APPENDIX 15. SOME IMPORTANT INFORMATION AGE PARADIGMS SHIFTS AND THEIR ASSOCIATED MYTHS, AND REALITIES

Written by F. Woody Horton, NCLIS Consultant

PREFATORY NOTE[5]

The Commission believes that in order for the President, the Congress, citizens, and stakeholder groups to make informed judgments as to the soundness of this study's findings, conclusions, and recommendations, it would be helpful to first identify some key "Information Age major paradigm shifts," some common myths and realities that are associated with each of them, a judgment as to what the reality is in each case, and suggestions for exposing the myths. These paradigm shifts, myths, realities, and debunking suggestions directly or indirectly shape the nature, the scope, the feasibility, and the timing of the reforms recommended in the NCLIS report.

Some of these paradigm shifts, and their associated myths and realities, are technological in character. Others are socio-cultural, economic, political or philosophical. Individually they each pose one or more arguable assertions that are endlessly debated. Opposing stakeholders have often already polarized their public positions and staked out their turf interests in the halls of Congress, in the fight for public opinion in the media, and in the competition for market share. Together, these paradigm shifts, myths, and realities make up a formidable tapestry of attitudes and behaviors that are influencing the mindset of policy-makers, the media, academicians and researchers, the commercial information and communication marketplace, Wall Street, and the individual citizen.

The Commission has tried to be as objective as possible by playing an honest broker role in bringing together the constituencies and the stakeholders in helping to identify these paradigm shifts, myths, and realities, and in undertaking the substantial scholarly research task of reviewing the literature and talking to experts in the various disciplines.

Major Paradigm Shifts

1. *The Paradigm Shift*. **Government information for the public is increasingly and rapidly being discontinued in ink-on-paper, microforms, and other pre-electronic formats and mediums, and instead being made available in electronic formats and mediums—especially online, utilizing the World Wide Web and the Internet. There are both upsides and downsides to this initiative. One negative consequence is the erosion of permanent public availability of government information. Another dysfunctional consequence is the erosion of the government's ability to preserve its information holdings in formats and mediums that will remain functional indefinitely, even if the technologies used to create and store the information in the first place obsolesce.**

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[5] Available at http://www.nclis.gov/govt/assess/assess.appen15.pdf. This appendix was last revised on November 7, 2000.

The advent of the Internet and the World Wide Web has brought with it the concomitant advantage of enabling and encouraging federal agencies to increasingly create, store, transfer, make available and accessible their government information products and services in online electronic forms by bringing those products and services up on thousands of agency web sites which are directly searchable or searchable through portals such as FirstGov.[6] The website is inexorably replacing the pre-electronic repositories and depositories of hard copy documents. Currently, both traditional and electronic federal agency and federal depository libraries, archives, record centers, reading rooms, and information centers exist "side-by-side," but the fraction of the federal government's paper-based data, documents, and literature is very rapidly going down while at the same time the fraction of its electronically-based holdings are going up. This major paradigm shift is presenting enormous challenges to the established federal information infrastructure for housing and disseminating government information to the public. The roles, authorities, responsibilities, rights, and privileges of the government, commercial information providers, information handling intermediaries and specialists such as librarians, technical information specialists, and archival and records specialists, are all shifting and being redefined in order to cope with the new information environment. This study recommends various reforms in laws, policies, programs, and agency practices to help the President and the Congress, as well as the Judiciary, cope with the transition from paper to electrons.

- **The Myth:** All of the Federal Government's public information holdings are universally available and conveniently accessible on the World Wide Web to everyone—citizens, students, job-seekers, government entitlement seekers, businesses, lower levels of government, or other kinds of individuals or groups, and they can find, verify the authenticity of the information, and download any or all of it easily, quickly, and free of charge, and remain confident that technologies will always exist to preserve the information in viable and functioning formats and mediums, so there is no longer any need for the government to plan, manage, and control government information, nor is there any need any longer for maintaining and preserving pre-electronic mediums and formats such as ink-on-paper publications or microfiche, so information in those obsolete mediums and formats can be deleted, archived permanently, or destroyed.

