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Leonard Goodman

Dan Palmon

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Leonard Goodman
RUTGERS UNIVERSITY
and
Dan Palmon
RUTGERS UNIVERSITY

TECHNOLOGICAL INNOVATIONS AND THE WORK OF THE ACCOUNTING HISTORIAN: SOME KEY ISSUES

Abstract: This paper considers how innovations in information technology have changed the process by which accounting historians collect primary and secondary sources of information. It examines how web-based systems have made it possible for historians to collect data from what is effectively a twenty-four-hour "on-line library". The paper explores some of the limitations of technological innovations and considers the steps necessary to ensure future access to information stored in digital electronic form. It also considers the challenges involved in authenticating primary source documents such as e-mail and facsimiles and the impact of encryption on the availability of data in the future. Advances in information technology suggest that future generations of accounting historians will require new skills.

INTRODUCTION

Performing accounting history research is a labor-intensive process that involves identifying a worthwhile topic, collecting relevant primary and secondary source information, synthesizing prior studies, and analyzing the issues being researched. This article explores critical issues associated with the impact of technological innovations on the work of the accounting historian.

First, it considers how innovations in information technology have simplified the process used by accounting historians

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to collect information from books, articles and similar sources. Second, it looks at how technological innovations have simplified the work of the accounting historian by making it easier to type, edit and store accounting historical manuscripts. Third, it examines the challenges involved in authenticating primary source documentation such as e-mail and facsimiles which are likely to be encountered by accounting historians researching historical topics beginning with the last decade of the 20th century. Fourth, it analyzes the problems associated with reading historical documents stored under computer technology of prior years. Fifth, it discusses issues involving the preservation of digital documents and the steps proposed and taken by interested parties to deal with the danger of losing information because of new technology. Lastly, it considers encrypted primary source information and recommends a way that accounting historians might encourage policies that could ensure the future accessibility of historically important but encrypted data.

This paper concludes on a mixed note. On the one hand, innovations in information technology have made it easy to store enormous amounts of information that may be of use to accounting historians in the future. On the other hand, the abundance of data and the digital form in which it is likely to be held leads to challenges in authenticating and preserving this information.

HOW INNOVATIONS IN INFORMATION TECHNOLOGY CHANGE THE WAY IN WHICH ACCOUNTING HISTORIANS ACCESS SOURCE INFORMATION

The type of information that historical researchers need, that is, primary and secondary source material, has not been changed much by technology. What has changed, however, is how this information is accessed. With improvements in computer technology the search for information can begin with a computer in the researcher's home or office at any hour of the day. On-line public access catalogs (OPACs) now serve the same function that printed cards, physically contained in alphabetical drawers in a library's reference section, did for so many years. OPACs connect researchers via the Internet to card catalogs of universities, important public libraries, and national libraries. Some major archives repositories also have on-line catalogues.

Gaining access to a university's OPAC can be done by typing in a direct Internet address. For example, typing

www.libraries.rutgers.edu as an Internet address will directly access the Rutgers University library system. If the direct address is not known access can also be achieved by first locating the University's Home Page on the Internet. A comprehensive list of OPACs can be accessed through a search engine such as YAHOO.

On-line booksellers such as Amazon.com have simplified the process by which books, including difficult to find titles, can be purchased on-line. Amazon.com has a surprisingly large number of out of print books available. At least for now, however, research libraries with well-honed interlibrary loan capabilities remain the best source for out-of-print and difficult to find scholarly titles. While Amazon.com charges a fee for obtaining out-of-stock books, research libraries will rarely charge those who use their interlibrary loan capabilities.

Clearly the technology in this area is changing. Companies like netLibrary, Ebrary.com and Questia Media convert scholarly books into an electronic format so that they can be read on-line. In the case of netLibrary, which can be found at www.netlibrary.com, web-based technology allows a user who enters a particular topic or keyword to see a listing of books in which this word or topic appears. Clicking on the title of a selected book leads to each of the locations in the book in which the item of interest appears. NetLibrary has about 18,000 copyrighted books and 4,000 public-domain works. But this is only a fraction of the volumes available in major research libraries. Ebrary and Questia Media have plans to make a much larger number of scholarly books available than netLibrary. Ebrary.com already has 130,000 volumes in its demonstration database and plans to have over 600,000 scholarly books electronically available when it opens in 2001. Questia Media expects to have 50,000 volumes when it opens in 2001 with a three-year goal of 250,000.

