BOOK VERSUS BYTE:
THE PROSPECTS AND DESIRABILITY OF A PAPERLESS SOCIETY
By Charles N. Faerber[*]

I. INTRODUCTION

> Print on paper is a little like democracy: the worst possible system except for all the others. Books are fragile, they are bulky, they are not easy to search through. . . .Yet printed volumes have endured half a millennium as readable as the day they came off the press, whereas digital data a mere 30 years old may have vanished past hope of retrieval.
>
> Paul Wallich (1998)[1]

There is an ominous traffic sign on the electronic superhighway to that much-ballyhooed paperless society. It reads: "Road Under Construction—Completion Date Unknown."

To be sure, the vaunted superhighway does extend, perfectly paved, for a good distance, as anyone who has ever made a paperless purchase on the Internet will attest, but the highway engineers have so far been stymied from reaching their digital Valhalla by practical hurdles.

And there is another hitch: many travelers do not want to get on the superhighway no matter how far it extends. They prefer unpaved horse-and-buggy thoroughfares that are slower but seem to be more secure. In other words, they prefer paper.

With today's technology, a society is attainable in which every transaction formerly entrusted to paper—from everyday purchases with

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[1] Paul Wallich, *Preserving the Word*, Sci. AM., Jan. 1998, at 110. Mr. Wallich's article is a review of the film *Into the Future: On the Preservation of Knowledge in the Electronic Age*. INTO THE FUTURE: ON THE PRESERVATION OF KNOWLEDGE IN THE ELECTRONIC AGE (Am. Film Found. 1997) (PBS television broadcast, Jan. 13, 1998).

pocket currency to real property conveyancing with grant deeds—would be performed and archived digitally. But is such a society desirable?

Many are terrified of an Orwellian linkage of databases allowing any individual to leave home *without* a wallet or purse but *with* a retinal pattern or other biometric identifier and then to perform any conceivable financial or documentary transaction. At what point is our obsession with convenience overridden by a concern for privacy?

There are numerous gaping chasms—more cultural and psychological than technical—to be spanned before the engineers of the electronic superhighway reach their paperless Camelot.

The "CyberNotary" provides a case in point. Conceived by the American Bar Association's Information Security Committee[2] as "A New U.S. Legal Specialization for Facilitating International Electronic Commerce,"[3] the CyberNotary's role "would be one in which technical and legal expertise were combined in a single specialization."[4] The CyberNotary was envisioned as an American notary with both a law degree and an expertise on digital signatures[5] who would be regarded as a professional equal by the attorney-like notarial officers of nations within the International Union of Latin Notariats ("IULN"). These foreign *notaires* and *notarios* have looked with reservation upon their ministerial American counterparts, concerned about their minimal qualifications and training. The CyberNotary, according to the Information Security Committee's blueprint, would interface as a peer with foreign notaries and would "to a very great degree, be a specialist in international transactions, whose bread and butter will be in the international milieu."[6]

So far, however, there exist no CyberNotaries, as envisioned by the ABA's Information Security Committee. To a great extent, the CyberNotary is a hypothetical office in search of a real-world purpose. In the arena of Electronic Data Interchange ("EDI"), the world still awaits clear and widespread agreement on the exact practical role of the CyberNotary. There would appear, for example, to be little need for the CyberNotary in the growing volume of electronic commerce regularly conducted between parties well known to each other. However, in certain one-time

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[2] MICHAEL S. BAUM, ELECTRONIC CONTRACTING, PUBLISHING, AND EDI LAW (1991). The Information Security Committee is chaired by, Mr. Baum, who also heads the Electronic Data Interchange and Information Technology Division within the ABA's Section of Science and Technology. The Information Security Committee was formed in the early 1990s to discuss and propose rules for electronic commerce.

[3] Theodore S. Barassi, *The CyberNotary: A New U.S. Legal Specialization for Facilitating International Electronic Commerce*, BULL. OF L., Sci. & TECH., April 1995, at 5-7.

[4] *Id*. at 5.

[5] *See* ABA Comm. on Information Security, Report of the CyberNotarial Group, (Nov. 9-11, 1994).

[6] *See* Barassi, *supra* note 3, at 6.

transactions involving transmission and authentication of documents between individuals who may never meet (e.g., conveyance of property between citizens of different nations), the CyberNotary may have a future role; indeed, one authority foresees that CyberNotaries will become important in a future era of electronic land registries.[7] Part of the reason that the CyberNotary remains a hypothetical rather than a real-world office may be that many foreign civil law notaries advocate proceeding cautiously when it comes to embracing "informatics,"[8] perhaps fearful that their roles will be marginalized in the current digital revolution— though the IULN leadership in recent years has been receptive to proposed adaptations of cutting-edge technology to notarial duties.

The ABA Committee's decision to link legal training—particularly, foreign civil law training—with EDI skills in the office of CyberNotary might seem arbitrary in needlessly excluding non-attorneys from electronic commerce. The Florida Legislature would seem to agree, since it decided in 1997 that EDI expertise and civil law knowledge were of little use when combined in a single officer, but that they were of potentially great use when each of the two skills was reposed in a separate officer. Thus, Florida two years ago enacted legislation to allow commissioning of two new kinds of notary:[9] a digital notary to perform "electronic notarizations"[10] using a private/public key pair, and a "Florida international

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[7] Telephone Interview with Joseph Alhadeff, Vice President of Electronic Commerce, U.S. Council for International Business, U.S. Chamber of Commerce (Dec. 1998).

[8] Luis Maria Gatti, Ph.D., The Authority to Attest Documents as a Means of Reinforcing Security in the Making of Contracts via Informatics (April 1998) (unpublished manuscript, on file with the Informatics and Judicial Security Committee of the International Union of Latin Notariats, Rosario, Argentina). Dr. Gatti sent the manuscript to colleague notaries and stated, "The Latin body of notaries believes there are areas in which informatics cannot replace its presence as a member of the legal community. . .Long live informatics!. . .[B]ut let's not allow the faintest excess of informatics." *Id*.

[9] H.R. 1413,15th Leg., 1st Reg. Sess. (Fla. 1997); S.R. 1754,15th Leg., 1st Reg. Sess. (Fla. 1997). The Florida statute provisions creating the two new notarial offices were enacted in 1997 through Committee Substitute for House Bill 1413 (Chapter 241) and Committee Substitute for Senate Bill 1754 (Chapter 278). *Id*.

[10] FLA. STAT. ch. 117.20 (1997). Provisions regarding "electronic notarization" state that, "electronic notarization shall include the words 'Notary Public - State of Florida,' the name of the notary public, exactly as commissioned, the date of expiration of the commission of the notary public, the commission number, and the notary's digital signature." *Id*. Neither a rubber stamp seal nor an impression-type seal is required for an electronic notarization. *Id*. To become an electronic notary, an applicant must already have been commissioned as a regular Florida notary and have had a private/public key pair certified by a certification authority; the Florida Secretary of State then would issue an amended commission to any qualifying applicant. *Id*. Electronic notaries must abide by all laws governing regular notaries, including that requiring each document signer to appear in person before the notary at the time of notarization. *Id*. Unlike other Florida notaries, however, the electronic notary must "keep a sequential journal of all acts performed"; it is ironic that the journal for the electronic notary, presumably, is *paper*, since it must contain each document executor's signature and, if it is "stolen, lost, misplaced, destroyed, or rendered unusable," must cause immediate written notification to be made to the state. *Id*.

notary"[11]1 to operate under civil law rules and interact as a professional equal with foreign notaries, by virtue of being a member of the Florida Bar. Florida thereby became the nation's first state[12] to authorize electronic notarizations; Utah in 1998[13] became the second. Neither state, however, has yet commissioned a single "electronic notary."[14]

The National Conference of Commissioners on Uniform State Laws ("NCCUSL") is currently wrestling with the practical problems of a societal transition from paper to electronic documents. Its drafting committee for a proposed Uniform Electronic Transactions Act ("UETA") issued a report on September 21, 1998, enumerating the difficulties.[15] One of

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[11] FLA. STAT. ch. 118.10 (1998). This legislation changed the title of the new office of "Florida international notary" to "civil-law notary." *Id*. To qualify for appointment by the Florida Secretary of State as a civil-law notary, an applicant must have been a member in good standing of the Florida Bar for at least five years. *Id*. The civil-law notary is authorized to issue "authentic acts," in the manner of foreign Latin notaries, but also has authority to perform the same acts as ordinary Florida notaries, including the power to solemnize the rites of matrimony. *Id*. The civil-law notary must maintain a protocol containing original documents. The Florida civil-law notary has global jurisdiction to take acknowledgments and proofs. *See* FLA. STAT. ch. 695.03 (1998). Not surprisingly, the roving authority of this new officer has already drawn criticism from notaries in IULN nations, who resent the invasion of their own jurisdictions. *Id*.

[12] Charles N. Faerber, *Electronic Notarization: Florida, Utah Lead the Way*, NAT'L NOTARY MAG., July 1998, at 20-21.

[13] UTAH CODE ANN. § 46-1-13(8) (1998). Through enactment of Senate Bill 107 in 1998, qualifying Utah notaries may now take acknowledgment of digital signatures:

> A notary acknowledgment on an electronic message or document is considered complete without the imprint of the notary's seal if: (a) the electronic message or document has been digitally signed pursuant to § 46-3-401 in the presence of a notary; (b) the notary has confirmed that the digital signature on the electronic message or document is verifiable by the public key listed in the certificate issued to the signer in accordance with § 46-3-403; (c) the notary electronically signs the acknowledgment with a digital signature pursuant to § 46-3-401; and (d) the following information appears electronically within the message digitally signed by the notary: (i) the notary's full name and commission number exactly as indicated on their commission; and (ii) the words 'notary public,' 'state of Utah,' and 'my commission expires on (date)'; and (iii) the address of the notary's business or residence exactly as indicated on their commission.

Id.

[14] Telephone Interview with Linda Adams, Notary Education Coordinator, Florida Governor's Notary Section (Oct. 21, 1998); Telephone Interview with Fran Fish, Notary Public Administrator, Utah Corporations and Commercial Code Division (Oct. 30, 1998). Adams and Fish indicated that practical operating rules for electronic notaries are still being developed and have yet to be promulgated. *Id*.