- **The Reality:** Only a fraction of the federal government's total data, document, and literature holdings are universally available online, and only a fraction of what is available online is easily identifiable, efficiently locatable, economically searchable, and conveniently accessible for viewing or downloading from the Web. Moreover, many citizens do not know where to find the government information they want and need, even if they are computer literate, know how to "call it out," or how to search for and retrieve it. Not all citizens have easy or affordable access to a computer or a telephone they can use. Nor are physically, financially, or otherwise disadvantaged individuals able to find, afford, or efficiently use such equipment, software, and detailed procedures to search for government information because it is often inconveniently formatted, not well customized to the special needs of the disadvantaged, or not understandable because of presentation barriers. Finally, information technologies are becoming obsolete continuously, thus rendering information holdings that were created and are being housed in obsolete technologies vulnerable to preservation requirements.

- **Debunking the Myth:** A careful, comprehensive, and authoritative analysis of just what government information is available on the Internet, how it is being searched and retrieved, who is using what kinds of information and for what purposes, and similar considerations, is required. For example, what classes of publications are available in full text form? How much of it is free on government sites and how much is on commercial sites for a fee? For example, very few NTIS reports are available for free on the Internet in full text form. There is a substantial amount of basic bibliographic information available for free, but most full text reports are on paid commercial sties. Can all of this be quantified to NTIS reports, for Superintendent of Documents

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[6] Available at http://www.firstgov.gov/. A preliminary analysis of First Gov is available in Appendix 19.

publications, or for other classes of publications? Based on current trends, how is the picture likely to change in the next few years? Based on the amount of content in "all government publications," what would it take in terms of initial and ongoing operating cost to put all government publications on the Internet? A combination of staff calculations of volume and experts roughing out costs could provide some useful estimates. Finally, the concepts of "Permanent Public Availability" of government information, and the "Technological Preservation" of government information must be statutorily based; Congress should therefore amend an appropriate existing law, such as the Paperwork Reduction Act, as quickly as possible for these purposes.

2. *The Paradigm Shift*: **The traditional standards and guidelines for bibliographically controlling government information were developed and used by librarians and other information professionals before the advent of the Web and the Internet. They are failing now because they are not being appropriately modified, updated, and adapted to electronic publishing, and/or they are starting to be modified, but are being applied haphazardly and ineffectively in the rush to bring volumes of electronic materials up on the Web as quickly as possible.**

Hundreds of years of development, testing, and refining traditional bibliographic tools that are applied to the creation, production, and publishing of ink-on-paper publications (whether government or not) have been put aside in the rush to bring more and more electronic government information materials up online. While it is true that substantially more government information is now available to the computer literate public than ever before, the problems of searching for this information efficiently and effectively are compounded immeasurably because of the failure of agencies to apply traditional bibliographic guidelines to organizing and making more accessible materials that were created in electronic form in the first place ("born digital" to use the argot of the day). The major functional areas of accessioning, cataloging, abstracting, indexing, and related areas are all involved.

- **The Myth**: Modern website search engines, such as FirstGov, can find precisely, and only, whatever government information is available on federal agency websites that a user needs and believes is relevant. This can be done without expensive and time-consuming cataloging, abstracting, and indexing by librarians and other information professionals. The information databases are accurate, complete, authentic, timely, indexed, cross-indexed, searchable, and the information once found, can be delivered in the right format, at the right time, in the right place.

- **The Reality**: Success in searching for, finding, and utilizing precisely the information a user seeks, and only the information a user seeks, is only as good as the quality, the integrity, the timeliness and the accuracy of the federal information infrastructure which is searched. Haphazardly created and organized source documents and publications inevitably results in expensive, fruitless searches, with thousands, tens of thousands, or even millions of "hits," but yielding little or no positive results and compounding the frustration and anxiety of searchers who are confronted with an even larger information overload problem than they had in the first place.

- **Debunking the Myth**: Careful pilot tests must be conducted to evaluate and measure the benefit:cost performance ratios of using modern search engines, correlated with varying degrees and qualities of bibliographically controlled electronic materials. For example, if one million NTIS reports were on the Internet in full text form, how well would a modern search engine perform in locating only relevant reports and not identifying irrelevant materials? What would such a search engine cost to build and run? What if some of the content is available only as scanned images of pages that cannot be searched? What multiplier would have to be used to include all government information? If a search is limited to bibliographic, indexing, and abstracting material, instead of full text, what happens to costs and search results?

