DIGITAL COMMUNICATIONS: DOCUMENTARY OPPORTUNITIES NOT TO BE MISSED

ANNE GILLILAND-SWETLAND

ABSTRACT: Drawing upon professional literature and electronic records and digital library research initiatives at the University of Michigan, this paper examines the nature of and opportunities provided by digital communications, primarily as evolving documentary media, but also as digital environments through which documentation may potentially be made more widely available and relevant. It cautions against utilizing a pure systems or risk management approach in identifying such materials for long-term retention, and concludes with a discussion of the need to revisit the role of appraisal to establish and capitalize on the nature and use of digital communications.

Introduction

In a recent article on the implications of the case of Armstrong v. the Executive Office of the President, David Bearman concluded that:

> If archivists do not use this and other opportunities to articulate forcefully what we expect from records creators and systems designers and to extend our mission and authorities both legally and in practice, we will lose most of this record of the next decade and squander our role as protector of the public interest in documented and accountable government.[1]

While such proactive approaches are indubitably necessary to assist in the legal management of the digital communications record, they do not come close to covering the wider professional and cultural considerations of managing the "human record" in the evolving and expanding world of digital communication. Moreover, the constant exhortations in the archival literature for the profession to cast aside, or at least significantly augment its traditional roles and approaches by plunging into the stratosphere of high technology, have left many archivists feeling confused, anachronistic, insecure, even stupid. Like a rabbit out of its burrow on a dark night, many an archivist, faced with venturing into the realm of electronic records, has found herself or himself frozen in the lights of oncoming traffic, unable to move either forwards or backwards, doomed to be roadkill on the information superhighway.

The time has come for archivists to reassert their interests and expertise with the documentary aspects and issues associated with preserving and accessing

the human record. These are the aspects and issues that attracted many archivists to the profession, and that will endure regardless, and as a direct result of, technological innovations and initiatives. Digital communications, both in the sense of transaction-interaction mechanisms and of documents, provide a strong focus in this respect. They are altering the nature of bureaucratic processes and transactions, personal interaction, information seeking and delivery strategies, and documentation itself, which is why they are already under study by communications researchers and organizational behaviorists, and by engineers, publishers, and information scientists involved in building "digital libraries." The archival profession should strive to bring its own, unique perspective to such research by identifying the uses and documentary natures of digital communications (especially what it is that they might reveal of changes in organizational, professional, and individual communication, and even changes in society and cultures), exploiting digital capabilities to track and harvest certain types of electronic interactions, and capitalizing upon these technologies for the ongoing dissemination, preservation, and use of archival materials.

The Nature of Digital Communications

The nature of digital communications in terms of content, context, structure, and use must be a central concern for any appraisal or selection process for these materials. This is so because archivists must be able to understand whether the digital communications they are appraising are potentially official records or offer new, enhanced, or additional documentation of a records mandate or collecting theme. Perhaps one of the most interesting aspects of electronic records, and one of the least treated by archival literature and practice, is their enormous potential to document contemporary culture and cultural and societal change due to the implementation of electronic information systems. Such change is manifested in many ways, including through developments in organizational structure and behavior, ethics, concepts of individual privacy and right to access records, ownership, and information use patterns, not to mention changes in the actual nature of the documentary record. To be truly effective in working with networked information and record-keeping systems and in interpreting their output, archivists must be aware of those systems' wide-ranging cultural, sociological, and legal implications. For example, Catherine Bailey has stated that: "Electronic mail gives the illusion of privacy with none of the constraints of official correspondence."[2]

Of all the existing electronic information and record-keeping systems, digital communications (also referred to as computer-mediated communications or CMC) perhaps best demonstrate all the above manifestations. Digital communications have been in a rapid and exponential state of evolution since their inception, not just in terms of technology, but in terms of the extent and nature of their use at almost every level of society and in almost every country in the world. Identifying and addressing the changing documentary nature of such media is an area that gets to the heart of the archival role in society, and is one that should receive much more attention in archival literature than it has to date.