[15] NCCUSL, Report of the Task Force on State Law Exclusions (Sept. 21, 1998) (unpublished manuscript, on file with the Nat'l Conf. of Comm'rs on Unif. St. Laws, circulated for purposes of discussion only). The 30-page report suggested that "exclusions" would be documents exempted from the proposed Uniform Electronic Transactions Act due to insoluble difficulties in changing from a paper to an electronic format. *Id*.

the problems is the sheer volume of signed paper documents now required by state and federal statute. For example, in the first title alone of the Ohio statutes, 167 sections pose writing or signature requirements, with a total of over 8,200 such statutory provisions within the entire Ohio code.[16] Georgia's code has over 5,500 writing or signature requirements.[17]

The report speculates that the transition of certain document types from paper to digital may necessitate such upheaval of customary practice as to be more societally harmful than beneficial. It proposes, for example, that wills and codicils be excluded from the Uniform Electronic Transactions Act,[18] as well as sworn documents used in court filings[19] and, possibly, negotiable instruments.[20] Noting that the Canadian province of Ontario now does allow attorneys to make electronic filings of real estate deeds in the public registry,[21] the report still conditions inclusion of real estate documents in the UETA upon the devising of a reliable electronic equivalent to a notary's signed and sealed paper acknowledgment certificate.[22] The report urges proceeding cautiously in the real estate field when proposing any replacement of paper, pen, and ink with digital alternatives:

> The question of whether to include or exclude real estate transactions [in the proposed Uniform Electronic Transactions Act] has significant legal and practical consequences. The elimination of a writing requirement strikes to the heart of the traditional statute of frauds. It also has implications for the maintenance of real estate records by government record-keepers. Like the special formalities associated with the execution of wills, the execution formalities for real estate transactions are intended to promote deliberation and prevent fraud.[23]

A concern that state government may be moving too fast in embracing digital documents has inspired enactment of at least one piece of "backlash" legislation. At the request of county recorders, Minnesota legislators in 1998 approved a law requiring use of only original pen-and-ink signatures on any document conveying title to real property.[24] This

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[16] *Id*. at 6.

[17] *Id*.

[18] *Id*. at 11.

[19] *Id*. at 25.

[20] NCCUSL, Report on the Task Force on State Law Exclusions (Sept. 21, 1998).

[21] *Id*. at 13.

[22] *Id*. at 24.

[23] *Id*. at 13.

[24] *See Electronic Signings No Longer Okay for Real Estate*, NOTARY BULL., Aug. 1998, at 9. The legislation was Senate File 2031 (Chapter 262), effective Aug. 1, 1998. MINN. STAT. § 507.24(2) (1998). "Unless otherwise provided by law, an instrument affecting real estate that is to be recorded. . .must contain the original signatures of the parties who execute it and of the notary public or other officer taking an acknowledgment." *Id*.

followed passage in the previous year of legislation authorizing use of electronic signatures on official documents.[25] The author of Minnesota's 1998 bill, Senator Don Betzold, explained that county recorders felt the state was moving too fast with new technology.[26] "To be honest with you," he said, "real estate is an area where, if a mistake is made, it can cause real problems."[27] Senator Betzold ventured that it may take years for electronic signatures and documents to find full acceptance in business and government.[28]

Recidivism is the upshot for one electronic application that is proving to be a poor substitute for a traditional paper-based system: digital audio taping in courtrooms and legislatures. Prout points out that a digital taping system at the House of Commons in Ontario, Canada, installed in 1994, covers the main Legislative Assembly and 17 committee rooms, but requires 100 transcribing typists to handle up to 16 events simultaneously to produce 16 paper transcripts by 9:30 the next morning; by contrast, the Los Angeles Superior Court System employs 325 court reporters to cover 259 courtrooms, producing, if needed, 259 transcripts that very same day.[29] The problem with audio taping is that "no existing technology can effectively automate its indexing or convert speech to text."[30] Every word entered by a court reporter may be indexed through simple software, whereas indexing with audio tape is only possible if a "tape monitor" listens in and types what appears to be key words into a word-processing document.[31]

> After the courts' use of audio tape recorders caused dramatic increases in appellate backlogs and unexpected expenses, the state of New Mexico switched back to court reporters as a faster, more cost-effective method of providing transcripts. The federal court system located in Reno, Nevada, also returned to court reporters after extensive testing of tape recording systems. And even in courts that use tapes, court reporters are brought back in when the spotlight is on the record—most recently, for the DuPont murder trial and the Oklahoma City bombing trial. The U.S. Judicial Conference, American Judges Association, Justice Research Institute, multiple bar associations and other judicial groups have studied tapes and agree: court reporters are faster, cheaper and more accurate than any other method of taking down court

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[25] *Id.*

[26] *Id.*

[27] *Id.*

[28] *Id.*

[29] John J. Prout, Jr., Digital Audio, *Without the Written Word: A Step Backward for the Courts?*, IND. LAW., Jan. 21, 1998, at 7. Mr. Prout is president of the National Court Reporters Association, whose 35,000 members include captioners and official and freelance court reporters throughout the world. *Id.*

[30] *Id.*

[31] *Id.*

proceedings.[32]

Of course, it should not be ignored that American court reporters universally use computers to produce a readable paper transcript. Only a luddite or a fool would deny the advantages of the computer nor the inevitability of its inroad into every corner of modern life. Still, it is possible to proceed too hastily and thoughtlessly in "digitizing" the practices of commerce and law—and in discarding customs whose utility is subtle.

Too much of the engineering for the electronic superhighway has involved the metaphoric imposition of an unswerving, unchanging stretch of concrete on a blasted countryside, rather than the integrating of a road of varying width and composition into the folds and switchbacks of a rich and complex cultural landscape.

Specifically, the engineers have shown too little regard for three unmistakable features of that landscape: (1) the surprising durability of paper; (2) the fragility of hardware and non-paper media; and (3) the ephemerality of electronic systems.

II. PAPER VERSUS DISK

A. PULP FICTIONS EXPOSED: THE SURPRISING DURABILITY OF PAPER

> People just don't realize that if paper is properly cared for, it is more permanent than marble statues.
>
> Wallace E. Dawes[33]

Amid the crumpled metal at aircraft disaster sites and the tumbled bricks at earthquake ground zeroes, rescue workers are sometimes struck by the astounding survivability of paper. Every mechanical and electronic device may be shattered and useless, but paper files and books often live on to continue performing their function of conveying precious information from one human to the next.

Even the ravages of time may not totally impair paper's ability to transmit human thought. At an ancient oasis in Egypt's western desert, for example, archaeologists today are piecing together papyrus fragments from 1,700-year-old books and scrolls to reconstruct the writings of the founder of the Manichaean faith.[34] And there are almost perfectly preserved Egyptian papyrus writings from the pre-Christian era that are twice as old.[35] The papyrus writing material that would one day lend

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[32] *Id.*

[33] Wallace E. Dawes, *Historian and Purveyor of Fine Paper*, L.A. TIMES, Sept. 29, 1998, at A21.

[34] Mariam Sami, *Illuminating an Ancient Emissary of Light*, LA. TIMES, Oct. 4,1998, at A36.

[35] The Louvre's famous statue of the seated Egyptian scribe — perhaps also history's first representation of a notary, albeit *de facto* — reminds us of the importance of papyrus writings in the governmental administration of the pharaohs.

modern paper its name was produced by the ancient Egyptians by pressing together wet layers of the Nile sedge.[36]

Humans had been searching for the perfect transportable surface on which to record ideas ever since the Cro-magnons began painting bison on cave walls.[37] The Chinese carved on bone, the Greeks wrote on parchment made from animal skin, and the Maya painted on beaten mulberry bark.[38] Other ancient media included clay, metal, ivory, wood and cloth.[39] Virtually every source attributes the invention of what is today known as paper to the Chinese eunuch Ts'ai Lun,[40] who created the thin substance from hemp, tree bark, rags and fishnets in 105 A.D.[41] Contemporary papermakers still use the same basic recipe—water and cellulose.[42]

After the Arabs learned the secret of papermaking from Chinese prisoners of war in the 8th century,[43] the Moors introduced paper to Europe in the 12th.[44] This set the stage for "the first information revolution,"[45] which began around 1450 when Johannes Gutenberg printed his landmark Bible.[46] Martin Luther hailed printing as "God's highest and extremes! (sic) act of grace," reasoning that if every man could own a Bible, there would be no need for priests to interpret God's word.[47]

In the five and a half centuries since Gutenberg's Bible, paper and its hybrids have become indispensable to modern life, and not just as a communications and archiving medium. Paper has a dizzying diversity of uses, from packaging pizzas to providing a surface for artists' prints to absorbing kitchen spills. "As an industrial commodity paper ranks among giants such as petroleum and steel."[48] The advent of economical photocopying fueled the consumption of paper, and, in 1989, 600 billion

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[36] *See* Jon R. Luoma, *The Magic of Paper*, NAT'L GEOGRAPHIC, Mar. 1997, at 88-109.

[37] *Id*. at 98.

[38] *Id*.

[39] *See* Dirk J. Stratton, *Down the Paper Trail*, ALDUS MAG., Jan./Feb. 1992, at 80.

[40] *Id*.

[41] *See* Luoma, *supra* note 36, at 98. Legend has it that Ts'ai Lun was searching for a more practical writing material than bamboo strips or the more costly silk. *Id*. Some scholars attribute the fact that the Chinese language is written vertically rather than horizontally to the ancient vertical limitations imposed by bamboo strips. *See* Rebecca Bailey, *The Mystery of the Tao*, DARTMOUTH ALUM. MAG., Nov. 1998, at 45.

[42] Luoma, *supra* note 36, at 95. "Paper forms when atoms in the fibers bond with those in the water molecules. As the water is drained through a screen, the water molecules tug at the fibers with a force that enmeshes them so tightly new bonds form between the fibers to create a solid surface." *Id*.

[43] *See* Stratton, *supra* note 39.

[44] *Id*.

[45] *See* Luoma, *supra* note 36, at 98.

[46] *See* Stratton, *supra* note 39.

[47] *See* Luoma, *supra* note 36, at 94.

[48] *Id*. at 95.

photocopies were produced worldwide, 350 billion of which were generated by American businesses.[49]

Early predictions about computers displacing paper have wildly missed the mark; paper consumption is soaring to new heights, with each American in 1995 using an average of 731 pounds of paper,[50] up from an average of 669 pounds in 1989.[51]

Unpredictably, computer word processors that have removed much of the tedium from the act of writing by simplifying textual changes have also encouraged countless printouts of text that eat up paper like never before. In the typewriter age, a new manuscript incorporating an author's revised text might take weeks to produce and proofread; today it takes minutes. Thus, in decades past, writers penciled most of their emendations in a margin or between typed lines. The fact that most modern authors make their revisions on disk by deleting displeasing words into oblivion rather than crossing them out by hand has been a loss to literary scholarship—as attested by the researcher who sought out the original manuscript of Charles Jackson's noted 1946 novel, *The Lost Weekend*:

> The original typing read "*The Long Weekend*," but a pencil point had slashed through "Long" and above was written "*Lost*."... This inspired self-edit—"*Lost*"—would have been lost itself, altogether, if Jackson had been writing his novel on, say, a Mac in this Age of the Computer. That is the tiny miracle of preservation that all bibliophiles love, now so rapidly disappearing in the virtual dust of the Information Highway. These old-style, scratched in emendations are precious: the author's revisions made visible, revelatory of the very act of writing, and hence, small witnesses to the creation of literature.[52]

Ironically, the numberless, unpenciled, undistinguished printouts of the word processor are less likely to be preserved than the fewer, eccentrically emended manuscripts of the typewriter. The loss to historians and scholars is immeasurable.