3. *The Paradigm Shift***: Information content is increasingly being severed from its information conduit (container), thereby greatly exacerbating the problems of understanding its full meaning and significance because its context (or provenance as the historian or scientist would say) has been lost. Attributing the information correctly to its true source and origin is sometimes impossible, and evaluating its credibility and authenticity is extremely difficult. Metaphorically, "information orphans" are increasingly being created with substantial burdens and costs to information users.**

More and more information is being put into online databases from which very specific information items may be searched for and retrieved "on demand," and "just in time." The traditional and conventional way to organizing large quantities of related information was to organize it all into discrete filing systems, recordkeeping systems, document collections, and publication depositories, which were often program-based, function-based, system-based, etc., and which would be revised and updated, often infrequently. However, these conventional information systems are difficult to cross-search through and retrieve from because they are organized, indexed, searched, and mined in widely different ways. This has sometimes been referred to in the literature as the "stovepipe" phenomenon—vertical systems organization with little or no horizontal search capability. Moreover, even if several items from different systems and files were located, it was often impractical or even impossible to earmark ("bookmark" to use the electronic term) items located in different systems into the same integrated "retrievable capsule." Online databases change all of that. Now many different information items from many different "vertical" information files or systems can be efficiently and effectively cross-searched and retrieved, and then viewed, downloaded or otherwise customized for delivery in whatever medium(s) or format(s) the user requires, economically and just in time, when it is needed. However, one "hidden" price to be paid is that the retrieved material is often retrieved without a clear indication as to its source, and origin. In short, its context has been lost. Then, when that same item is reused, re-communicated, or republished, say in an official government document, the author, if challenged, cannot ascertain its authenticity and attest to its reliability.

- **The Myth**: Information content, and its source or origin (and therefore context), are always inseparable, and users can always easily discern and verify the authenticity of the source, as well as understand the context in which the information originally reposed.

- **The Reality**: There is an increasing danger as more and more agency information is organized in the form of online databases to facilitate the ability search, cross-index, and retrieve information, that the original source and origin from whence the information came becomes increasingly difficult to verify, thus creating the problem of attesting to the authenticity and official status of an information item that has been orphaned from its parent.

- **Debunking the Myth:** New technical information attribution concepts and technologies, such as the Unique Object Identifier, offer the promise of "automatically" imprinting information so that its source, origin, and context are not lost when the information is removed from its original locus. However, these developments will require strong standards support and meanwhile the problem is exacerbated. The federal information community, under the aegis of the CIO Council, should ensure that such a development is afforded high priority.

4. *The Paradigm Shift***: A recent National Academy of Sciences report says, "information is increasingly becoming an event to be viewed or experienced, rather than packaged as an artifact to be kept and archived."**

Of all the paradigms discussed herein, this one is perhaps the most fundamental and far-reaching. It accounts for a mindset that is becoming pervasive. For example, an MIT professor recently told a

library gathering "I haven't been to the library in the last four years," because, she explained, "research (in my field) is evolving so quickly that there is no use anymore in publishing in paper."

In a recent meeting between NCLIS and a government official, a young recent computer science graduate, told NCLIS that in his field "everything I need to know is on the web or I can communicate with my colleagues on the web so I don't need to research historical information, so I don't see why libraries or other government depositories need to keep information for more than a year at the most."

- **The Myth**: All of mankind is inexorably moving into a kind of real-time mode whereby the "present tense of the human record " is the only thing that will be really important anymore. The "past tense or historical record" is increasingly of limited value according to this theory, and will ultimately become the province of a few seedy historians keeping dusty electronic artifacts on remote Tibetan mountaintops. Sayings such as "learning lessons from the past," and "the past is prologue," are passé' in the Internet Age because developments are occurring too swiftly to allow time to review past experiences and the history of the human record.