NetLibrary originally envisioned access both through libraries and private subscriptions. It has discontinued private subscriptions in favor of access only through libraries that pay a fee to netLibrary. Under the Questia Media model anyone will be able to search the company's entire database of titles for free. Only subscribers to the company's service, however, will be able to see the pages of a requested book. Using a somewhat different approach Ebrary.com has adopted what can be thought of as a "photocopy model" under which searching, retrieving and reading will be free. But printing or otherwise copying, for example, by using a cut and paste approach, will

require payment of a small fee, akin to a photocopy charge, which will be deducted on a per page basis from a user's debit card. Ebrary.com will automatically generate a citation at the bottom on any page printed or otherwise copied [Guernsey, 2000].

A major impediment to reading books on-line has been that computer screens do not have the same high level of clarity and resolution as printed books. Technological changes in this area seem likely to at least mitigate these difficulties. Microsoft's "Reader" software program [Smith, 1999] is designed to give the computer screen more of the feel of a book along with the ability to do something that no scholar would dare do to a library book—write in the margins. Microsoft's decision to give away its "Reader" software and sell its related hardware at low cost broadens the availability of scholarly books on-line.

The collected papers of individuals that have often been carefully guarded by librarians are increasingly available at web sites. For example, the papers of Frederick W. Taylor, which are available at Steven's Institute of Technology in Hoboken, New Jersey can be found at http://taylor.lib.stevens-tech.edu/.

Accounting history researchers may find it helpful to be on a mailing list or list-serve that provides information of particular interest to them. In contrast to a newsgroup (also known as a bulletin board) where anyone with Internet access can post content, a list-serve is intended for those whom the coordinator of the list agrees has a legitimate interest. Typically the coordinator of the list maintains its content and places on the list only those who will either benefit or are likely to find the information useful. Some list-serves that accounting historians may find valuable include Economic History Net (EH.NET) (messages to list@eh.net) and Network di Storia Economica (Nestore-L) (messages to mailserv@cesit1.unifi.it) which is primarily in Italian. Links to the web sites associated with these list-serves can be found through the Academy of Historians web site at http://weatherhead.cwru.edu/accounting.

Libraries are also working at integrated document delivery services. For example, at Rutgers University, the Web of Science links directly to electronic journals held by Rutgers. It also offers a free document delivery service for those journals that the Rutgers library does not own.

In the 1990s journal collections began to be published in CD-ROM form. For research libraries that wanted to acquire collections in many disciplines, the benefits of CD-ROMs were myriad. They include a reduction in expenditures

for new periodicals, the availability of a wider array of journals for interested users and a better utilization of library shelf space.

Web-based technology can often enhance the usefulness of CD-ROMs. For example, consider how the Library of Congress' five-part CD-ROM product entitled "Birth of a Nation" effectively combines CD-ROMs and web-based technologies. It introduces readers to the world of important historical manuscripts, maps, prints and photographs. These images are accompanied by insightful narratives that show the ability of historians to "create a powerful sense of time and place through the creative use of primary sources" [Oshinsky, 1999, p. G-9]. Much of this work follows chronological and thematic lines. The "Birth of the Nation" CD-ROM series is linked to the Library of Congress's American Memory web site providing almost instant access to a vast collection of historical documents. As another example, scholars of Abraham Lincoln can use the web site of the Abraham Lincoln Association (www.alincolnassoc.com) to locate the vast array of material available about the life of Lincoln. Simply typing in words that Abraham Lincoln may have either spoken or written provides a search engine with information that determines in what speech or written document Lincoln used the words of interest to a particular researcher [Mitgang. 1999].

HOW TECHNOLOGY HAS CHANGED THE TYPING, EDITING AND STORING OF ACCOUNTING HISTORICAL MANUSCRIPTS

The swiftness with which technology is changing the work of accounting historians can be seen, in part, by considering how computer technology has changed the typing, editing and storing of academic manuscripts.