Paper provides a textured and tangible history of our personal lives and accomplishments. The birth certificate, the report card, the college diploma, the marriage license, the combat decoration, the stock certificate, the retired mortgage and, ultimately, the death certificate, chronicle our lives. Who among us has not proudly framed a paper tribute to some significant personal rite of passage and proceeded to hang it on the wall? But who would frame and hang a floppy disk?

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[49] *See* Stratton, *supra* note 39.

[50] *See* Luoma, *supra* note 36, at 100.

[51] *See* Stratton, *supra* note 39.

[52] Brock Brower, *Lost in the Treasure Room*, DARTMOUTH ALUM. MAG., Oct. 1998, at 44.

The physical immediacy of paper—its touch and smell—are reassuring proof of our existence and of our past. By contrast, what physical comfort is there in the flicker of an electronic document on a computer screen, especially when its image is alterable only by the initiated and its very existence subject to the vagaries of electricity? In the contest between photon-illumined screen and ink-limned page, the page retains its subtle charms. Why, for example, does an afternoon's reading of a handheld book leave many people refreshed and fulfilled, when the same time spent viewing television would leave them unsatisfied and dispirited? The answer, likely, involves more than just the uninspiring content of most television programs. It might even be argued that part of the appeal of the TV remote channel selector is that, like a book, it provides something for the viewer to hold and manipulate while controlling the flow of information.

Of course, paper is a far from perfect or permanent medium. Extremes of heat[53] and moisture may take their toll. And while stacked sheets of paper may have the strength to withstand significant shearing and impaling forces, a single unprotected, unattached sheet of paper is a delicate object, subject to the slightest breeze.

Time may be paper's most dangerous enemy, since there are few defenses against its most insidious weapon: acid. Acid can cause paper slowly to turn to dust.[54] Ironically, the acid-free purity and strength of the materials used in early papermaking—hemp and linen rags—allow many books printed in the 15th and 16th centuries to look today as if they just came off the press.[55] Not so with many books printed in the 19th and early 20th centuries, when increased demand caused papermakers to turn to tree fiber for their raw material, since it was cheaper and more abundant than rags.[56]

> . . .Unlike cotton, which is almost pure cellulose, tree fibers are cemented together with a natural substance called lignin, which eventually oxidizes and turns the paper brown. An acid sizing added to the paper made the problem worse. Over time, the paper turned as brittle as a dead leaf. In the U.S. today the majority of the books published are printed on non-acidic paper to better preserve them, but what about most of the books published since 1900? Conservators rescue some damaged pages by bathing them in solutions that neutralize the acids. But the Library of Congress, which houses 20 million volumes, has only a handful of conservators to save its treasures. It is also scrambling to

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[53] Ray Bradbury, FAHRENHEIT 451 (1953). The title of Ray Bradbury's ominous 1953 novel memorializes the temperature at which book pages will burst into flame. *Id*.

[54] *See* Luoma, *supra* note 36, at 99.

[55] *Id*. However, there is one drawback to rag paper: silverfish and bookworms much prefer to eat paper made from fabric than from wood pulp. *See* Eugene L. Meyer, *Old News Is Good News*, SMITHSONIAN, Nov. 1998, at 138-146.

[56] *Id*.

store its collection on microfilm or in computerized form, but with the books decaying at an alarming rate, it expects to record only a fraction.[57]

Computer technology coming to the rescue of paper is not a usual scenario in the daily functioning of American commerce and law. The reverse is far more common: paper rescues the computer by providing a replacement backup for digital data lost in a "crash." Much of the valued content of the world's computer memory is duplicated on paper. If the pioneers of the digital revolution foresaw a computerized society weaning itself away from paper, they were mistaken. Computers have helped boost paper consumption to new heights.[58] The countless paper printouts of proliferating PCs and Macs are part of an immense, worldwide shadow archive that may in time dwarf the globe's libraries.

Why the need for such a parallel archive?

The answer in part lies in the physical fragility of digital "hardware" and of disks, magnetic tapes, and other non-paper media that are "read" not by the human eye, but by an electronic device.

B. THE FRAGILITY OF HARDWARE AND NON-PAPER MEDIA

> Ernest Hemingway read notes onto acid tapes that are now 40 to 50 years old. Today you can't even move the tape. If it isn't human readable, you run the risk it's just a piece of junk.
> Dr. Richard Bradshaw (1998).[59]

The theoretical advantages of the elimination of paper in business, law and academia are seductive. One of the foremost is the reduction of storage space now devoted to books and paper files. The *Encyclopedia Britannica*, for example, produces a slender CD-ROM incorporating 72,000 articles and 50 million words;[60] on an average computer hard drive, each square inch of drive can store the equivalent of 200,000 double-spaced, single-sided sheets of paper.[61] "Digital storage is already so compact and cheap it is essentially free."[62] Closen and Richards also

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[57] *Id*. at 99-100.

[58] *See* Luoma, *supra* note 36, at 100. *See* also Stratton, *supra* note 37.

[59] Telephone Interview with Dr. Richard Bradshaw, Senior Technical Staff Member, Removable Media Storage System Solutions, IBM, Tucson, Arizona, conducted by David S. Thun, Assoc. Editor, Nat'l Notary Ass'n (Oct. 1998).

[60] Lawrence J. Magid, *PC Focus: Exploring Some of the Best Bets in Today's Cyber Encyclopedias*, L.A. TIMES, Oct. 19, 1998, at C3.

[61] Telephone Interview with Sue Burke, Market Research Manager, Western Digital Corp., Irvine, California, conducted by David S. Thuri, Assoc. Editor, Nat'l Notary Ass'n (Oct. 1998).

[62] Stewart Brand, *Written on the Wind*, CIVILIZATION, Oct./Nov. 1998, at 70. *See also* Michael Lesk, *Going Digital*, Sci. AM., Mar. 1997, at 58-60.

> The . . . advantage of electronic copies is that they occupy millimeters of space on a magnetic disk rather than meters on a shelf. Expanding library buildings is in-

envision a reduction in the following:

> the collateral materials and equipment necessary for the effective use of paper documents (including everything from notebooks and staplers to photocopy and fax machines). Almost every one of the processes takes less time as computers handle functions formerly done by hand. All of this, in turn, reduces the administrative overhead required to complete paper documents, and achieves significant savings.[63]

However, if the *bulk* of books and paper files is to be taken into account in any cost-benefit analysis, so must the *fragility* of digital electronic equipment and appurtenances. Paper may be a less efficient medium for storing and transmitting information, but it is durable and survives considerable abuse. In moving office equipment, for example, a cardboard box of books and manila files may be dropped, tossed, and otherwise manhandled with no ill effect, while similar treatment of computer gear might result in thousands of dollars in damage and irreparable loss of precious data.

But it is not dropping and manhandling that comprise the greatest threat to disks, tapes, and other electronic media. It is the touch of a finger, a scratch from a pen point, a drop of fluid, or the sudden application of heat that can ruin a disk or tape's usefulness as a repository and transmitter of data. Internal hard drives enjoy a measure of protection,[64] but disks or tapes that are inserted into computers are vulnerable.

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[63]creasingly costly. The University of California at Berkeley recently spent $46 million on an underground addition to house 1.5 million books — an average cost of $30 per volume. The price of disk storage, in contrast, has fallen to about $2 per 300-page publication and continues to drop.
Id.
Michael L. Closen & R. Jason Richards, *Notaries — Lost in Cyberspace, or Key Business Professionals of the Future?*, 15 J. MARSHALL J. COMPUTER & INFO. L. 730 (1997) (citing *Florida Recognizes Electronic Signatures as Legal and Binding*, SUN-SENTINEL, June 4, 1996, at 3D; Victoria Slind-Flor, *Moving Into Cyberspace as Notaries, the Need to Authenticate Electronic Documents Is a New Frontier for Attorneys*, 18 NAT'L L.J. 16 (1995)).
[64] Telephone Interview with Sue Burke, *supra* note 61. Whether a computer hard drive installed in a Central Processing Unit ("CPU"), essentially the main body of a computer, is on or off is a significant factor in its resistance to damage. *Id*. If the drive is off, the chance of damage to a computer falling from a four-foot desk is low, but the chance of damage is significantly higher if the drive is on and running. *Id*. Burke's colleague, Michael Millard, said that most operating hard drives can withstand a shock of 2G to 10G for 11 milliseconds, while non-operating hard drives can take 75G for 2 milliseconds. Telephone Interview with Michael Millard, Market Research Analyst, Western Digital Corp. (a hard drive manufacturer), Irvine, California, conducted by David S. Thun, Assoc. Editor, Nat'1 Notary Ass'n (Oct. 1998). "Most drives are tested for higher stresses, but 75 is a safe number. I don't know the reason drives are tested for different times when operating or not operating." *Id*. Millard said that typical testing for a hard drive includes dropping it 36 to 48 inches in padding to simulate various states of installation in a computer. *Id*.

Eastman Kodak Company lists six ways to "ruin" one of its compact disks (CDs):[65]

> (1) Write on it with a pencil or ball point pen. (2) Expose it to sunlight. (3) Peel a label from it. (4) Apply solvents to it. (5) Expose it to dust and dirt. (6) Handle its surface. Don't eat, drink, or smoke around CDs. The worst handling stresses for a CD are caused by severe flexing or application of a sharp point to the top surface. These actions deform the substrate, wiping out pits and causing areas of the disc to become unreadable. . . .This can happen to both CD-ROMs (read-only disks) and CD-Rs (recordable disks), but the danger is more acute for CD-Rs.[66]

None of the above "abuses," of course, would render a piece of paper unreadable.

Because of their fragility, the repair and preservation of CDs, CD-Rs and CD-ROMs have become a minor industry in itself. Memorex®, for example, now offers a "CD Scratch Repair Kit."[67] (The world still awaits the first "Paper Scratch Repair Kit").

Perhaps the most insidious threat to computer disks—both external and internal—comes not from the inevitable scratches and bumps but from environmental heat and moisture. The cooler and drier the surroundings, the longer a disk will remain usable.[68] Temperature changes of more than 15 degrees Celsius per hour can cause warping and distortion of a CD.[69] Kodak promises that 95 percent of its CD-Rs will have a usefulness of more than 200 years if stored in the dark at 25 degrees Celsius (77 degrees Fahrenheit) at 40 percent relative humidity—i.e., "archival conditions."[70] "Stored in an office or home environment, the

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[65] EASTMAN KODAK Co., PERMANENCE, CARE, AND HANDLING OF CDs, KODAK DIGITAL TECH. REP. 9, 9-10 (1998).

[66] *Id.* (pondering the thought of the bibulous literary lions of the pre-computer age refraining from drink or smoke out of fear of damaging their paper is a humorous one).