- **The Reality:** It can be argued that this mindset was behind the Department of Commerce's announcement in 1999 that it wanted to close down NTIS and transfer its holdings and operations to the Library of Congress. In the public announcement there was a "concession" that information should be held for three years, but by inference, no longer. Yet statistics show that nearly two-thirds of all requests for NTIS materials are for over materials that are over three years old, and one third is for requests for materials that are over 10 years old. This point of view, to the extent that it is apparently now beginning to drive government policy, could easily result in the dangerous loss of the historical record of the United States. While some scientists in extremely fast-moving fields such as computer science may take this view, certainly when it comes to the arts, to the humanities, to the social sciences, and even the traditional physical sciences of physics, mathematics, and chemistry, the knowledge base of past discoveries is absolutely essential to the forward progress of those fields, and the creation of new knowledge. Associated with this phenomenon is the increasing pressure to forego permanent records retention in favor of temporary records retention, thereby eroding the ability of the National Archives and Records Administration (NARA) to comply with its statutory mandate to preserve the federal record.

- **Debunking the Myth:** The irony of this situation is that modern electronic information and communication technologies are making the mass storage of, the searching for, and the retrieval of information from electronic repositories a technically feasible and cost-effective reality. So why, in the face of these technological advances, would one even want to "throw everything out that is a year or so old" if it can be held efficiently and cost-effectively in electronic storage? Moreover, it would not at all be difficult to arrange a controlled pilot test whereby a researcher was given a "bench challenge" but his/her access to information more than a year old precluded, while another researcher given the same challenge was given access to historical information. The results could then be compared. Can the U.S. government really afford to encourage and foster this mindset when the risk of a failed policy may well result in the irretrievable loss of the U.S. world leadership in science and technology in so many fields, not to mention all of the other disciplines? NCLIS admonishes national leaders to make it crystal clear that preservation of the human record is absolutely vital to our democracy, lest government officials get the mistaken idea that they can forget about yesterday's information with complete impunity. To return to the National Academy of Sciences report, NCLIS would amend the statement to read: "information is increasingly becoming an event to be viewed or experienced, but information must always be packaged as an artifact to be kept and archived in order to preserve mankind's record and hold leaders accountable."

5. *The Paradigm Shift***: Information life cycle management authorities and responsibilities within departments and agencies are dispersed, fragmented, decentralized, and compartmentalized. Internal agency information management continues to be split from external agency information management, essentially by two different worlds. Moreover, the increasing movement to electronic publishing has exacerbated the problem of agency-wide oversight of electronic government information because no single office in the agency has clear, overall, lead authority for the life cycle management of both internal and external agency data, documents, and literature, although the Chief Information Officer (CIO), the public affairs office, and the printing and publishing office all have partial responsibility.**

Information having a *life cycle* is not a new idea, whether government information or *any* information for that matter. A useful analogue often mentioned is the concept of the *product life cycle*. That is, in the business world, as taught in business schools, a product is "born," "matures," "demand levels off," and then customer disinterest sets in and product sales decline and finally the product is taken out of production and off the shelves. Another analogue sometimes used is the biological life cycle. That is, an organism is born, grows, matures, declines, and eventually dies.

Applied to the creation, handling, disposition, and archiving of information, the life cycle concept follows a similar circular path, which is both endless and continuous. However, the usual starting point is when information is first created, whether that is a document, an e-mail message, or anything else, regardless of format or medium. One useful portrayal of the steps in the life cycle follows, although the authors concede there may be many variations of this graphic:

Government information is:

- **Step 1**: Created and produced (by authors in all agencies, in all branches, at all levels, and in many different formats and mediums).

- **Step 2**: Cataloged and indexed (metadata tools applied).

- **Step 3**: Temporary and permanent availability and entitlement established (ownership and disclosure rights of creators, publishers, disseminators, licensees, franchisees).

- **Step 4**: Published in the public domain or withheld from disclosure pursuant to a wide variety of statutes, internal agency policies, foreign agreements, and so forth.

- **Step 5**: Put into files, databases, collections, holdings, and other storage repositories.

- **Step 6**: Communicated, disseminated, and distributed.

- **Step 7**: Searched for and retrieved (full text, abstracts, key words).

- **Step 8**: Used for decision-making and problem solving.

- **Step 9**: Archived.

- **Step 10**: Re-used over and over again by government officials, journalists, archivists, researchers, citizens, and others (information recycled).

- **Step 11**: Disposed of (temporarily or permanently).

- **Step 12**: Expunged or destroyed if permanent retention period exceeded.

- **Step 13**: Need for new information to replace old information established.