For many years the bane of writers of history was the need to initially type and then to continually retype a paper as changes were made. Fortunately, over the past twenty years or so the drudgery of doing all of this has been mitigated by word processing packages that store, print and retrieve manuscripts. The once all too familiar routine of cutting and pasting is now done on the computer rather than with scissors and tape.

The invention of the personal computer has permitted historical manuscripts to be stored in an electronic medium initially on tape and later on five and one-quarter inch low-density

floppy diskettes. These floppy diskettes while a blessing relative to earlier technology had limited storage capacity and were easily scratched causing them to lose information that may have taken days to retype. The advent of low-density three and one-half inch diskettes doubled the amount of storage space and created a more durable medium for storage than existed for the larger diskettes. These three and one-half inch low-density diskettes, in turn, became obsolete when high-density diskettes of the same size quadrupled the amount of information that could be stored.

In the past, out of fear that their work would be lost or otherwise misplaced, cautious individuals would leave printed copies of their manuscripts in their home, their office and perhaps one or more other secured location(s). Computer technology has reduced these fears by allowing manuscripts to be inexpensively stored in multiple formats. For example researchers who want the security of extra copies can now use multiple storage devices (e.g., high-density computer diskettes, hard drives, DAT tapes CD-ROMs, DVDs, and portable hard drives).

Innovations in technology have also led to efficiencies in scanning and saving primary source documents. Scanning these documents, particularly those in a deteriorating condition may ensure that the historical record is not lost. Much of this scanning and saving can be performed at relatively low cost thanks to improvements in optical character readers and larger, more reliable hard drives that allow data to be stored using advanced compression techniques.

Further advances continue to be made in how researchers go about inputting, modifying, and saving their work. Consider in this regard that voice recognition systems have already begun to allow people to orally dictate to a computer, and have the computer type, print and save what is spoken.

AUTHENTICATING DOCUMENTATION IN A DIGITAL WORLD

In recent years hoaxes involving documents purportedly written by famous people such as President John F. Kennedy and infamous ones such as Adolph Hitler have attracted the public's attention. Some of the methods used in evaluating the authenticity of hard copy documents include handwriting analysis, chemical analysis of the ink and a determination of the age of the paper on which documents were written.

E-mail and facsimile messages will provide accounting historians researching topics beginning with the last decade of the 20th century with an additional challenge in authenticating primary source documents. These challenges are likely to be best understood and dealt with by those who understand the technological advantages as well as the limitations of digital transmissions.

Consider in this regard that e-mail messages received by an individual may be found stored on the hard drive of the intended recipient providing evidence that a message had been received. In contrast to regularly delivered post office mail, e-mail messages leave digital footprints that a message had been sent by one computer and received by another computer. Moreover, the computer will store digital evidence of an electronic reply.

For facsimiles there can be digital evidence of transmissions, receipts and responses. The date and the time of transmission along with the sender's facsimile number are electronically printed on each sheet of paper received by the recipient. As in the case of e-mail, digital evidence of an electronic reply may be available.

Ironically, the ease with which e-mail messages are now sent reduces the likelihood that historians, writing about events at the end of the 20th century and thereafter, will locate the letters which have traditionally been a rich primary source. Instead, accounting historians in the future will more likely find relatively few personally written letters but a large number of on-line ones for which knowledge of computer technology may be helpful in verifying their authenticity.

In making judgments and looking back on an increasingly digitized world, will accounting historians of the future have the computer skills to recognize an electronic forgery? Consider as an example, an e-mail that appears to emanate from the Office of the President of the United States. It is possible for someone who is not in any way associated with the U.S. government to compose an e-mail that appears to come from the White House and the President. While this might fool some people into believing that an e-mail message was in fact sent by the President, those who can decipher the computer transmission data that precedes the body of an e-mail message are in a better position to assess its authenticity.

The accounting historian of the future will need to recognize that innocent errors might have occurred in a digitized environment as they did in the pre-digital world. There have

been many examples in the past of errors occurring when manuscripts were copied, when new editions were set in type, and when editors, however well intended, made unfounded decisions resulting in original source documents being published which were very different than that envisioned by the creator. In the case of digital documents electronic '"watermarking" helps to alleviate this problem.