[67] MEMTEK PRODUCTS, INC., NEWS AND INFORMATION RELEASE (Oct. 1998). Memtek released the following statement about its CD Scratch Repair Kit:
> What good is all that state-of-the-art computer equipment when a frequently used CD-ROM gets scratched or nicked, or when that equipment inevitably gets dirty? Without the proper cleaning and maintenance products, performance and durability ultimately suffer. Memorex is introducing a full line of cleaning and maintenance tools, led by the CD Scratch Repair Kit. The kit includes non-abrasive, non-toxic, anti-static solutions and wipes that allow users to easily touch up the minor nicks and the deep scratches that can cause a CD to skip. Memorex also offers a full line of related products including: laser printer cleaning sheets, fax cleaning sheets, multi-purpose cleaning wipes and mouse and notebook cleaning kits.

[68] *See* EASTMAN KODAK Co., *supra* note 65, at 10.

[69] Telephone Interview with Cheryl Bianchi, Category Manager, Storage Business, Eastman Kodak Co., Digital and Applied Imaging, conducted by David S. Thun, Assoc. Editor, Nat'l Notary Ass'n (Oct. 1998).

[70] *See* EASTMAN KODAK Co., *supra* note 65, at 2. An additional report released by Kodak states: "Under controlled conditions, our best estimate of the data life of these products is 217 years, which provides room to incorporate reasonable differences of opinion as to

lifetime should be 100 years or more."[71]

All CD manufacturers strongly recommend that their disks be maintained in protective containers. Yet not all disk containers are created equal. Kodak warns that "cheap plastic sleeves," as are used sometimes to hold CDs in the back of books or in some types of multiple CD holders, are not suitable for long-term storage; temperature and humidity extremes may cause the disk and sleeve to adhere to each other, and the "shear forces generated upon forced removal of a disc in such circumstances can lead to delamination."[72] Regarding disk containers and storage, Kodak recommends:

> The acrylic "jewel cases" provided by many manufacturers and distributors are good protection against scratches, dust, light, and rapid humidity changes. If the manufacturer provides a spacer card or other material as part of the jewel case package, it should be retained. Protect individually cased CDs further by placing them in a closed box, drawer or cabinet. This gives additional protection from light, dust, and climate fluctuations. It is always a good idea to handle the CDs themselves only when they are being used. Never allow them to remain out of their enclosures for long periods of time. Always handle disks by their edges.[73]

Ensconced in their own permanent "containers," internal disk hard drives are afforded a measure of protection from the dust, light, moisture and incidental nicks and scratches that afflict external disks. Because the dust seals that protect them are susceptible to pressure, most hard drives are rated to go as high as 30,000 feet so they can be safely transported by airplane.[74] Western Digital Corporation marketers claimed that a hard drive can be stored in temperatures ranging from -40 to 60 degrees Celsius without damage, and, when operating, from 5 to 55 degrees;[75] and that SCSI hard drives (used for networks and large systems) have a mean time of 1 million hours (114 years) before suffering irrecoverable data failure, though most have a five-year guarantee, and desktop drives a mean time of 300,000 hours (34 years) before failing.[76] Many desktop owners might care to challenge the latter figure.

Dr. Bradshaw said the degradation of digitally stored data due to other than accidents has not proven to be a major problem.[77] He claimed that today's storage media are much more resistant to erasure by mag-

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[71]what constitutes 'normal storage conditions.'" EASTMAN KODAK Co., LIFETIME OF KODAK DIGITAL SCIENCE CD-R AND PHOTO CD MEDIA, KODAK DIGITAL TECH. REP. 5 (1998).
  Id.
[72] *Id*. at 9.
[73] *Id*.
[74] Telephone Interview with Michael Millard, *supra* note 64.
[75] Telephone Interview with Sue Burke, *supra* note 61.
[76] Telephone Interview with Michael Millard, *supra* note 64.
[77] Telephone Interview with Dr. Richard Bradshaw, *supra* note 59.

netic fields than old systems such as the 5-1/4-inch disk drives.[78] He pointed out that a 1994 report from the National Media Lab, written by Dr. John Van Bogart, showed no significant failures in a variety of magnetic tapes (audio, video, and data cassette) that were subjected to aging simulations equivalent to 5 to 25 years at room temperature.[79] The National Aeronautics and Space Administration's ("NASA") ill-fated 1986 *Challenger* explosion provided an extreme example of the durability of electronic storage systems: although *Challenger*'s tapes were damaged in the explosion and immersed in sea water for six weeks, a team at IBM was able to recover a large portion of the data by washing the tapes in chemical mixes.[80]

Still, not all authorities paint as bright a picture of the durability of electronic media:

> Magnetic media, such as disks and tape, lose their integrity in 5 to 10 years. Optically etched media, such as CD-ROMs, if used only once, last 5 to 15 years before they degrade. And digital files do not degrade gracefully like analog audio tapes. When they fail, they fail utterly.[81]

A seldom mentioned but great vulnerability of all electronic equipment is its dependence on electricity—a notoriously fickle force. Both a sudden surge or loss of current can be devastating to delicate electronic systems. Surge protectors guard most computers against the obliterating effect of lightning strikes. However, the sudden deprivation of current can be a more challenging problem. "Everything is powered by electric current. If electricity went bye-bye, we would be in serious trouble."[82] Do serious electrical outages happen very often? Often enough, particularly in Third World nations with rickety infrastructures:

> Thousands of university applicants in Uganda were left in limbo after rats chewed through computer cables at the National Examination Board and crashed the computer system. . . . Earlier this year, rats gobbled up telecommunications wires in the African country, cutting off phone links to parts of western Uganda and Rwanda. And just last week. . .reams of vital computerized court evidence had been lost because of rats chewing up computer cables.[83]

Worldwide, a larger threat to computers comes from human "rats"— hackers. One of the computer's greatest capabilities—global access through telephone modem—is also one of its greatest vulnerabilities. "Computer systems are very accessible. The New York Times Web site

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[78] Telephone Interview with Dr. Richard Bradshaw, *supra* note 59.
[79] JOHN W.C. VAN BOGART, PH.D., MEDIA STABILITY STUDIES FINAL REPORT, Nat'1 Media Lab Tech. Rep. (July 1994).
[80] C.H. Kalthoff, et al., *Magnetic Tape Recovery and Rerecording of Data*, 61 J. APPL. PHYS. 8 (1987).
[81] Brand, *supra* note 60, at 72.
[82] Telephone Interview with Dr. Richard Bradshaw, *supra* note 59.
[83] *Wide World of Weird*, L.A. TIMES, Oct. 16, 1998, at E2.

was recently hacked. Had they been a little more malicious, they could have changed. . .words in copy for publication and no one would have noticed."[84] Proffit said that many types of software are shipped with default passwords or access codes that owners forget to change once the software is installed; many hackers have access to these passwords.[85] A growing problem Proffit mentioned is disgruntled ex-employees with knowledge of how to access company records; there have been recent cases of former workers going into company computer records and destroying vital files such as payroll data.[86]

Yet, perhaps none of the above threats to the security or physical integrity of electronic data storage systems is as confounding or potentially catastrophic as archivists' inability to access digital records only 5 to 10 years old because of a technology that is "constantly self obsolescing."[87]

C. The Ephemerality of Electronic Systems: A Case of "Galloping Obsolescence"[88]

> It is only slightly facetious to say that digital information lasts forever—or five years, whichever comes first.
>
> Jeff Rothenberg (1995)[89]

One of the major advantages of electronic media is its facility in reducing the likelihood of data loss through accidents or natural disasters by storing data at different remote locations, instantly and simultaneously.[90]

An offsetting disadvantage, however, is the fact that the likelihood of data at any location being accessible and readable reduces with each passing day. If a decade passes before retrieval of digital data is attempted, it may be a bit like trying to find the burial chamber under a pyramid and then to translate the hieroglyphics on its walls.

> [P]eople discover that they cannot revisit their own word-processor files or computerized financial records from ten years before. It turns out that what was so carefully stored was written with a now-obsolete application, in a now-obsolete operating system, on a long-vanished make of computer, using a now-antique storage medium (where do you find a

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[84] Telephone Interview with Phil Proffit, Analyst, Broadcast Network International (a computer consulting firm), La Crescenta, California, conducted by David S. Thun, Assoc. Editor, Nat'l Notary Ass'n (Oct. 1998).
[85] *Id.*
[86] *Id.*
[87] Brand, *supra* note 62, at 70.
[88] Wallich, *supra* note 1.
[89] Jeff Rothenberg, *Ensuring the Longevity of Digital Documents*, SCI. AM., Jan. 1995, at 42-47.
[90] Telephone Interview with Dr. Richard Bradshaw, *supra* note 59.

drive for a 5-1/4-inch floppy disk?).[91]

Electronic hardware and software are obsolescing at an accelerating pace. Millard estimated that approximately every 12 months a new drive comes out that doubles the capacity of previous hardware.[92] He said that most computer users find it necessary to upgrade every three years.[93] The problems arise after several upgrades.

> If your data is stored in straight ASCII text format, then you stand an excellent chance of being able to access it with future applications. If the data is stored in a proprietary format, however, such as a database or word processing format, then you cannot count on future versions of the program being able to read the data—or even on an operating system being able to access the information. How would you handle a Magic Pencil file on a SuperBrain CP/M floppy disk, for example?[94]

One authority is collecting a "roll call" of once-honored but now out of date personal computer names: Altair, Amiga, Amstrad, Apples I, II and III, Apple Lisa, Apricot, Atari, AT&T, Commodore, CompuPro, Cromemco, Epson, Franklin, Grid, IBM PCjr, IBM XT, Kaypro, Morrow, NEC PC-8081, NorthStar, Osborne, Sinclair, Tandy, Wang, Xerox Star, Yamaha CX5M.[95] "Buried with them are whole clans of programming languages, operating systems, storage formats, and countless rotting applications in an infinite variety of mutually incompatible versions. Everything written on them was written on the wind, leaving not a trace."[96]

Brand noted that while we have "good raw data from previous ages written on clay, on stone, on parchment and paper," information from the 1950s onward increasingly falls into a digital black hole.[97] "Historians will consider this a dark age .... Science historians can read Galileo's technical correspondence from the 1590s but not Marvin Minsky's from the 1960s."[98]

Is there a solution in sight to allow future generations to access and read our current chaos of incompatible, obsolescing digital media?