CMC is really an umbrella term covering a multitude of different technologies, formats, genres, and environments, some of which are more clear cut and

have more predictable uses, contents, and structures, and hence may be easier for archivists to identify and appraise, than others. CMC include the familiar electronic mail,[3] used for either one-on-one correspondence, or one-to-many mailings; the ubiquitous bulletin board, listserv, and news group formats for communication among many; and various conferencing environments available for self-selecting or self-contained groups to use in task-oriented and social discussion. CMC also include both refereed and unrefereed journals, especially in scholarly and research fields, and a burgeoning number of hypermedia "documents" such as those generated using Hypertext Mark-up Language (HTML) and disseminated over the World Wide Web. Already the addition of new capabilities to existing software make it difficult in some cases to identify where one format or genre ends and another begins. Many of these formats and genres will become obsolete with developing technology, while some will continue to evolve and become more complex before rigorous internationally accepted standards, predictable document structures, societal use norms, and agreed-upon policies are developed that may simplify CMC management by archivists and other concerned parties.

Of all these forms of CMC, the most widespread administrative and personal uses are probably made of textual electronic mail. With large-scale implementations already in place in the corporate environment in particular, advanced voice processing applications such as voice-to-text conversion and voice annotation are also being integrated, along with public key encryption (PKE), to make this once rather straightforward format increasingly complex. Electronic conferencing generates administrative materials in instances where it is used to provide an electronic forum for groups of administrators, committees, and research collaborators, but much of the impetus for electronic mail's development over twenty years ago was to provide for personal interaction. Indeed, extensive use is made of all forms of digital communications by individual users acting solely in a personal capacity, or appending personal communications to those that would otherwise be considered official. This personal involvement in digital communications provides an essential element to any discussion of their documentary nature.

Where CMC developments, users, and archivists are today is a far distance from the beginnings of the widespread use of CMC in the 1970s. Where they will be in ten years time will probably not resemble any situation archivists have previously encountered. It is this dynamism that, rather than being viewed by archivists as an obstacle to working with these media, should be seen as the key to the many potential benefits that may accrue both to the historical record and to archival practice. Archivists, records creators, and historical researchers alike need to be aware of the documentary potential of materials generated by CMC and the associated opportunities the technologies present to reach new user communities in new ways. Charles Dollar, writing in 1992, emphasized the power of technologies as instruments of change. He stated that a basic condition of modern life is:

> ...the power of technologies, particularly information technologies, to break down the social, cultural, and national differences in communication —one of the most fundamental of human activities. No cultural or national tradition will be immune from the pervasive power of information technologies over the next century. In the long run, therefore, social, cultural,

> and national traditions about archives are useful in providing us with a baseline against which to assess the nature of change occurring around us.[4]

Hugh Taylor is one of the only archivists to have written about changes in the resultant "record," that is, the potential of the output of such technologies to reflect their global societal and cultural impact. Taylor states that:

> ...there is a need to understand how various technologies impinge upon communication in such a way as to change the bureaucratic process and the meaning of the act or decision entered in the record, which may look the same but ceases to have the same authority, especially since the computer is already evincing certain characteristics analogous to preliterate authority.[5]

Unfortunately Taylor's observations appear to have largely escaped concrete application in the appraisal practices of archival electronic records programs and archival research into the management of CMC. Catherine Bailey has commented upon the documentary nature of electronic mail:

> Electronic mail is the nearest written equivalent to the correspondence of the pre-World War II era, when decision makers committed their thoughts, feelings and judgments to discursive prose in official letters. The letters conveyed information for an immediate purpose; they were not written with an eye to history, nor did they serve the purpose of most official letters today—after-the-fact confirmation of decisions already reached.[6]

Awareness of cultural and sociological changes brought about by networking are being investigated by disciplines other than archivists, however, especially in fields such as communications research and sociometrics.

In 1991, Roberta Corbin observed in an article about the proposed National Research and Education Network (NREN) that:

> The development of a new technology occurs in several phases. First is the replacement of traditional manual functions with automated ones. Next, people see the potential of using the technology, and new uses and ways of doing things are devised. Finally, society itself changes as a result of that technology. These societal changes are occurring with the development of networks on a local, regional, national, and international scale.[7]

In the aftermath of the ruling in Armstrong v. The Executive Office of the President that held, among other things, that some electronic mail may indeed have archival value, and that the value may be greater, or at least different, in its original digital form to its print-on-paper version, Corbin's observation would appear to be particularly pertinent. What Corbin describes is not exactly a continuum, but is rather the interaction of various stages. While her first stage, that of replacement of manual functions with automated ones, has already occurred in many administrative environments, administrative users, individuals, and society in general are all straddling various points in the second and third stages (that is, devising new uses and ways of doing things, and eventually effecting societal change). Through the implementation of digital networking technology, digital documents are being created, annotated, and delivered, not only by and to government, corporate, and academic institutions, but also by and to individuals communicating in a personal capacity—the person in the street, even the child in the home. Integral to all of this for the archivist is the impact that

changing technology has upon the nature of the resulting "record," its historical import, and the ways in which we access, validate, and correlate it.