In the pre-digital world valuable historical documents were often only allowed to be examined under the watchful eye of a person entrusted with their care. This vigilance may have averted vandalism but it did not eliminate it as pages of important documents were sometimes removed by those who decided to act as censors. Special care must be taken with electronic material since it may be less obvious that someone has removed information. Similarly, in the absence of appropriate safeguards a malicious person might modify an electronic document to reflect their own viewpoint rather than that of the author. While read-only access can enhance assurance that documents being read are what they are purported to be, it will be up to the accounting historian to make judgment calls as to the completeness and authenticity of documentation.

Instead of poring through boxes of papers the accounting historian of the future may be confronted with the riddle of retrieving data stored in a computer system that has long ago been relegated to the dust heap of technology. In searching for primary sources of information within these machines accounting historians may find it desirable to follow some of the procedures commonly employed by today's forensic accountants. Like the forensic accountant in search of fraud, the accounting historian of tomorrow may need to access electronic data which, of course, cannot be seen from outside the machine and which may be imbedded in digitized devices.

Consider that many people delete e-mail messages with the same intended finality that others have in physically shredding a document. The motive may simply be a desire to throw away an uninteresting document, or perhaps of more potential interest to the accounting historian, a desire not to have someone see a particular correspondence. However, some people have learned to their chagrin that the message may still exist within the computer and thus, may be retrievable at least under the computer technology most commonly used at the end of the 20th century. A deleted e-mail message only becomes irretrievable when a computer hard drive is full and new information begins, in effect, to push out this older information

because no more space is available. Accounting historians who are aware of this technological glitch may need to acquire the skills necessary to retrieve data which might otherwise be irretrievable.

The task might involve applying common sense to obtain the password used by a person of interest. People often leave clues for accessing information on their computer. Forensic experts often find sticky notes with a password taped to a computer monitor or stuck under a keyboard. Clues such as the names of family members or pictures of a pet or friend, if they can be identified, often lead to a password that can unlock information contained in a digital device. If passwords cannot be ascertained in this way knowledge of computer software and hardware may be needed to bypass a computer's password and to set up a new one that allows access to needed information [Blank, 2000].

Technological advances may place the accounting historian in search of primary sources of information in the position of having to learn about the computer technology current during the period being researched. Consider in this regard that new technologies likely to aid the accounting historian in verifying the authenticity of primary source documents are emerging at a fast pace. For example, Microsoft has announced that it will include in future versions of its Windows operating systems biometric devices that can identify authorized computer users from fingerprints and eye-scanners [Sapsford, 2000].

Another recent development is the introduction of a software program called BioPassword. This program is based on the idea of using typing rhythms as a means of validating the identity of the person typing. Every time a person types in a password, BioPassword is able to identify that individual through unique characteristics such as hand size, the pressure with which the keys are struck, the length of time keys are held down and the length of time between pressing the keys [Marriott, 2000].

A further important development is a recently enacted United States law that legalizes electronic signatures. This law, known as "E-Signing" is technologically neutral in the sense that it does not favor any specific technology over any others.It is therefore expected to give a tremendous boost to developers of new technologies. Alternative E-Signing technologies currently being considered include public and private key technology (to be discussed later in this paper), a smart card, biometric technologies, and technologies that retain the human

signature in combination with devices such as a digital pad [Feder, 2000].

While it is unclear which technology or combination of technologies will prevail, these developments have implications for future accounting historians, when researching topics relating to the period when these technologies were used. Historians will need to exercise considerable professional judgment in making decisions about the authenticity of primary source documents.