The American free enterprise system makes it unimaginable that the solution would ever be nationwide agreement to use just one operating system or just one storage medium—visualize the VHS-Beta debate

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[91] Brand, *supra* note 62.
[92] Telephone Interview with Michael Millard, *supra* note 64.
[93] *Id*.
[94] Alfred Poor, PC MAG., Apr. 21, 1998.
[95] Brand, *supra* note 62, at 72 (referring to the list of obsolete personal computers compiled by science fiction writer Bruce Sterling).
[96] *Id*.
[97] Brand, *supra* note 62, at 72.
[98] *Id*. Brand quotes science fiction writer Bruce Sterling in referring to our time as "the Golden Age of dead media, most of them with the working life span of a pack of Twinkles." *Id*.

to the Nth power.[99] A measure of totalitarianism or a touch of monopoly,[100] of course, might impose some order on the digital chaos, but we are not living in Iraq.[101]

Part of the solution is to engineer hardware with more "backward compatibility," the quality allowing DVD drives to read CDs.[102] "Sideways compatibility," however, allowing one idiosyncratic digital system to read another, remains a pipe dream. Maintaining vintage hardware to read vintage media often will be the only option.[103]

Bradshaw asserts that the solution to galloping obsolescence is for organizations storing information on electronic media to copy the data on new storage formats every few years.[104] Bradshaw predicts that "automatic archiving systems" will be developed to transfer stored data to new systems as soon as they are installed.[105]

Brand argues that only by recording digital data on a physically permanent medium, "such as silicon disks microetched by Norsam Technologies in New Mexico," will it be kept perpetually accessible.[106]

Kodak was less specific about a solution:

> The principal fact of life for all digital storage media is the rapid obsolescence of hardware and software. Users of CD technology should be reassured by the long physical life of CDs, but they must not lose sight of the need to maintain a viable path for migration of data to new hardware and software platforms. Digital storage media impose a strict discipline that human-readable records do not: their rapid evolution creates a continual progression of technology that cannot safely be ignored for too long.[107]

Paper printouts of stored digital data, in the eyes of many experts, comprise the only present guarantee of readability by future generations. A professor of history who has been using computers for 20 years and has "multiple generations of disks gathering dust now that, for all practical purposes, are unreadable," recommended printing out valuable

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[99] Telephone Interview with Dr. Richard Bradshaw, *supra* note 59.

[100] U.S. v. Microsoft Corp., 159 F.R.D. 318 (D.D.C. 1995), *rev'd* 56 F.3d 1448 (D.C. Cir. 1995), *remanded*, 1995 WL 505998 (D.D.C. 1995). The legal dangers of attempting to impose one system on the digital world is amply shown in the U.S. Justice Department's lawsuit against Microsoft and its chairman Bill Gates over the firm's alleged violations of antitrust laws in marketing Windows '98. *Id*.

[101] Under a totalitarian or monopolistic system, needless to say, engineering and entrepreneurial ingenuity would not have been given free rein and countless technical accomplishments of today's digital world would not have been achieved.

[102] Poor, *supra* note 94.

[103] *Id*.

[104] Telephone Interview with Dr. Richard Bradshaw, *supra* note 59.

[105] *Id*.

[106] Brand, *supra* note 62, at 72.

[107] EASTMAN KODAK Co., *supra* note 65, at 12.

data "on 100% cotton or linen rag buffered paper with a neutral pH, and [store] in a nondestructive archival folder in a dark, safe place, like a safety deposit vault."[108]

> In the final analysis, you may want to create a parallel archive on old-fashioned paper. This will give you the opportunity to recover the data if your machine-readable solutions should fail, and you'll be able to use OCR [optical character recognition] to scan and reenter the data in a future system, if necessary. This might be a cheap insurance policy for protecting the data over long periods of time.[109]

The crux of the digital storage problem may be that "[c]ommercial software is almost always written in enormous haste at ever-accelerating market velocity."[110] Such haste is perhaps mainly responsible for the Year 2000 ("Y2K") problem that private companies and government agencies have been wrestling with for the past several years to prevent their computers from reading "00" as "1900" instead of "2000" A.D. and throwing their organizations' time-sensitive operations out of whack.

As the digital world prepares for the unknowns of Y2K, paper again is proving to be an indispensable backup. "There's going to be a huge demand for better records," said William Ulrich, president of the information technology planning company Tactical Strategy Group, Inc., and the author of *The Year 2000 Software Systems Crisis: Challenge of the Century*.[111] "As people feel the deadline getting closer, they are going to demand that [computer] companies provide more information. Problems with electronic documents in terms of authenticity and reliability may generate a higher need for paper."[112]

Mistrust of electronic records has resulted in computer companies being pressured by many customers to produce hard copy statements in dictating whether or not their products will be affected by the Year 2000

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[108] Dennis Grafflin, *Dear Abby: Sharing Grandpa's Written Legacy of Love*, L.A. TIMES, Sept 23 1998, at E3. Mr. Dennis Grafflin is Professor of History at Bates College, Lewis ton Maine. *Id*. Professor Grafflin responded to a letter previously printed in Dear Abby's column about a deceased grandfather who had left a letter on a computer disk for his two year-old granddaughter to read:
> There is a genuine tragedy awaiting [anyone] who thinks that storing precious family information on a computer disk is the perfect high-tech solution to the problem of combining preservation and privacy. By the time her 2-year-old daughter is old enough to care about her grandfather's autobiography, no one outside a couple of computer museums will be able to retrieve it from the disk — if she s incredibly lucky.

[109] Poor, *supra* note 94.

[110] Brand, *supra* note 62, at 72.

[111] Telephone Interview with William Ulrich, President, Tactical Strategy Group, Inc., (information technology planning company), conducted by David S. Thun, Assoc. Editor, Nat'l Notary Ass'n (Nov. 1998). *See also* WILLIAM M. ULRICH & IAN S. HAYES, THE YEAR 2000 SOFTWARE SYSTEMS CRISIS: CHALLENGE OF THE CENTURY (1997).

[112] Telephone Interview with William Ulrich, *supra* note 111.

problem.[113] "People are trying to keep paper trails of Year 2000 compliance. A lot of manufacturers said that they've had overwhelming re quests for paper."[114]

 Shortsightedness on the part of software designers is not the sole cause of electronic snafus. Very often important digital records are lost because of the computer user's error. "Human error is a bigger factor than people realize," said Proffit.[115]

> One client deleted 15 years of work without realizing it . . . Backing up is the most commonly used solution for dealing with lost information, but 60 to 80 percent of backups fail. Many people do not test their back-ups to see if they were successful. They just shove the backup somewhere. They may find out five years later that it didn't work.[116]

Proffit pointed out that if information is inadvertently deleted from a computer disk, there is an 80 to 90 percent chance of recovering it, if it is not overwritten: "The data is not yet lost. But if the data is overwritten, it is phenomenally difficult to recover."[117]

Sometimes software designers purposely create digital storage systems that delete their own data. An attorney may spend $1,900 for a CD-ROM on admiralty law, for example, and find that the disk will "expire"—that is, become unreadable—unless a renewal fee is paid for an updated disk before a certain date.[118] Some electronic publishers regard their CD-ROMs merely as licenses to use the contained information for a set period of time.[119] Many purchasers, however, resent such arrangements and feel they have lost something they bought and paid for.[120] One attorney compared CD-ROMs containing legal data to a loose leaf binder service and complained, "If I don't buy [the loose leaf updates] do you have somebody stop by my office and pick up all my books?"[121]

Use of any proprietary or copyrighted information on electronic media is problematic because of the ease and speed with which the data can be copied and transmitted. In converting their books to digital, most libraries have so far dodged the potential expense[122] of obtaining copy

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[113] Telephone Interview with Doug McCloskey, Dir. of Research, Infoliant, (Y2K information database co.), conducted by David S. Thun, Assoc. Editor, Nat'l Notary Ass'n (Nov. 1998).
[114] *Id.*
[115] Telephone Interview with Phil Proffit, *supra* note 84.
[116] *Id.*
[117] *Id.*
[118] Michael Higgins, *Disappearing Data*, ABA J., Aug. 1998, at 30.
[119] *Id.*
[120] *Id.*
[121] *Id.*
[122] Lesk, *supra* note 62. The author reported that when IBM prepared a CD-ROM for the 500th anniversary of Columbus's first voyage, the company had to spend $1 million to obtain the necessary copyright permissions. *Id.*

right permissions by converting only materials published before 1920—and thus out of copyright.[123] The Library of Congress, for instance, has converted to digital media thousands of Civil War photographs, Continental Congress documents, and speeches from World War I, but not yet *Gone with the Wind*.[124]

> Unless libraries are allowed to share digital copies of works as easily as they share actual copies, visitors to a library 20 years hence may find everything on-line except a strange pile of books published from 1920 to 1990, a kind of Sargasso Sea of publishing relegated to the stacks.[125]

While legal issues relating to such matters as copyright and pornography are yet to be settled in the digital world, the two fundamental flaws of current electronic data storage and transmission systems dwarf these problems. As mentioned, these flaws are the fragility and vulnerability of hardware and non-paper media, and the ephemerality and quirkiness of electronic systems.

In the daily functioning of business, law, government, and academia, electronic data transmission and archiving are still somewhat of a high wire act Prudence still dictates a safety net—paper.

III. WHAT SAY A MORE REALISTIC DIGITAL REVOLUTION?

A. THE PROMISE OF DIGITIZATION

> There's a lot of paper that gets filed that nobody wants to see. . . .[T] here's all this paper weighing us down. With [electronic filing], it'll be there if anybody needs it, but out of sight.
>
> Judge Stuart R. Pollak (1998).[126]

In allowing instantaneous remote "deposits and withdrawals," the computer has adapted much more successfully to the function of dynamic databank than to that of trusted authenticator of electronic messages.

Such successes as the Automated Fingerprint Identification System ("AFIS"), which now enables law enforcement agencies to link a latent crime scene print to a suspect within seconds, show the value of the computer as an encyclopedic databank.[127]

However, in the circumstances where an absent signer/grantor attempts to file or record a conveyance of valuable assets or a pledge of commitment, the computer has not adapted as usefully. These are situations that traditionally have involved the signing and exchange of notarized or witnessed paper documents. Yet, so far, digital signatures and

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[123] *Id.*

[124] *Id.*

[125] *Id.*

[126] John Roemer, *Digital World Arrives at S.F. Civic Center Court*, L.A. DAILY J., Nov. 5, 1998, at 3.

[127] NAT'L NOTARY ASS'N, How TO FINGERPRINT, 25-31 (1997).

electronic documents have not yet proven themselves to the point where they are wholeheartedly and universally embraced as a substitute for paper by commerce, law, and government.

Still, the digital revolution presses on relentlessly on countless fronts, making notable progress in weaning particular industries and organizations away from paper. There are two paper-intensive venues where digitization is achieving phenomenal success: libraries and courts.

1. Marian The Cybrarian

While the much heralded CyberNotary has yet to arrive on the scene,[128] with less fanfare the Cybrarian has become a reality in most of the major libraries and archives of our nation.[129] The book-bound librarian of old has evolved into a digitally-savvy "knowledge navigator" in cyberspace.[130] Nearly three-fourths of the nation's libraries have "plugged into the Information Age, providing public access to the Internet and the chance to explore databanks and archives."[131] San Francisco's main library, for instance, hailed as a high-tech model for the 21st century, offers 220 computer workstations providing public access to databases and the Internet.[132] The California Legislature in 1998 allocated funds to begin linking the state's 8,000 public and private libraries "into a single, interactive resource," a $66-million project scheduled for completion by 2010.[133]

Cards were long the operational mainstay of the traditional American library, whether tucked in a sleeve at the back of a book and removed when the book was taken out, or neatly filed in a card catalog drawer in a packed display of a library's amassed treasures. Automation hit libraries in the 1970s when machine-readable bar codes replaced stamped book cards, and a catalog of books could be called up on a computer monitor, along with the *Reader's Guide to Periodical Literature*, magazines, newspapers, encyclopedias, and dictionaries.[134]

Libraries have taken on the monumental project of converting their books into bytes, led by the Library of Congress with its National Digital Library Program, which is expected to exceed the goal of 5 million works

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[128] Telephone Interview with Linda Adams, *supra* note 14; Telephone Interview with Fran Fish, *supra* note 14.