The dynamism (perhaps even chaos) of, and researchers' associated lack of knowledge, or potentially even inability to know about, the extent and nature of the use of digital communications comprise some of the most difficult aspects to operationalize in research projects looking at CMC. This has proven to be a problem not only for archivists, but also for researchers such as those in organizational behavior and theory, communications research, and information science. As a result, it has proved difficult to develop studies that are high in internal and external validity that might help to characterize the nature and uses of CMC.

Much current research is being driven by the plans to develop the National Information Infrastructure (NII). This proposition calls for the investment of billions of dollars of government and corporate moneys in an unparalleled partnership to develop an "Information Superhighway." Coupled with this are new developments in "digital libraries," for which major monetary awards have recently been made by the National Science Foundation to several collaborative projects based at six major American universities: Carnegie-Mellon University, Stanford University, the University of California at Berkeley, the University of California at Santa Barbara, the University of Illinois, and the University of Michigan. The essence of the digital library concept is that:

- heterogeneous and distributed files and databases are available, linked together, and frequently annotatable;
- library contents comprise multiple digital media (text, images, graphics, audio, video);
- library contents are universally accessible from work, school, and home through telecommunications networks;
- the library is designed for multiple and diverse user communities;
- the library is dynamic, in that the nature of both the digital library and its user communities should change as a direct result of their interaction with one another;
- the library is economically feasible, implying that it may well include commercial components; and,
- the development is frequently a collaborative venture.[8]

Major problems with the premises of the NII and the concept of the digital library, however, are that little is currently known or understood about the actual use and impact of digital communications networks. Perceptions that are most frequently cited, although little sound empirical evidence exists, are that such networking encourages intra- and inter-institutional as well as transnational collaboration; that it is a democratizing force which is breaking down hierarchical organizational and scholarly structures; that it can function almost as an instantaneous, synchronous medium and as a result may be more reflexive, spontaneous, candid, and informal. The findings of various research projects discussed below regarding who is creating materials, and the "recordness" of those materials in terms of provenance and ownership, legal and fiscal values, validation and authentication, and documentary quality, should demonstrate a number of concerns of interest to archivists.

Research into the impact of CMC upon organizational hierarchies, as well as the questions associated with the impact of such communications upon property

rights and the scholarly review process is currently being undertaken at the John F. Kennedy School of Management at Harvard University, in concert with the Consortium for Networked Information (CNI). Discussions so far circulated appear to affirm what has already been mentioned above, that is, democratization and flattening of existing hierarchies is occurring and considerably more publishing is being done digitally by those who actually create the publications and/or do the research. The result is a host of associated concerns with breakdowns in traditional validation mechanisms such as peer review and release of research results after approval by the top of the organization. Kahin and his associates feel that particularly in young and emergent fields of research, digital publication and other digital communications may be used to gain rapid visibility and credit for a particular viewpoint or line of research.[9]

Research is also beginning to indicate different use patterns between male and female users, with women using digital communication capabilities to do more time-shifting to meet demanding schedules, as well as more peer networking.[10] Similar sorts of differences have been detected between senior and junior researchers and executives. Users frequently feel very proprietary toward materials created by the more individualized CMC genres such as electronic mail, even in the administrative environment, thus raising issues regarding ownership of such materials and the specifics of institutional information policy. The increasing level of collaboration between peers is making it much more difficult to define primary authorship of research projects and articles, and, more generally speaking, the provenance of documents. It is, of course, unknown at present what impact the implementation of realistic charges might have upon CMC use as a result of commercialization of the Internet and the developing National Information Infrastructure, since many of the heaviest users of the Internet (particularly those involved in education and academic research) currently experience it as an inexpensive if not free environment.