READING HISTORICAL DOCUMENTS STORED UNDER COMPUTER TECHNOLOGY OF PRIOR YEARS

In order to maintain our ability to use information stored in a particular technological platform, two components are needed: hardware and software. Initially, stone, clay and then paper served as the hardware, and language was the software. While we can still read, understand and save old stone, clay and paper records this will not be as easy when we move from our current platform to the next level. From now on, changes in technology may actually decrease our ability to go back to past data.[1] The problem is that we can no longer read and interpret information ourselves; we need an interface. For example, WordStar was the most popular first generation DOS-based word processing program. However, it is difficult to understand information contained in WordStar documents unless we have the program and a computer that can run it. Many new versions of software recognize and/or accept files of older versions of the same software package and software of other vendors while retaining some (but not necessarily all) of the characteristics of the original document. For example, Word 2000 will convert older versions of Word files and also earlier versions of

[1] The speed of technological innovations has resulted in the loss of historically significant documents at an alarming rate. The Commission on Preservation and Access and The Research Library Group [1996] describes numerous examples including one in which data from the U.S. Census deemed to be of long-term historical value could only be read by a UNIVAC type II-A tape drive leading the Committee on the Records of Government to write in a hyperbolic manner that "when the computer tapes containing the raw data from the 1960 federal census came to the attention of NARS [the National Archives and Records Service] there were only two machines in the world capable of reading those tapes; one in Japan and the other already deposited in the Smithsonian as a relic" [p. 2].

Word Perfect retaining the text and most of the formatting of the original document. For a document available in ASCII format only the text will be retained while the formatting will be entirely lost.

The problem of maintaining access to historical business information is essentially an issue of supply and demand. As our current technology is superceded by newer designs, the demand for the old technology decreases. Suppliers of that technology see that the market is shrinking and stop producing for it. As a result, we are left with software, but no hardware on which to use it. You may own some eight-track audio tapes or Beta video cassettes that you can no longer play. If you are fortunate, the same album or movie is available in a newer format because the content is still popular, even though the technology is not. When hardware becomes obsolete only researchers may have an interest in preserving it. For example, The Library of Congress and most university and municipal libraries keep millions of records on microfiche. What will happen to the data contained in those tiny rectangles of film when the last microfiche reader breaks, and we can no longer get the parts to repair it?

Inability to access old data can create problems for many organizations. The current solution to this problem is to make continuous backups. This creates layers of historical data at lower cost than keeping paper records. With today's computer technology, we can convert paper records into digital records through scanning. It is a slow process, so most old paper records have not been converted. Yet we can still read the old records in their original format. Unfortunately, the same will not be true for digital information, which we cannot access without a computer interface.

WHAT IS BEING DONE TO ENHANCE THE LIKELIHOOD THAT IMPORTANT INFORMATION IS NOT LOST DUE TO TECHNOLOGICAL CHANGES?

Fortunately, there is worldwide interest among companies, libraries and archives in preserving documents, software products and other digital information. For example, The Commission on Preservation and Access and the Research Libraries Group [1996] has a task force on digital archiving. Composed of high-level executives at archives, museums, publishers and scholarly societies within the United States, it was established to "investigate the means of ensuring continued access indefi-

nitely into the future of records stored in digital electronic form." [The Commission on Preservation and Access and the Research Libraries Group, 1996, page iii]. This task force issued a draft report in August 1995 and received helpful comments and suggestions from interested parties from around the world. In May 1996 the task force issued its final report which can be found at http://www.rlg.org/ArchTF/index.html. Basically it called for the development of a national system of digital archives which it defined as "repositories of digital information that are collectively responsible for the long-term accessibility of the nation's social, economic, cultural and intellectual heritage instantiated in digital form" [The Commission on Preservation and Access and the Research Libraries Group, 1996, p. iii]. The envisioned digital archives differ from digital libraries in the sense that digital libraries collect and store digital information but may not necessarily provide long-term access and storage for that information.

The proposed national archival system would be formed through two essential mechanisms. First, these repositories would need to satisfy the standard of an independently administered archival certification body. This in effect would prove to users that they are dealing with a reliable body. Second, these depositories would need to provide fail-safe mechanism to ensure an aggressive rescue function was being performed to preserve significant digital information that might otherwise be lost.

The Task Force's report of May 1996 recognized the need for a migration strategy:

> Migration is a set of organized tasks designed to achieve the periodic transfer of digital material from one hardware/software configuration to another, or from one generation of computer technology to a subsequent generation. The purpose of migration is to preserve the integrity of digital objects and to retain the ability for clients to retrieve, display, and otherwise use them in the face of constantly changing technology. The Task Force regards migration as an essential function of digital archives [The Commission on Preservation and Access and the Research Libraries Group, 1996, p. iii].