[129] Dennis McLellan, *Libraries Turn High-Tech Page*, L.A. TIMES, Nov. 10, 1998, at A3.

[130] *Id*. at A25.

[131] *Id*. at A3.

[132] *Id*. at A25.

[133] *Id*.

[134] Dennis McLellan, *Libraries Turn High-Tech Page*, L.A. TIMES Nov. 10, 1998, at A25.

online by the Library's bicentennial in the year 2000.[135] Cybrarians see three clear benefits to digitizing their paper assets: 1) it helps preserve rare and fragile objects (e.g., the medieval manuscript of *Beowulf*) without denying access to those who wish to study them; 2) it allows library patrons to retrieve books in seconds rather than minutes, while also allowing more than one patron to read the same work at the same time; and 3) it saves space, with electronic copies taking up "millimeters of space on a magnetic disk rather than meters on a shelf."[136]

Some argue that online libraries make information too accessible to the public. They advocate use of software by libraries to "filter" from the Internet verbiage containing suggestive words such as "sex" or "breast," to protect the sensibilities of malleable young people.[137] Others maintain that such measures amount to unwarranted censorship.[138]

Lesk estimated that, by the year 2000, half of the material in most of the nation's major libraries will be digital.[139] This does not mean, however, that every digitally converted paper publication will be discarded by these libraries—just that more information will be available to library patrons in more accessible formats using less space. 2. Courting the Disk.

If ever there were a marriage made in cyber-heaven, it is the union between a computer and a court about to receive pleadings in a complex

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[135] *Id.*

[136] Lesk, *supra* note 62. The author describes the different methods for digitizing book pages and their pros and cons: scanning each page is the cheapest method and preserves the look of the page, but does not allow digital word search and indexing; optical character recognition ("OCR") software converts book text character by character, but is error-prone; typing the text by hand is the most expensive method, especially when it is formatted in the Hypertext Markup Language ("HTML") used on the World Wide Web, which can cost 30 times as much as simply scanning the pages. *Id.* "Increasingly, libraries are able to license large quantities of material on CD-ROM or some other machine-readable form, thus avoiding the need for conversion altogether." *Id.*

[137] Roxana Robinson, *Libraries' Use of Filtering Software Isn't Censorship*, L.A. DAILY J., Oct. 28, 1998, at 6.

[138] Lawrence R. Jensen, *Letters to the Editor: Library Internet Filters Are Censorship*, L.A. DAILY J., Nov. 16, 1998, at 7. Jensen claims the following:

> The problems with filtering software are legion. [It] is arbitrary and filters out much important information. Web filters either block out material based on key words such as sex or breast — thereby impermissibly blocking sites featuring, for example, the poetry of Anne Sexton or information about breast cancer — or are based on content review by filter services. The employees of these services have wide discretion to block access to sites on numerous vague grounds.... Experience with Web filters has shown that constitutionally protected materials, such as news or opinion articles published in family newspapers, are sometimes arbitrarily blocked. On the other hand, filters often fail to block new, obscure or clever sites that feature obscene material.

Id.

[139] Lesk, *supra* note 62.

lawsuit involving hundreds of plaintiffs or defendants. Such suits can literally swamp a court with paper and generate an endless need for copies of each pleading by every party to the suit. However, if the pleadings are filed and available in cyberspace, any interested party may instantly call up and review any pleading without touching a piece of paper.

In the early 1990s, courts around the nation began "trial marriages" to test whether electronic filing of court documents would work. In February of 1995, the United States District Court of Northern Ohio's Eastern Division became the first federal district court to adopt an electronic docket system, called Complex Litigation Automated Docket ("CLAD").[140] Developed and maintained by Lexis-Nexis, CLAD allowed remote filing of motions, pleadings, memoranda of law, and other documents in a complicated maritime asbestos case involving numerous litigants and counsel.[141] Once the documents were prepared, they were not printed and physically transported, but instead electronically transmitted, minimizing the need for law firms to dispatch messengers to the court to file papers manually.[142] Upon receipt of each digital document, the court transmitted a "Notice of Electronic Filing" to interested parties, who could then access the documents from anywhere with a personal computer and a modem.[143] "I'm excited to be pioneering an electronic system for managing the great number of pleadings and parties involved in this action," said Judge Ann Aldrich, who authorized the use of CLAD.[144] "A system like this provides solutions to increasingly common problems for courts faced with enormous cases or caseloads."[145]

Based on the success of electronic filing in the 1995 asbestos case in the Northern District of Ohio, a pilot test program is now in place in nine federal courts around the nation.[146] However, the pilot program will be implemented in a given lawsuit only if all parties are willing to file electronically; the attorneys of record must then each register with the court to obtain a user name and password.[147] Under the program, a Portable Document Format ("PDF") will allow an authorized user to view all filed documents in their original form on any computer, but the courts may

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[140] LEXIS-NEXIS *News Release, U.S. District Court of Northern District of Ohio Adopts Electronic Docket System*, Feb. 27, 1995.

[141] *Id.*

[142] *Id.*

[143] *Id.*

[144] *Id.*

[145] LEXIS-NEXIS *News Release, U.S. District Court of Northern District of Ohio Adopts Electronic Docket System*, Feb. 27, 1995.

[146] Lori Gray, *Federal Electronic Filing Debuts*, LEGAL ASST. TODAY, Sept./0ct. 1998. The nine federal courts are: U.S. Dist. Ct., E.D. N.Y.; U.S. Dist. Ct., W.D. Mo.; U.S. Dist. Ct., N.D. Ohio; U.S. D. Or.; U.S. Bankr. Ct., D. Ariz.; U.S. Bankr. Ct., S.D. Cal.; U.S. Bankr. Ct., N.D. Ga.; U.S. Bankr. Ct., S.D. N.Y.; U.S. Bankr. Ct., E.D. Va. *Id.*

[147] *Id.*

discourage "scanning" of page images when the documents to be filed are "numerous or voluminous" in favor of pure textual transmission.[148] Safeguards are in place to ensure that documents filed cannot be altered during their transmission over the Internet.[149] Electronic filing in federal courts is slated to go national after the Administrative Office of the U.S. Courts in Washington, D.C., has analyzed the test programs in the nine district courts.[150]

Across the country, many local courts are also experimenting with electronic filing, in collaboration with private vendors. In the San Francisco Civic Center Courthouse, for example, electronic filing and service of pleadings in asbestos cases began on a trial basis in December of 1998; while first filings in the suits must be on paper, all subsequent briefs, motions, memoranda of law, orders, and other documents may be filed over the Internet.[151]

> Attorneys will upload their court documents to an Internet address and within minutes the judge and opposing counsel will have access to them, according to the Texas vendor running the system, LAWPlus of Dallas. The Internet connection will also collect and deliver filing fees to the court clerk and will assess a charge for the service. Participants will be required to deposit a retainer of $500, which will be assessed and disbursed via a personal identification number through an automated clearinghouse account. Uploading costs the filing party $5 plus 15 cents per page.[152]

However, not all of the more than 250 defense firms involved in the asbestos litigation will take advantage of the new filing system, which remains optional. "[The firms are] at various stages of technological evolution," one involved lawyer said.[153] "Not everyone is ready."[154] "It's clearly the wave of the future, but they're ahead of themselves," another commented[155]. "There are hundreds of ways they could screw up. . . .And the Legislature has not authorized electronic service. When they write it into the Code [of Civil Procedure], I'll have no choice."[156] One concern was whether LAWPlus' errors and omissions insurance would fully indemnify attorneys in the event of a service failure.[157] Yet, one executive of LAWPlus, which also runs electronic filing systems in two Texas counties and the City of El Paso, predicted that all civil court

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[148] *Id.*

[149] *Id.*

[150] *Id.*

[151] Roemer, *supra* note 126.

[152] *Id.*

[153] *Id.*

[154] *Id.*

[155] *Id.*

[156] Roemer, *supra* note 126.

[157] *Id.*

filings in San Francisco will be done online within a year to 18 months.[158]

In 1995, a Los Angeles County Courts Working Group on Electronic Filing reported on the relative efficacy of the four methods of court filing: paper, fax, E-mailed image and E-mailed SGML text.[159] The report designated E-mailed SGML text as by far the most cost-effective and efficient method, since "SGML documents can be automatically processed to check for errors, extract data for the case management database, and append the incoming document in suitable form to an electronic case file."[160] However, conceding that technological upgrades in law offices will take some time and that *pro se* and indigent litigants might be denied access to the courts if electronic filing were mandatory, the report recommended allowing all four filing methods.[161]

Another paper-mediated function of the judiciary is in the process of transition and simplification via the utilization of computer technology: the issuing of arrest warrants. Traditionally, obtaining an arrest war rant was a time-consuming process for a local law enforcement officer, who had to drive to the courthouse, fill-out the paperwork, meet with the judge, wait for the warrant to be processed and signed, and then drive back to the precinct or detention center to serve the papers on a suspect.[162] On March 17, 1998, a warrant was issued in Gwinnett County, Georgia, which was "the first in the nation's history to be evaluated, authorized, issued and signed—on-line."[163] Using a PenOp system that measures certain dynamic biometric aspects of the making of a signature, including speed of pen stroke, both judges and law-enforcement officers are given concurrent access to the same document while conversing via videoconference.[164] "With the completed document on screen at both locations, both sign the document with a digitizer and then click on the Print icon. One original copy with a digital watermark is printed for the officer, while a copy, also printed with a digital watermark, is printed for the judge's files."[165] The new Georgia Electronic Records and Signature Act, which recognizes the legality of electronic signatures, also removed statutory language requiring an arresting of

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[158] *Id.*

[159] Robert Steiner, Chair, Working Group on Electronic Filing, Rules and Commentary for the Los Angeles County Courts Electric Filing Project with Draft Digital Signature Legislation (Feb. 11, 1995). "SGML" is shorthand for Standard Generalized Markup Language. *Id.*

[160] *Id.*

[161] *Id.*

[162] PenOp Inc. *News Release, Gwinnett County [GA] Judicial Circuit Case Study*, March 1998, at 2.

[163] *Id.* at 1.

[164] *Id.* at 3.

[165] *Id.* at 4.