Bishop, Doty, and McClure, who have conducted several studies looking at the use of networks, claim little evidence documents how many researchers are regular users of the existing national network structure, what the vast majority of researchers use networks for, and how networks affect their work. Much of their study of network use has been conducted with the aid of federal funding in order to make policy recommendations for the proposed NII and combines traditional social science empirical methods with policy analysis. This research looked at three settings that have been major users of computer networking: private industry, academia, and federal laboratories. It found that little research on major policy issues related to the design and implementation of a national research network has been conducted and that increased end-user training and digital network policies are necessary to support and reinforce classical disciplinary and scientific norms such as peer review in order for researchers to feel comfortable using networks for formal functions.[11]

One concern voiced by many scholars and researchers is that academia, if not society, may be beginning to confuse digital information and databanks with knowledge. For example, Richard Wurman, writing about the "information revolution," cites a source who states that:

> Information is not knowledge. You can mass-produce raw data and incredible quantities of facts and figures. You cannot mass-produce knowledge,

> which is created by individual minds, drawing on individual experience, separating the significant from the irrelevant, making value judgments.[12]

This concern was also implied in a 1987 article by Jay Bolter, writing about what he called the: "...dichotomy between the spoken and the written language; between writing and memory; between technology and the human mind itself." Bolter goes on to discuss how it is a:

> ...short step from electronic reading to electronic writing—from determining the order of texts to altering their structure and content. Traditional writings such as encyclopedias had permanent hierarchies of knowledge due to their formats. Now we can rearrange and make links as we wish. Computerized text is becoming more eclectic: combining visual symbols and images in more complex ways (including iconographic writing). One way to characterize this whole complex of changes in structure and symbol is to say that the computer gives us a new space for reading and writing. Literate people not only speak differently from illiterates, but they think differently as well: they analyze, they categorize, they reason abstractly with much greater facility.[13]

This is an interesting point, given that there are many archivists who would see their role, as manifested in the activities of appraisal, description, and reference, in large part being that of turning information into knowledge, but who are finding that to be more challenging when working with digital materials:

> The quest for knowledge rather than mere information is the crux of the study of archives and of the daily work of the archivist. All the key words applied to archival records—provenance, *respect des fonds,* context, evolution, inter-relationships, order—imply a sense of understanding, of 'knowledge,' rather than the merely efficient retrieval of names, subjects, or whatever, all devoid of context, that is 'information' (undeniably useful as this might be for many purposes). Quite simply, archivists must transcend mere information, and mere information management, if they wish to search for, and lead others to seek, 'knowledge' and meaning among the records in their care.[14]

In some respects, Jay Bolter's comment harks back to Hugh Taylor's concerns about subtle (and not so subtle) changes that may be taking place in the nature of the historical record. It would not be difficult, for example, for an archivist to perceive, when appraising existing electronic mail, whether electronic mail does indeed tend to be more candid, and to reflect more collaborative relationships. Perhaps electronic mail might reflect government associating with the corporate sector and the individual citizen on a scale, and of a nature quantitatively and qualitatively different than before CMC (for example, President Clinton's development of an "electronic White House"). It is certainly likely that the archivist will find that current CMC being appraised contain a much higher degree of mixture of personal and official communications within individual digital documents than is normally found in paper correspondence. It would be harder, however, for the archivist to identify whether the nature of the record and documentation of society in general is being fundamentally altered. Findings of the electronic conferencing project conducted at the University of Michigan in 1991-1992 would suggest considerable new and different forms of

documentation are being created on university campuses, especially those documenting the experiences of the ordinary person, as opposed to the central figure, or the office. Findings also point to the documentation of activities and social, political, and intellectual concerns that had not previously been possible to document through traditional record-keeping practices. The historical value of such interactions, however, are highly dependent upon how free individuals feel to speak their mind, whether or not membership of an online group has a critical mass and a strong organizer, and what costs are associated with system use.[15]