The Task Force favored migration over the commonly used (and often still essential) process of "refreshing" under which data is transferred from one medium to another, for example from a deteriorating hard drive to a newer one.

In 1998 as a follow-up to its Task Force Report the Research Library Group funded a study that can be found at http://www.rlg.org/preserv/digpres.html which looked at the preservation policies of its members. It found that less than half of the responding institutions with digital holdings refresh them to new media or migrate them to current formats. The majority of institutions that "refresh" or "migrate" materials do so on an ad-hoc basis or as part of a system update; a majority of respondents also lack the capacity to mount, read or access data on some of the media they hold. While there was concern over the lack of uniform standards, there was a consensus that coordinated strategies and shared resources were essential in achieving broad solutions [Hedstrom and Montgomery, 1998].

Suggestions similar to those proposed by the Research Library Group have been made in other countries. For example, higher education institutions in the United Kingdom have created a useful document entitled "A Strategic Policy Framework for Creating and Preserving Digital Collections" located at http://ahds.ac.uk/manage/framework.htm. It describes the importance of having institutional commitment and a framework of policies and procedures to ensure that there will be viable digital preservation. [Beagrie and Greenstein, 1998]. Also, the National Library of Australia has embraced a "Statement of Principles for the Preservation of a Long-Term Access to Australian Digital Objects." This document sets up specific policies on digital preservation and can be found at www.nla.gov.au/preserve/digital/princ.html [National Library of Australia, 1995].

ENCRYPTION

Concern over the stealing of trade secrets and/or a desire to protect personal privacy in a digitized world in which disturbing acts, such as identity theft, are occurring has encouraged increased use of encryption software. This penchant for privacy has also been fueled by the actions of Internet companies like DoubleClick.com which seek to match Internet use with specific individuals.

In researching historical topics beginning with the last decade of the 20th century, accounting historians of tomorrow may encounter the frustration of trying to obtain primary source information relative to individuals who, as a backlash to such efforts, encrypt their digital tracks. This desire for privacy has been aided by public-key cryptography, a means to limit

e-mail's accessibility to the sender and the intended recipient. This encryption technology, which became known as PGP (Pretty Good Privacy), requires two keys, one by the sender, and the other by the recipient. The sender uses the recipient's "public key" available on the web (for encryption) and the recipient uses his/her own "private key" to decode the message. This technology was initially considered so powerful an encryption device that the U.S. government attempted to classify it as "ammunition" so that it could not be sent outside the country. By 1993, however, the computer code behind this encryption technology was posted on the Internet. This has led to the creation of a host of new companies that sell encryption services to individuals desiring to protect their privacy.

It is difficult to measure the extent to which encryption will result in a lack of accessibility to the information which future accounting historians may find important. One could argue that accounting historians should not bother to consider the policy implications of this issue since it will be many years before we are studying historical topics for which encrypted information becomes a problem. On the other hand, this may be an area where accounting historians, who like other historian, have generally been silent on the issue of preserving our digital heritage, can make a contribution. While the technical areas of preservation via migration and the creation of central depositories of digital information are probably best left to professional librarians, accounting historians might make a meaningful contribution by examining the effect of encryption on the availability of primary source documents to future researchers. With today's hardware/software state of the art technology it may take a lifetime to decrypt text by complete enumeration. While technology may improve in the future allowing historians to decrypt it, further advances in encryption technology may foil these attempts.

Groups such as the Academy of Accounting Historians might consider the feasibility of making recommendations requiring that all encrypted data and other firewalls be initially programmed to expire after a set period of time. In this manner a sufficient length of time (say, 50 years from its creation) could be allowed to elapse so that historians will benefit by having access to potentially important primary source information while those involved with its creation would no longer be injured by its dissemination.

