptual Problems*, p. 31.
21 Terry Cook, "Media Myopia," *Archivaria* 12 (Summer 1981), pp. 146-57.
22 National Historical Publications and Records Commission, *Research Issues in Electronic Records* (St. Paul, 1991); see also Margaret Hedstrom, "Understanding Electronic Incunabula: A Framework for Research on Electronic Records," *American Archivist* 54 (Summer 1991), pp. 334-54.
23 Eldon Frost, "Government Archives Division: Issues Relating to Electronic Records," National Archives Internal Report (10 July 1992), pp. 1-2.