Obstacles to the Archival Management

Many problems raised by digital communications for archival management are products of technological developments and legal interpretation, and are germane to most digital systems. At this point, these problems are almost self-evident and have been discussed in some depth by the existing archival electronic records literature.[16] They include the facts that digital communications formats are constantly evolving and lacking in standards; no one is sure exactly how substantive or widespread are their administrative uses; and the lack of clarity in many circumstances as to what extent such materials constitute public record, especially when communications frequently contain a mixture of official and private correspondence. User capabilities to create a document on a computer, send it electronically to one or more second parties, who in turn may modify it, add graphics, and so forth, make the establishment of provenance and version control problematic. The passage of digital communications materials through network gateways and individual electronic mail boxes in chronological rather than any more useful original order, makes it difficult to identify the boundaries between systems, record series, and documents, yet archivists may have to work with such correspondence while it is still active, perhaps before the recipient has even read it and replied, or else risk losing it to a system purge or user deletion. Moreover, those who design communications systems and set communications and software standards still remain largely ignorant of archival needs.

Added to all of these is a set of obstacles acknowledged not only by archivists, but also by industry, and scholarly and research communities, for example, too much to save (sheer volume); too hard to weed, filter, or appraise (depending upon one's perspective); media integration (e.g., images, voice processing); text encryption; lack of standard digital document structures; authentication and mutability; migration of "archived data"; and lack of standard end user equipment.

Not so obvious and perhaps more difficult to resolve, are what might loosely be termed "philosophical" issues. Many of these are discussed from varying perspectives in the information and library sciences, business, and communications research literatures, although they receive significantly less attention in the archival literature. They include questions of assessing documentary value, establishing ownership of network materials, promoting user access, protecting personal privacy, even the ethics of managing digital materials.[17] Some of these questions have economic underpinnings, but many of them boil down, as Doty, Bishop, and McClure suggest, to a fundamental need for widespread user education and the encouragement of appropriate societal and community norms

regarding the use of computer networks and the secondary uses of materials created thereon. All of them should be of prime concern for archivists.

A Return to Appraisal

Much of the current archival literature follows in the same vein as the comment by David Bearman that is quoted at the beginning of this paper, that is, that digital materials should be managed within an electronic records management context, with heavy emphasis on the identification and retention of electronic records of evidentiary value. In fact, the terminology for this area is most telling: the profession talks in terms of "automated records and techniques" and "electronic records management," not in its usual bifurcated terms of administration of electronic "archives and manuscripts." The electronic records management approach may provide a cleaner, and more administratively persuasive framework within which the fuzzy universe of digital materials can be examined, especially from the perspective of the National Archives. It is, at best, however, limiting from a true archival perspective, and at worst, actually precludes the identification, preservation, and use of those materials that the archivist often finds to be the richest in historical terms, those that are integral to the process of *uberlieferung* or the handing down of culture to future generations. Perhaps the profession has become too confined within existing structures and constructs—rigid definitions of records, an implication of the exclusivity of evidential and informational values, and an over-reliance on the legal environment to set up operational parameters. Legislated law will never be sufficiently up-to-date to give archivists clear guidelines as to how to proceed in this area, and case law is never, by definition, proactive, and not necessarily made in the best interests of archivists.

In fact, the emerging digital communications environment raises surprisingly few new issues for archivists, and those it does raise are more often than not also issues for other professional communities. Rather, what digital communications do is force consideration of many documentary problems which archivists have long acknowledged and which they have attempted to address in recent years for more traditional materials through documentation strategies and other new approaches to archival appraisal (for example, how to document more than great white male-dominated institutions; or how to cope with evolving organizational hierarchies). It is now time for archivists to re-focus their attention away from its awe of the actual communications technologies and systems and onto the documentary values of the materials they create, and appraisal is the key to this process.

The archival community has conducted very little substantive research into the conduct of appraisal for digital communications materials. This is in part due to the availability of large-scale, relatively inexpensive digital storage which allows more to be kept; and in part due to a lack of techniques for "weeding" vast files of communications materials. In many instances, the appraisal decision is reduced to a simple equation—keep all or nothing. Where appraisal does take place, however, it can strip away a large amount of "useless" materials to reveal a rich and novel documentary core while at the same time assisting individuals and organizations with the awesome task of managing digital information overload. What has been learned from several research projects conduct-

ed at the University of Michigan both in appraising digital communications, and using them as a major vehicle to develop collaborative digital libraries, is that they present tremendous opportunities for enhancing the quality and scope of existing documentation not only of administrative activities, but also of the human record, and then for delivering this record in the integrated, contextual manner that many researchers will come to expect as society becomes increasingly engaged in digital communication. For example, findings of the University of Michigan electronic conferencing appraisal project suggest that electronic conferences, as one form of digital communications, represent an untapped form of documentation regarding life on university campuses where they are widely used. While the utility of such documentation will depend upon the archival mission statement and collecting policy, it can be especially revealing of the experiences of the ordinary person, as opposed to the central figure or office, as well as documenting activities and social, political, and intellectual concerns (particularly those of minorities) that previously had been captured through traditional record-keeping practices.[18]