Might such a recommendation be legislative in nature and go beyond encryption to include the retention of other histori-

cally important digitized information as well as that which might not be encrypted? Companies are often required by law to preserve, for a prescribed period, certain financial, environmental and other data so that it is available for examination by the appropriate governmental agency. While companies are legally required in these cases to provide data, it is doubtful that such an approach would work for other potentially important historical information that is not required to be retained under current law. It is hard to justify requiring companies to keep records of historical importance in a retrievable format when technological advances make retrieval increasingly difficult.

Legislation of this sort would also run counter to a business environment in which companies are increasingly concerned about unnecessary government regulation. Further, just as the various committees and task forces of librarians that considered preservation policies eschew legislation in favor of cooperation it would be better to convince companies that they have a vested interest in retaining historically important information.

Many potentially important digitized primary source documents are likely, however, to be destroyed irrespective of the above consideration because of an increasing number of electronic discovery lawsuits. Concerns over the legal exposure of this discovery process often result in companies retaining only that data which is required. E-mail and other potentially valuable primary sources of information to accounting historians may not be retained.

In spite of the fact that the increasing use of encryption and company fear of lawsuits may imperil the availability of some historically important information, improvements in technology may lead to other compensating sources of data. Consider in this regard that the rapid integration of audio, video and text has led to the production of films and documentaries that in the past could only be produced by the most sophisticated professional studios. Inexpensive video cameras and the increasing ability of computers to integrate audio, video and text have led some to claim that in the not too distant future we will be watching films which not only broadcast images and sound but also smell and taste. Future events captured in such rich detail, while subject to potential manipulation due to the same computer technology which allowed it to be captured in the first place, offer tantalizing prospects for contemporaneously capturing and storing valuable primary source information.

CONCLUSIONS

Technological innovations have not changed the work that accounting historians perform. Yet, computer technology is dramatically changing the *process* by which accounting history research is performed and the way researchers obtain and work with information. While accounting historians may still find it necessary to physically visit libraries and records offices to obtain source materials, the number of trips will be significantly reduced by advances in computer technology. There has never been more access to more information, available on the operation of a few keystrokes.

Paper, particularly acid-free paper, remains the most effective long-term storage medium for recording information. We know that books printed on acid-free paper with good air-conditioning can last 500 years and that microfilm if properly cared for will also last hundreds of years. In contrast, digital storage media such as magnetic tape and CD-ROMs are expected to last only ten years and there remains much uncertainty concerning the shelf life of other digitized media [Brand, 1999]. One highly respected figure in the field of digital preservation has written: "It is only slightly facetious to say that digital information lasts forever—or five years, whichever comes first" [Rothenberg, 1995, p. 42]. But the alternative to digitization, printed materials in the form of books, journals, newspapers are costly and occupy much space.

In our current plateau new history is being created and stored in digital format everyday. For now it is accessible to us. When the technological base changes, it may no longer be possible to return to the original record so easily. It is likely that we will still need the old technology to interpret data trapped in digital-electronic-magnetic-optical formats.

A new technological platform would help historians by improving the storage, manipulation and dissemination of new data. Unfortunately, in the future it may create impediments to accessing the data created in the formats that we use today. Migrating data to new platforms is the key to developing preservation policies that those with responsibility for data preservation are likely to find acceptable. Company retention strategies, preservation efforts of libraries working separately and together, and the ability of the accounting historian to navigate in an increasingly digitized world will affect how relatively easy or difficult it will be to access information in the future.

We have no way to know what the next generation of

information technology will be. It might have a liquid base, or encoded information in DNA strands, or be some form that we cannot even imagine. However, we can guess that the data media of the future will be as unrelated to current computer technology as a hard drive is to a magazine.

The speed at which these technological changes are occurring is consistent with a law known to computer mavens as Moore's Law, which states that chip density doubles every eighteen months.[2] If Moore's Law continues to hold, accounting history may be entering a new millennium, both chronologically and figuratively, as information becomes easier to obtain.

Of course, history is best studied in hindsight and historians are usually wise to write about events which occurred long ago. But the transformations occurring today in computer technology are history in the making. The nature of these innovations and the speed at which they are occurring would amaze anyone who like "Rip Van Wynkle" had just woken from a long sleep, as well as others who may have just taken a short nap.

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[2] D(log(t/c)) = (log2/18)dm, t = transistors, c = chips, m = time in months

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