Obviously the above steps in the Information Life Cycle could be expanded or compressed, depending on one's particular purposes. Moreover, there is certainly room for debate has to how we've framed the sequence of specific steps or stages, and depicted their inter-relationships, and admittedly rather

cryptically defined them. Nor do we mean to imply simply because the steps are schematically portrayed as a circle that all steps necessarily always occur iteratively in the same "prescribed" sequence. Oftentimes some steps may proceed in parallel, one or more steps may be "leapfrogged," or the consequences of dealing with the information in electronic formats and mediums are different than those used when the data is in pre-electronic forms. But, for working purposes, notwithstanding these caveats, we would like to move forward with our discussion using this twelve-step methodology. Perhaps one of the benefits of this paper will be to refine and improve the above construct.

- **The Myth:** Every step and stage in the information life cycle is completely independent of every other step and stage in the life cycle, both those that occurred before it, and those that will occur after it. There is no point in trying to link and interconnect the steps and stages in the life cycle because trying to specify the precise nature of those links would be so time-consuming and expensive that one would spend more time specifying the links than paying attention to the step or stage in question. Besides, each step or stage probably involves different people, with different skills and different expertise, operating in different divisions and units in the overall organization, with different authorities and responsibilities, and different goals and objectives, and all using different hardware and software and systems and networks. In short, "why should we mind somebody else's business when we can barely manage our own?"

- **The Reality:** Each step and stage in the information life cycle is interdependent with and on every step that preceded it and every step that will occur after it. If one ignores these interdependencies, and counter dependencies, one pays the price of recreating information at each stage of the life cycle, in a unique and customized format and medium that may or may not harmonize with the formats and mediums that preceded that step and will follow it. Many years ago, in the 1950's, the concept of Source Data Automation (SDA) was in vogue. But it was a concept many years ahead of its time. Essentially this concept was closely linked to the life cycle of information idea. It urged information creators (such as authors and publishers) to create information products and processes in formats and mediums that could easily and cheaply be converted and be made minimally compatible with, if not entirely consistent, to formats and mediums utilized for handling the same information later in the life cycle. At that time the pressure to automate processes was just beginning, and converting "manual" products and processes, as they were called in those days, to computer-assisted products and processes was so great that the SDA concept never got very far. But the reality today is that most systems and sub-systems that handle information are incompatible and inconsistent, and there is an entire industry "systems integration" that has evolved just to help pay the price of our failure to follow the source data automation and information life cycle precepts.

- **Debunking the Myth:** We need to return to the basic precepts of source data automation and life cycle management and ensure that they are adequately taken into account when new information products and processes are first on the drawing boards. It is too late to deal with the problem once products and processes have been designed, developed, tested, and debugged. Then the investments are virtually irreversible. To do this, the government needs to strengthen its policies and procedures, and demonstrate the practical applicability of the concepts to the bottom line of agency budgets and information use efficiency. To that end, revisions are needed in the Paperwork Reduction Act and OMB Circular A-130, in particular. Those suggested revisions are dealt with in the Commission's final report in greater detail. They are also spelled out in another NCLIS staff paper entitled "The Government Information Life Cycle Management Concept."

6. *The Paradigm Shift*: **There appears to be a trend in federal agencies to replace a comparatively much more proactive policy to disseminate government information to the public, including reaching out to the public to notify them of what was available to them, with relatively much more passive policies that shift the burden of knowing what**

government information exists, then trying to identify it, then find it, and then access it. The consequences of this shift in agency stance are far-reaching, especially in terms of exacerbating the Digital Divide.