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ficer to "appear in person" before a judge so that Gwinnett County's new Electronic Warrant Interchange ("EWI") system is deployable throughout the state.[166]

In California, a new law allows judges to issue arrest warrants by Email from their home computers using digital signatures.[167] Formerly, remote issuance of warrants could only be done in the state by fax, but there was concern that un-encrypted fax transmissions are too easily intercepted.[168] It was also pointed out during legislative hearings that of the more than 500 municipal and superior court judges in Los Angeles County, only 200 have agreed to be available for warrants in the evenings and on weekends, of which only an overburdened 40 have home fax machines.[169]

If electronic filing reduces the volume of paper and electronic issuance of warrants lessens the need to transport paper, then electronic services such as Lexis-Nexis and Westlaw reduce the need to delve through libraries of paper. Key word search is perhaps the most liberating and widespread of the digital applications available to courts and lawyers. However, an evaluation of this powerful and rapidly evolving tool is beyond the scope of this article.[170]

The documents proving most resistant to digital alternatives are those instruments conveying title to valuable personal property that have traditionally been notarized or multiply witnessed, such as real property deeds and wills.[171] It is the role of the Notary Public, of course, to screen the signers of such documents for identity, willingness, and basic awareness.[172]

Assets of great value are routinely transferred electronically, but these typically are corporate, institutional or governmental assets, not those of an individual. For example, the University of Illinois, in a push for a paperless administration, has begun to order goods and services electronically, eliminating an estimated 142,000 paper-mediated pro

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[166] *Id*. at 2.

[167] 1998 Cal. Stat. 692. California SB 1970, a bill sponsored by Sen. Adam Schiff of Pasadena, was signed into law Sept. 8,1998. 1998 Cal. Stat. 692. On Jan. 1, 1996, California granted legitimacy to digital signatures under the California Digital Signature Act. The Secretary of State issued standards for implementing the act in May 1997.

[168] Peter Blumberg, *Judges May Soon Issue Arrest, Search Warrants Using E-Mail*, L.A. DAILY J., April 17, 1998, at 1.

[169] *Id*.

[170] Anthony Aarons, *Westlaw Severs Link to Shepard's*, L.A. DAILY J., Nov. 19, 1998, at (recounting the recent purchase of Shepard's Citations Service by Lexis-Nexis and the resulting unavailability of Shepard's through Westlaw).

[171] *See supra* notes 18 through 22 and the accompanying text.

[172] NAT'L NOTARY Assoc., NOTARY HOME STUDY COURSE § III (1998).

curement transactions per year.[173] And, employing the Federal Acquisition Computer Network ("FACNET"), the United States government has procurement policies and procedures in place "to help it buy millions of dollars of goods without replicating the wave of paper documents."[174] By law, FACNET must be used "whenever practicable or cost effective," and must have the capability to take on 75 percent of federal contracts by January 1, 2000.[175]

Due to a regularity of use of the digital channels and the familiarity of the regular participants with the terms and context of any routine procurement, electronic shifting of valuable assets between corporate, institutional, and government entities and their vendors and contractors entails a minimal risk of an unknown party absconding with funds.[176] Likewise, filing of electronic documents in court generally entails little risk of forgery because the litigants and counsel are well identified and have a considerable stake in the propriety of their digital submissions.

However, certain court documents—namely, sworn written testimony that may subject the signer to perjury penalties—are regarded in a different light than briefs, motions, and memoranda of law submitted by attorneys. Indeed, the report by the drafting committee of the Uniform Electronic Transactions Act recommended that "Jurats and Declarations used in connection with court filings and testimony should be excluded from the [Act]."[177] In other words, be submitted to any court on paper, signed in pen and ink.

Also regarded in a different light are documents signed by individuals unaffiliated with a corporate, institutional or governmental entity and conveying valuable personal assets or applying for valuable benefits. The University of Illinois, for example, has eliminated 700,000 annual paper transactions in its campaign for a paperless administration, but has drawn the line at admissions and financial aid, whose sensitive operations will continue to be conducted through paper.[178]

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[173] *Paper's Days Numbered at University of Illinois*, DAILY SOUTHTOWN, Apr. 13, 1998, at A5 [hereinafter *Paper's Days Numbered*]. University departments now use procurement cards similar to credit cards to make small purchases, allowing faster delivery of goods. *Id*. "In some cases, we're probably saving weeks," said Craig Bazzani, the school's vice president for business and finance. *Id*. While changes involved up-front investment in technology totaling millions of dollars, Bazzani said the university would realize compensating "hard savings" in paper and personnel. *Id*.

[174] Glen-Peter Ahlers, Sr., *The Impact of Technology on the Notary Process*, 31 J. MARSHALL L. REV. 917 (1998).

[175] *Id*.

[176] This is not to say, of course, that such frauds against the taxpayer as a $2,000 toilet seat may not be perpetrated within the context of a "lawful" electronic procurement for the military establishment.

[177] NCCUSL, *supra* note 15.

[178] *Paper's Days Numbered*, *supra* note 173.

There is no lack of high-tech companies offering systems purporting to authenticate and safeguard sensitive electronic transmissions. Some of these firms trade on the eclat of the Notary by labeling their systems a "Digital Notary Service," an "Electronic Notary Public," an "Internet Notary" or the like.[179] One of these systems, Surety Technologies' Digital Notary Service, was adopted by VeriSign Inc., a company that offers "secure electronic commerce solutions."[180]

> VeriSign's Digital IDs use state-of-the-art cryptographic techniques to bind the identity of a person or entity to a unique mathematical key, providing a trusted means of authenticating the identity of each party in an electronic transaction. . . . Surety's Digital Notary Service provides the electronic equivalent of a notary stamp. It is used to "certify" and "seal" any digital record [including e-mail] in content and time in such a way that it can later be proved incontestably that a given record or image is the one created when claimed and not altered after the fact. At the same time, it attaches a unique and secure serial number for tracking and control purposes.[181]

The digital signature, based on Public Key Infrastructure ("PKI") technology, is the linchpin of virtually all of the different software now being marketed to "notarize" (i.e., authenticate as genuine and keep secure from alteration) electronic messages.[182] At present, however, digital signatures and PKI technology present two problems that have hampered their widespread growth and acceptance.

The first involves the cost and "hassle" to the average private citizen of acquiring PKI expertise and equipment. It may make sense for a government or a large corporation concerned with the security of its proprietary information to digitally sign and "hash" its electronic documents, but why would this be a necessity for a middle class citizen whose two major documentary transactions in a lifetime may be purchasing a house and making a will? Furthermore, "large numbers of people still do not have ready access to a computer or electronic transmission capabilities, or are unable to use them effectively because of a disability. Therefore,

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[179] Faerber, *supra* note 12, at 20.
[180] BUSINESS WIRE, INC., VERISIGN ADOPTS SURETY TECHNOLOGIES' ELECTRONIC RECORD AUTHENTICATION SYSTEM TO SAFEGUARD DIGITAL *Id*s (1996). Surety Technologies is based in Chatham, New Jersey, and VeriSign in Mountain View, California. *Id*.
[181] *Id*.
[182] California Office of Administrative Law, Proposed Digital Signature Regulations for the State of California (1997). While public key technology predominates in the marketplace for electronic document security systems, California Secretary of State Bill Jones recognized "signature dynamics" technology as an acceptable alternative in regulations proposed to implement the state's Digital Signature Act. *Id*. Using this technology, certain dynamic biometric characteristics of the affixation of a signature (e.g., speed of affixation) are measured and compared against a model held in the computer. PenOp Inc. News Re lease, *supra* note 153 (discussing the PenOp system used to issue arrest warrants in Gwinnett County, Georgia).

substituting electronic records for paper documentation raises equal ac cess issues that will need to be addressed."[183]

The second problem involves the issue that a private computer key may be co-opted by ruse or coercion and then used to create a fraudulent electronic message without the knowledge of the message recipient, who may be on the other side of the earth. To prevent such fraud, states have begun to see a need for an "electronic notary" who would be in the presence of the signer/transmitter of an electronic message to screen that person for identity, volition, and basic awareness, and then to authenticate the transmission by adding the Notary's own digital signature.[184] Indeed, some observers predict that "[i]nstead of causing the death of notaries public, technology might instead increase their importance."[185]

While "Digital Signature Guidelines" have been developed by the American Bar Association's Information Security Committee,[186] states are proceeding somewhat cautiously before legislating rules for digital signatures. "They're sort of dipping their toes in the water, but they're not jumping in with both feet," said Chicago attorney Thomas J. Smedinghoff, who chairs the A.B.A. Section of Science and Technology's Electronic Commerce Division.[187] Smedinghoff observed that legislators appear intimidated by the new, unfamiliar digital technology, and predicted that wide-scale digital commerce likely will arrive far ahead of any significant legislation.[188]

The banking industry, belying its stodgy image, is one of the sectors of American commerce that is leading the way in seeking out innovative digital applications to attract and better serve customers. For example, mortgage bankers and their vendors are competing to be first with a sys-

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[183] NCCUSL, *supra* note 15.

[184] Faerber, *supra* note 12, at 20.

[185] Ahlers, *supra* note 174, at 912. Mr. Ahlers makes the following contentions:

> At first blush it might *See*m that a notary's purpose, to note the *Id*entity of one who signs a document, is rendered moot in the digital age since computers and not people will be generating documents. But perhaps the greater complexity and more fluid consistency of today's technological documents should demand a greater effort to *Id*entify the person at the keyboard who signs or acknowledges an electronic document. Instead of causing the death of notaries public, technology might instead increase their importance. After all, who is going to organize and manage the many bits, the ones and zeros, of digital code orbiting around the globe? Ken Gilpatric, a Justice Department lawyer. . .believes a digital notary is necessary 'to make electronic commerce easy and trustworthy. *Id*.

[186] BAUM, *supra* note 2.

[187] John Gibeaut, *Sign on the Dotted Screen*, ABA J., May 1997, at 100. *See* also Thomas J. Smedinghoff & Ruth Hill Bro, *Moving with Change: Electronic Signature Legislation as a Vehicle for Advancing E-Commerce*, 17 J. MARSHALL J. COMP. & INFO L 723 (1999).

[188] *Id*.

tem to close loans online.[189] With a typical loan process now requiring 30 to 60 different paper documents, experts predict that online loan closing is just 18 months to two years away.[190]

Considering the entrepreneurial ingeniousness in the vibrant digital marketplace, it seems unlikely that any technical or logistical challenge will remain unsolved for long.

The greater challenges for digital entrepreneurs are posed not by failed technology or formidable logistics, but by certain peculiar realities of English speaking Western culture and human psychology.

B. LIVING WITH THE PAPER TIGER

> There is something distinctive in American civilization in its effort to make everything available to everybody.
>
> Daniel J. Boorstin (1998)[191]

The telephone, not the computer, was the electrical communications device that first nudged us toward a paperless society. And its first paper casualty was the medium that had tied Western civilization together for centuries—the interpersonal letter. The letter's lessening use as a means of communication between friends and family has been often noted and much bemoaned in recent years as an inestimable loss for future historians and biographers. Yet with the countless diversions and demands of modem life, the sheer convenience of the telephone has an undeniable appeal over paper, pen, and postage stamp.

So does the medium of interpersonal Internet e-mail, which com bines one of the main advantages of telephone conversation—speed— with one of the main advantages of written correspondence— opportunity to explain and edit oneself with more thoughtful precision than in spoken communication.