A two-fold automated appraisal strategy that may well assist in this process is the use of communications systems design or expert "front ends" first to identify and tag on a collective level those digital communications materials that document core functions performed by the responsible agency, and second, to perform item-level appraisal that looks at the context, content, and structure of each individual digital communication. This promising approach, which has been tested as part of a doctoral research project for the appraisal of electronic mail at Michigan State University, will be further developed over the next year.[19]

The fact that digital communications are created in digital formats also opens up possibilities of their being used as documentation, or perhaps more accurately, as data, by less traditional archival researcher communities such as discourse analysts, communications researchers, anthropologists, and sociologists who are seeking quantifiable digital data. The latter three, in particular, are evincing interest in triangulating quantitative with qualitative research techniques in studies which may take advantage of more traditional narrative records and even oral histories in concert with digital data accessioned by archivists. This implies factoring in the interests of these communities during the archival appraisal process (and possibly even the systems design process) so that the data needed by these communities can be automatically tracked, "harvested," and even delivered as part of the archival reference process. For example, the University of Michigan's digital library project (UMDL), which focuses on the area of earth sciences, is associated with an electronic scientific collaboration called the Upper Atmosphere Research Collaboratory (UARC). Project developers and organizational behaviorists have been studying the digital interactions of scientists involved with these projects in order to obtain more knowledge of the scientific and intellectual processes and group dynamics at work in these digital environments.

Conclusions

One of the most powerful effects of the decision rendered by Judge Charles Richey in the case of Armstrong v. The Executive Office of the President, has

been to make organizations across the country aware of the legal implications of electronic mail, thereby opening the political doors for archivists finally to begin to work with digital communications within their own organizations. This is only a part of the picture, however. While many of their contents may have little, if any, enduring value, digital communications materials are not ephemeral, and should not be dismissed whole cloth if the "documents" they generate cannot neatly be fitted into a legal or formulaic definition of a "record." Digital communications represent a potential rich source of documentation for many different facets of society, over and above its organizational activities. Archivists should seek to develop new appraisal strategies that enable them to identify that documentation, and to develop new digital environments that enable them to disseminate it in a coherent, contextualized manner.

Moreover, archivists are in a position to take a leadership role in collaborative research projects with their colleagues and allies in related professional settings. It is fast becoming a truism to say that the archival profession needs more systematic research and evaluation. Truism or no, rigorous research and evaluation conducted in cooperation with non-archival communities such as the computing and telecommunications industries, organizational theorists, and communications researchers, will bring the archival profession closer to understanding and measuring the content and impact of the technology and its media within their implementation environment. In doing so, the archival profession should be raising its own profile and concerns, demonstrating its unique skills, and making itself and its collections an indispensable part of the National Information Infrastructure.

ABOUT THE AUTHOR: Anne Gilliland-Swetland is an assistant professor at the University of California in Los Angeles Department of Library and Information Science where she is engaged in teaching and research in the areas of archival administration, electronic records management, and digital libraries. Prior to this, she taught at the University of Michigan School of Information and Library Studies and was director of the SourceLINK project of the University of Michigan Historical Center for the Health Sciences.