It is not surprising that as agencies realized the power and efficiency of the web enabling them to publish vastly increased quantities of information on their sites (as opposed to utilizing pre-electronic formats and mediums such as ink-on-paper and microforms) they rather naturally assumed that they had not only, in one fell swoop as it were, satisfied the need to provide *access* to public information, but also simultaneously had *disseminated* it as well*!* In short, they shifted the burden of dissemination from themselves to the public. This is a complex and difficult policy area, and certainly "the dust has not yet settled" on the debates that have, and will continue to occur both within the Administration and the Congress on the matter. *The policy question is: Does providing electronic access to digital document images constitute dissemination within the meaning of the various statutes that provide for an agency to dissemination certain of its information holdings to the public?* There are arguments on both sides. Certainly the agencies have a strong argument that they should not have to duplicate electronic accessibility with hard copy dissemination of the same information - - that is absurd. But, at the same time, there is a gray policy area in the middle. Dissemination in the pre-electronic era carried with it the idea that an agency would make a special effort to ensure that their public information products did, indeed, reach their intended audiences, both general and special. This was accomplished through the extensive use of distribution and mailing lists that were kept current. *But in the electronic era, the use of distribution and mailing lists clearly defeats the purpose of broadcasting the availability of and accessibility to the information electronically, utilizing the vehicle of the website.* And the possible use of "cookies" as a device for verifying whether or not a certain information product did or did not reach its intended audiences is in many cases at least controversial if not downright illegal and unethical. The one exception to this might be where the agency intends that its public information be available to all sectors of society, without regard to special, targeted sub-populations (e.g. the disadvantaged). Yet, it is an arguable proposition that all agency public information should be disseminated to all sectors of society. It certainly never was in the pre-Internet era. Has the mere fact that it can be disseminated in the Internet era changed that?

- **The Myth:** Providing access to public information in electronic form on agency websites removes the obligation of federal agencies to ensure that the information which they have posted to their websites has, indeed, reached its intended audiences. Information dissemination, in short, is a passé' concept that has been completely supplanted by electronic information access in the Internet era.

- **The Reality:** Providing access to public information in electronic form on agency websites does not remove the obligation of federal agencies to ensure that the information they have posted does reach its intended audiences, especially in instances where the sub-population(s) to be reached are disadvantaged in some respect. The broadest definition of "disadvantaged" includes minorities, senior citizens, school age children, the physically and emotionally disabled, the economically disadvantaged, and the computer and information illiterate. It also includes Americans living in tribal areas and in relatively inaccessible rural areas remote from normal infrastructure services provided urban populations such as electricity, telephones, and so forth.

- **Debunking the Myth:** The Federal Government must rethink its public information dissemination posture in the Internet era, taking into account the disappearance or downgrading of the use of distribution and mailing lists, and other tools and techniques, for ensuring that information disseminated to the public did, indeed, reach the targeted audience(s).

7. *The Paradigm Shift*: **Increasingly, physical libraries and information repositories are being replaced with virtual libraries and repositories, but the consequences and implications of this shift have not been adequately assessed.**

Libraries have always had to cope with collections composed of a wide mix of mediums and formats in which their acquisitions came "housed." Maps, recordings, photographs, special materials for the blind and the handicapped, and old manuscripts have been a challenge to libraries for millennia, not just centuries. In the middle of the last century the advent of microforms - - microfilm, microfiche, and other related formats began to insinuate themselves into the library's collections. Libraries had to begin buying a variety of special readers and printers, and set aside special reading rooms devoted to their microform collections. When the earliest computers appeared in the late Sixties and early Seventies, they began slowly to develop online catalogs and acquire some early online databases, either public domain databases or on a commercial subscription basis. CD-ROM's introduction brought with it additional complications due to proprietary and more complex search and retrieval technical instructions which librarians had to learn and understand before they could train their patrons. Seldom did the library budget keep up with the cost of special equipment, special facilities, special training, and special (meaning in most cases *higher*) costs for acquiring, maintaining in peak operating condition, upgrading as untold new versions kept reappearing every month, for all of these new formats and mediums. The obsolescent technologies were never completely replaceable by the newer technologies. That capital investment became a sunk cost. Now, the Internet Age has arrived. More and more material is being made available in electronic forms, accessible via websites.

- **The Myth:** Many futurists are having a field day predicting that the demise of the physical library is "just around the corner," "perhaps a little later," "if not much sooner." These old fashioned libraries, these Cassandras predict, will go the way of high button shoes and the surrey with the fringe on top, and be replaced by *virtual* libraries which require nothing more than a desktop or laptop to access their holdings since no physical institution of any kind would be required. Digitized collections become the name of the game. Anything that isn't digitized is passé'—somehow second-class in the information world.

- **The Reality**: It is an economic impossibility to digitize everything. Even the richest endowed institutions must make judicious budgetary decisions on what they can afford to digitize based on a whole host of considerations, including the needs and wants of their constituents and clienteles, the condition of their materials and how much danger certain kinds of materials may be in, and so on. "Born digital," many are now saying, is the real answer to the challenge, and we must find the means to live with pre-digital and digital mediums for a very long time - -at least many generations.