Increasingly in American public life, however, we are seeing a virtual elimination of recorded interpersonal communication of any kind— written paper letters and e-mail included—along with the extirpation of intrapersonal communication, such as notes and diaries. The reason is the investigative ardor of the media, political opponents, and special prosecutors. In former times, prominent persons in public life were wont to have their every move documented and chronicled for posterity, often with surprising candor. Nowadays, by contrast, there is a great fear of leaving a "paper trail" by which one might later be held accountable by legislative confirmation committees or nosy reporters. Even in the once

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[189] *Technological Solution in Sight for Loan Automation*, AM. BANKER, Nov. 19, 1998, at 18.
[190] *Id.*
[191] Hillel Italie, *Everyday Matters Matter Most to Prize-Winning Historian Boorstin*, L.A. DAILY NEWS, Nov. 15, 1998, at Viewpoint-5.

impenetrable White House, which lost its appeal in the spring of 1998 to keep Independent Counsel Kenneth Starr from questioning President Clinton's close advisors, most of the President's aides are now afraid to take notes or keep a diary lest they be subpoenaed.[192]

> Today, historians find themselves overwhelmed with information but knowing less about the exercise of power in Washington. The real business of politics takes place off the record, in unrecorded phone calls and one-on-one conversations. Starr has added new incentive for people to leave small footprints. We will still have history. It will just be bland and colorless.[193]

E-mail and other digital communications are perhaps a greater potential source of embarrassment than paper letters, notes, and diaries because they are unseen and out of mind in cyberspace—but not necessarily lost. "Many people have found themselves surprised and embarrassed by the reemergence of perfectly preserved e-mail or online newsgroup comments they wrote nonchalantly years ago and forgot about."[194] Thus, one e-mail authority has promulgated "5 e-mail Rules to Live by" to protect one's privacy: 1) treat e-mail as public information; 2) assume e-mail messages are permanent; 3) never use e-mail to discuss sensitive issues; 4) you can't control who reads your e-mail; 5) don't use the company's e-mail for personal correspondence.[195]

If some public figures feel compelled not to commit their thoughts to paper or disk, many private citizens, too, fear intrusions on their privacy. Some harbor a deep distrust of government and marketers snooping into their lives. With George Orwell's "Big Brother" as their bete noire, these individuals resist surrendering any part of their personal lives to the computer.[196] Some are paranoid, some antisocial, some have pasts they would prefer to keep hidden, and some are exemplars of that eccentric strain of Anglo-Saxon individualism that has prevented Common Law countries from embracing national ID cards.[197] In the United States, there is vocal resistance to linkage of digital databanks and to any requirement that would facilitate such linkage—namely, mandatory inclusion of Social Security numbers on job and license applications. Needless

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[192] Steven M. Gillon, *Piecing It Together: The Messy Stuff That Makes History*, L.A. TIMES, May 10, 1998, at M6.

[193] *Id*.

[194] Brand, *supra* note 62.

[195] Jacquelyn Lynn, *Managing Your E-Mail To Protect Yourself*, COM. L. BUL., Oct. 1998, at 34.

[196] GEORGE ORWELL, 1984 (1949).

[197] *Id. See also* KING JOHN, MAGNA CARTA (1215). Perhaps King John's Magna Carta and George Orwell's 1984 are the documents most responsible for the resistance to national *Id*s in the English-speaking world. *Id*. In the United States, the writings of Ralph Waldo Emerson (1803-1882) and Henry David Thoreau (1817-1862) have also helped foster a spirit of rugged individualism and defiance of government probing.

to say, this outspoken faction is strongly opposed to any prospect of a digitized, paperless society.

While some people are too eccentric or antiauthoritarian to enlist in the digital revolution, others refuse to sign-on because they are uncomfortable with computers or just too dead set in their paper-based ways to change.

> There are some transactions that are just too important, too sensitive to be trusted to machines—at least, that is how many people strongly feel. That is why many people will not go to an Automatic Teller Machine to transfer funds; they want to deal with another human being. They want someone to talk with and, yes, someone to blame if things go wrong.[198]

Digital distrust and technophobia seem to afflict the older much more than the younger. Such innovations as "smart cards," which can "perform the functions of a fistful of credit, grocery, phone, ATM, and security cards," are more readily embraced by the generation that has grown up with computers.[199] "You don't need keys. You don't need money. I love that," said one college student whose smart card/student ID lets him buy vending machine Cokes and obtain access to dorms.[200]

But plastic cards as a replacement for paper checks and currency still have a long way to go. "Trying to replace cash with electronics is hard," said one digital industry analyst.[201] The cards have not caught on everywhere: a New York City program in which they are used as a substitute for cash, for instance, is floundering.[202] "I expect [paper] checks to stay around because a large segment of people over 65 want to see a piece of paper of some sort," said another expert, who believes that the 45 to 65 year age group is in transition but the 30 to 45 group will readily embrace paperless transactions.[203] "These are people who use debit

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[198] Charles N. Faerber, The Notary & EDI, Presented Before the Work Group on Notarization & Nonrepudiation Of The ABA's Information Security Committee, Jan. 10, 1993.

[199] Laura Elizabeth Pohl & Richard Vega, *So small, So smart: Smart Cards Catch On*, USA WEEKEND, Nov. 20 - 22, 1998, at 8.
> Introduced in France more than 20 years ago, a smart card looks like a credit card but acts like an electronic debit, *Id*entity and security card rolled into one. It's embedded electronic chip will soon pack up to 64K of memory—as much as a 1985 computer—which means space for more smart features to come. No wonder, the cards have been hailed as the next intelligent step up from ATM cards.

Id.

[200] *Id*.

[201] *Id*. The expert quoted is Jonathan Cassell of the digital industry analysis firm Dataquest. *Id*.

[202] *Id*.

[203] Andrew Blum, *Will Retail Banking's High-Tech Future Mean Writing Off Checks?*, INT'L HERALD TRIB., Nov. 28-29, at 17. Blum quotes James Zogby, Professor of Risk Management and Investment, Illinois Central College, Peoria, Illinois. Noting that about 70 billion checks are written per year in the United States, Blum writes: "By some estimates, it could be 40 years or two generations before checks vanish, since to people of a certain age

cards. The generation after them will not remember what a check is."[204]

While smart cards are common in Europe and catching on in Asia, part of the reason they have not clicked in a big way in the United States is the difficulty of imposing a single smart card system.[205] "In Europe, a government ministry or a few large banks can set a standard outright. But here, different banks are backing different kinds of smart card systems in a battle reminiscent of the VHS-Beta war for videocassette recorders."[206] Another reason for the smart card's lackluster acceptance in the United States is the English-speaker's fondness for the paper bank draft—"checks are still largely viewed as an Anglo-Saxon phenomenon. "[207]

In the introduction to this article, the point was made that only "a luddite or a fool" would deny the advantages of the computer nor the inevitability of its inroad into every corner of modern life. But this is not to ignore the computer's disadvantages, one of which is an increased opportunity for fraud and mishap.

> Any technological development can be subverted. The more sophisticated the technology, the more difficult it is to detect subversion of it—and the more chaos results from malfunction. Back in 1969, the first moon landing was supposed to be hands-off, but astronaut Neil Armstrong had to take over manually or the Eagle would have landed on its side.[208]

The opportunities for digital subversion are infinite. For example, officials at the American Medical Association cringed this year when several new Web sites offered to sell Viagra and issue a prescription to almost anyone willing to complete an electronic questionnaire.[209] The quest for digital security has spawned a large and growing industry, including firstuse.com, a new California firm that has launched an Internet site allowing creators of intellectual property to instantly timestamp a digital file to protect it from infringement.[210] "Many people are

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[204]they provide unimpeachable evidence of a transaction: a paper record. There is probably more emotion than legality at work here."
 Id.
[205] Karen Kaplan, *E-Commerce May Help Americans Learn to Love 'Smart' Cards*, L.A. TIMES, Oct. 11, 1998, at Cl.
[206] *Id*. at C4.
[207] Blum, *supra* note 203.
[208] *See* Faerber, *supra* note 198.
[209] Greg Miller, *War of Professionals vs. Software*, L.A. TIMES, Oct. 21, 1998.
[210] Paul Verna, *Digital Stamp Offered — Firm Says Tool Protects Against Infringers*, BILLBOARD, Nov. 7, 1998. The firm offers to validate any intellectual property that may qualify for a copyright, trademark or patent and can be encoded in a digital file, including song demos, MIDI files, software codes, studio mixes, Internet sites, screenplays, illustrations and legal documents. *Id*. A firstuse.com officer said: "After registering documents at firstuse.com, users should continue through any of the other normal legal processes necessary to claim legal protection or ownership." *Id*.

under the illusion computer records are more precise [than paper records but in many ways it is the opposite," said the company's cofounder and chief executive officer.[211] "A bound [paper] journal like the ones notaries use is in many ways more accurate.[212]

V. CONCLUSION

Is a totally paperless society technologically possible? The answer is yes—but its achievement might be akin to that of the author who wrote a novel without once using the letter "e" What would be the practical point of doing it.

Considering the clear flaws and limitations of digital systems--the fragility and vulnerability of hardware and non-paper media, and the ephemeral and quirkiness of electronic systems--the advantages of paper hard to ignore. Indeed, paper has achieved a new role and prestige in the Age of the Computer under the rubric of "backup." For electronic systems, paper has become a necessary safety net.

To force digitization on the people of the United States would be procrustean and un-American in the extreme. In –essence, it would be a mandate for Americans to get by without using the letter "e." Boorstin has pointed out the distinctiveness of American civilization in its effort to make everything available to everybody."[213] Certainly there will always be people too poor, too out of touch, too unintelligent, too disabled or too eccentric to tap into digital technology.[214] For these disadvantaged many, paper is a lifeline. America will remain true to its ideals as long as a prisoner is allowed to write an appeal to the U.S. Supreme Court in ballpoint pen on lined notebook paper. And the physical companionship offered by paper is irreplaceable. "I keep hearing mumblings there won't be any hard-copy newspapers in the future," said one collector of old newspapers, "but I don't think you can replace something you can sit down and relax with."[215]

There is a strong temptation to view the computer as the solution to everything. It is not. Digitization is a powerful and invaluable tool, but it is not the only tool.

The Supersonic Transport can traverse oceans in two or three hours but we do not use it to go to the corner grocery store-we get in the car or we walk The computer can traverse cyberspace in nanoseconds, but still must defer to paper as a medium that can offer a reassuring tangibility and be wielded at a comfortable and human pace.

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[211] Telephone interview with Craig Honick, Co-Founder and CEO of firstuse.com, con ducted by David S. Thun, Assoc. Editor, Nat'1 Notary Ass'n (Nov. 1998).
[212] *Id*.
[213] *See* Italic, *supra* note 191.
[214] *See* Faerber, *supra* note 198.
[215] *See* Meyer, *supra* note 55.