NOTES

1. See David Bearman, "The Implications of Armstrong v. the Executive Office of the President for the Archival Management of Electronic Records," *American Archivist* 56 (Fall 1993): 689.
2. Bailey, "Archival Theory and Electronic Records," *Archivaria* 29 (Winter 1989-90): 73.
3. Electronic mail has been variously defined. For example, Webster's *New World Dictionary of Computer Terms* (1992) defines it as "the process of sending, receiving, storing, and forwarding messages in digital form over telecommunications facilities;" and Rice and Bair as "the creation, editing, sending, receiving, storage, forwarding, and printing of text—all facilitated by the computer." See, R. Rice and J.H. Bair, "New Organizational Media and Productivity," in R.E. Rice (ed.) *The New Media* (Beverly Hills, CA: Sage): 191.
4. See Charles Dollar. *The Impact of Information Technologies* (Macerata: University of Macerata Press, 1991).
5. Hugh Taylor, "My Very Act and Deed: Reflections on the Role of Textual Records in the Conduct of Affairs," *American Archivist* 51 (Fall 1988): 456-469.
6. Bailey, "Archival Theory and Electronic Records," p. 73.
7. Roberta A. Corbin, "The Development of the National Research and Education Network," *Information Technology and Libraries* 10 no. 3 (September 1991): 212-220.

8. This definition is compiled from the request for proposals for digital libraries issued by the National Science Foundation, 1994; the proposal submitted by the University of Michigan School of Information and Library Studies, et al.; and comments made by Nicholas Belkin at a presentation made at the University of Michigan School of Information and Library Studies in June 1994.
9. See Brian Kahin, "Scholarly Communication in the Network Environment—Issues of Principle, Policy, and Practice" (discussion paper, Science, Technology and Public Policy Program, John F. Kennedy School of Government, Harvard University; and the Coalition for Networked Information, 1992).
10. See, for example, Yvonna Lincoln, "Virtual Community and Invisible Colleges: Alterations in Faculty and Scholarly Networks and Professional Self-Image" (paper presented at the Annual Meeting of the Associations for the Study of Higher Education, Minneapolis, MN, October 29-November 1, 1992); and Kahin, "Scholarly Communications."
11. See Charles McClure, Ann P. Bishop, and Philip Doty, *The National Research and Education Network: Research and Policy Perspectives* (Norwood, NJ: Ablex, 1991); Philip Doty, Ann P. Bishop, and Charles R. McClure. "Scientific Norms and the Use of Electronic Research Networks," *ASIS '91: Proceedings of the 54th ASIS Annual Meeting*, vol. 28 (Medford, N.J.: Learned Information Inc), 1991): 24-38; and Ann P. Bishop, Philip Doty, and Charles R. McClure. "Federal Information Resources Management (IRM): A Policy Review and Assessment" *ASIS '89: Proceedings of the 52nd ASIS Annual Meeting*, vol. 26 (Medford, NJ: Learned Information Inc), 1989).
12. Richard S. Wurman, *Information Anxiety* (New York, NY: Doubleday, 1989.)
13. Jay David Bolter, "Text and Technology: Reading and Writing in the Electronic Age," *Library Resources and Technical Services* 31 (January/March 1987): 12-23.
14. Terry Cook, "From Information to Knowledge: An Intellectual Paradigm for Archives," *Archivaria* 19 (Winter 1984-85): 28-49.
15. See Anne J. Gilliland-Swetland, Gregory T. Kinney, and William K. Wallach, *Uses of Electronic Communication to Document an Academic Community* (Final Report to the National Historical Publications and Records Commission on Grant No. 91-113, Ann Arbor, MI: Bentley Historical Library, University of Michigan, December 1992).
16. See, for example, Bailey, 180-196; Margaret Hedstrom, "The Electronic Records Challenge," *History News* 48:4 (July/August 1993): 5-8; and Candace Loewen, "The Control of Electronic Records Having Archival Value," *Archivaria* 36 (Autumn 1993): 64-73.
17. For example, some users who do not trust or understand the archivist's motives may be prepared to destroy rather than hand over some material, especially in an environment such as academia, where a legal definition of what might be record can be much less clear than in the government setting.
18. For further information on see, Anne J. Gilliland-Swetland, Gregory T. Kinney, and William K. Wallach; and Anne J. Gilliland-Swetland, "Documenting Student Life Through the Use of Computer Conferences," paper presented at the Spring 1992 Meeting of the Midwest Archives Conference, Chicago, IL.
19. For more detailed documentation of this research, see Anne J. Gilliland-Swetland, *Development of an Expert Assistant for Archival Appraisal of Electronic Communications: An Exploratory Study*, Ph.D. Dissertation (Ann Arbor, MI: University of Michigan, 1995).