- **Debunking the Myth**: Libraries as physical institutions will not disappear for many moons. For future generations, they will remain as a repository of multi-media, multi-format, multi-platform information handling institutions. Public policies must be shaped to take that reality into account. Digitizing everything simply does not make sense, either from a preservation standpoint or from an economic standpoint. Moreover, many users of government information, for example, are disadvantaged and cannot use electronic materials for reasons cited elsewhere in this paper. Libraries as public institutions must never lose sight of the needs of all citizens they serve, not just those who happen to be able to afford their services, have easy access to them, and who have the requisite degree of computer and information literacy to search for and utilize electronic materials.

8. *The Paradigm Shift*: **Paperwork is being compounded by "Electronwork" which can be even more onerous and burdensome and costly than paperwork ever was. While the government is moving to replace paper-based public transactions with the government with electronic-based systems, pursuant to the Government Paperwork Elimination Act and similar**

legislation, there is a more or less blind assumption that "electrons are always better than paper." Although this controversy is not unique to this study's core objectives, nevertheless NCLIS has seen fit to alert the President and the Congress to a potential problem in the future.

While most people seem to agree that paper will never disappear, even at the height of the electronic information age. As has been pointed out many times, desktop printers have proliferated at a rate that seems to have kept pace with the proliferation of desktop computers and modem connectivity. Big central government printing plants like the Government Printing Office may be becoming the dinosaurs of the Information Age, but the paper and pulp industries do not seem frightened at the prospect of paper ever disappearing, even as laser printing supplants ink printing. Quite to the contrary! It can be argued that all that has really happened is that the burden of printing has shifted from the front end of the information life cycle when publishers' had to worry about massive print runs, to the middle of the cycle when Internet users download documents from the web and print them on their local printers. Gradually it is dawning on people that "Electronwork" can be far more insidious than paperwork ever was! That is to say, the burdens and costs of working in electronic formats and mediums, and on electronic platforms, can be far more onerous than pre-electronic formats and mediums. In short, paper is not necessarily "all bad," and there are many instances where paper is still the preferred medium. The Government Paperwork Elimination Act and the Paperwork Reduction Act both recognize that, but the recognition needs to be translated into more concrete operational guidance for federal agencies.

- **The Myth:** Paper formats and mediums are all bad; they should all be replaced as quickly as possible, depending primarily on economic considerations. The sooner we can shift from paper and microforms to electronic mediums and formats, the better. Only then will we be able to deal meaningfully with information preservation and permanent public availability effectively. Paper-based systems are almost always far slower, far more costly, and far more inefficient than are electron-based systems.

- **The Reality:** A family of pre-electronic and electronic information handling formats and mediums is a far more realistic approach for the government to take than a monolithic policy of "everything must go electronic tomorrow." Many citizens and disadvantaged populations are simply are not equipped to deal with computers or telecommunications connectivity. They either live in remote rural areas, are too poor to afford computers and modems, do not know anyone who has such capabilities, and are so computer and information literate that they do not even know how to find help. Moreover, history has demonstrated that as new mediums are invented and begin to spread into general use, they nearly always take their place side-by-side with existing mediums. This was true of radio when television came along, the telephone when faxes came into use, and broadcast when cable was invented. All of these mediums are still in use; we've simply added one more medium, albeit an extremely powerful one, to the existing family of mediums. Each medium has its own benefit:cost ratio depending on many variables, including convenience, urgency, capabilities of both senders and receivers (not just senders), cost, need for confidentiality, and so forth. Moreover, even many highly computer and information literate individuals who could convert to using the Internet almost exclusively, prefer to utilize all available mediums, even paper, couriers, and conversation over morning coffee!

- **Debunking the Myth:** Dissemination of government information to the public laws, policies, and programs must take into account the need for federal agencies to offer a family of mediums and formats for dealing with all segments of society. Users of government information are an extremely diverse class, ranging from the highly computer and information literate at the one extreme, to the computer and information illiterate at the other, including disadvantaged individuals from an economic, physical, or minority status standpoint. Individual laws, policies,

guidelines, and programs should be reviewed to ensure that government is not putting all of its eggs into the Internet basket, so to speak.