ASSESSMENT OF FORMATS AND STANDARDS FOR THE
CREATION, DISSEMINATION, AND PERMANENT ACCESSIBILITY
OF ELECTRONIC GOVERNMENT INFORMATION PRODUCTS

PHASE I DELIVERABLES

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INTRODUCTION

This "Assessment of Formats and Standards for the Creation, Dissemination, and Permanent Accessibility of Electronic Government Information Products" is being conducted by the U. S. National Commission on Libraries and Information Science under an Interagency Agreement with the U. S. Government Printing Office that was approved by the Joint Committee on Printing. The Computer Science and Telecommunications Board (CSTB) of the National Research Council has been selected to participate throughout the study.

Information gathered in this Assessment is to be used to facilitate improved public access to electronic Federal Government information made available through the Federal Depository Library Program and could be used to facilitate improved public access to electronic Federal Government information in general. According to the Interagency Agreement, this Assessment is expected to identify formats most appropriate for dealing with electronic information products throughout their life cycles, evaluate the plans of agencies, assess the cost-effectiveness and usefulness of various electronic formats, and assess formats most conducive to maintaining permanent accessibility.

The study is divided into three phases. In Phase I, CSTB develops a detailed statement of work (presented in this document) that defines the data collection process required to conduct this Assessment. Contractors other than CSTB will be engaged to perform the research and data collection in Phase II. For Phase III, CSTB will draw upon experts to review the data and develop conclusions and recommendations.

As indicated, the detailed statement of work is contained within this document. However, the larger framework for this study also needed to be sufficiently developed so that the appropriate data is defined for collection in Phase II. This preliminary framework, which will be elaborated upon and refined in Phase III, is also contained in this document. The preliminary framework will be used to develop a prospectus for Phase III, a necessary step towards establishing a formal CSTB project. The list of resources identified throughout Phase I, including all consultations, concludes this document.

This document is a staff product. It is not an NRC report.

DEFINITION OF ACRONYMS AND TERMS

ASCII	American Standard Code for Information Interchange
CD-ROM	Compact Disk-Read Only Memory
CENDI	Commerce, Energy, NASA/NLM, Defense, Interior
DTIC	Defense Technical Information Center
ERIC	Educational Resources Information Center
FED-STDS	Federal Telecommunications Standards
FIPS	Federal Information Processing Standards
GILS	Government Information Locator Service
HTML	HyperText Markup Language
NTIS	National Technical Information Service
OMB	Office of Management and Budget
PDF	Portable Document Format
SDTS	Spatial Data Transfer Standard
SGML	Standard Generalized Markup Language
TIFF	Tagged Image File Format
WWW	World Wide Web

dBASE	a relational data base format
Electronic Government Information Products	discrete sets of Government information, either conveyed through tangible (i.e., physical) electronic media, or made publicly accessible via a Government electronic information service. Electronic Government information products comprise of one or more information containers and may be made up of multiple formats..
Format	a specification for organizing data or information, such as TIFF or ASCII
Government	The Federal Government of the United States--Three Branches
Information Container	information that is organized in some way so that it may be interpreted by others. Print examples include articles, brochures, and technical reports. Electronic examples include an interactive map on a WWW site and an article in PDF. Information containers will generally have one or few formats.

Media	the physical or electronic means by which information is communicated--CD-ROM, floppy disk, telecommunications channel, etc.
WWW Site	File or group of files organized under a home page that is accessible through browser software on the WWW. The home page is typically an index, welcome, or menu WWW page for a distinctive activity or service. A WWW site could be an agency's entire presence on the WWW.

ASSESSMENT OF FORMATS AND STANDARDS FOR THE CREATION, DISSEMINATION, AND PERMANENT ACCESSIBILITY OF ELECTRONIC GOVERNMENT INFORMATION PRODUCTS

STUDY FRAMEWORK

This is a preliminary concept paper. It is not an NRC report.

Introduction

Advances in computer and telecommunications technology fundamentally alter information dissemination. Established concepts such as the definition of a book or directory become unclear in the context of analogues on the WWW. Users in the electronic environment need to know a lot more about the processes of information dissemination than in the print world. In the print world, you can a purchase a hardcover book with quality paper and binding, or an inexpensive paperback version produced with lower quality materials. Your "browser" are those optical wonders located just above your nose and they are very easy to use--you don't need any documentation or training.

In the electronic world, however, a user needs to know a great deal about the technology associated with information dissemination. Can I read the format? Is it in PDF? Microsoft Word 6.0? Do I have enough memory? Hard disk space? Do I have the optimal WWW browser? Is my Internet connection fast enough? Why is my computer crashing when I try to read the document? Where can I print it out? Do I need special conversion or printer driver software? How much does it cost? And so on.

The purpose of this study is to examine some of the issues concerning access to electronic Government information and to derive conclusions and recommendations to improve public access What are the different information containers (ways to package information such as a magazine article), media, and formats that are used and why? What are the issues concerning the evolution towards standards or other means to simplify access thereby easing the burden on information users?

The context for this study are those electronic Government information products available to federal depository libraries. Because the Federal Depository Library Program represents a diverse range of libraries--small and large, rural and urban, public and research/academic, those with minimal and extensive information technology resources-- the findings are also likely to be generally applicable to the users of electronic Government information products.

There are a number of institutional issues. A key concern is cost. What are the costs involved in electronic dissemination over the life cycle of information? How do these costs vary with different types of information containers, media, and formats? What is the cost impact in the transition to a primarily electronic environment on the users of Government information.

There are also a number policy issues regarding the roles of Government and private sector information intermediaries in the electronic environment. An important issue that requires clarification is ensuring the permanent accessibility of electronic Government information. What are the issues? How is permanent accessibility achieved? Who should be responsible? And at what cost?

What is an Electronic Government Information Product?

Familiar artifacts populate the world of paper-based or other non-electronic Government publications, such as books, newsletters, journals, articles, and technical reports. Government records constitute the evidence of governance and include both publications and other records that are typically not intended for general dissemination to others. An example of the latter could be the files describing the grant recipients of a federal matching grant program for cities.

In the transition to electronic information--tangible (i.e., physical information products such as CD-ROMs) or intangible (e.g., WWW)--some of the customary definitions of publications continue to be useful. For example, the concept of an article remains intact as an exploration of a specific topic that can be read within an hour or so (loosely speaking). Sections of an article might appear on individual WWW pages linked to the table of contents page, but the essence of the article as a conceptual whole persists.

Other publications from the non-electronic regime, however, may make less sense in electronic formats because of the improved alternatives that electronic technology make possible. These new means of electronic information dissemination and the existing print and electronic publications may all be described more generally as information containers. An electronic Government information product comprises of one or more electronic information containers.

The transition to electronic information has other implications. For example, the distinction between information dissemination (an intention to make information available to the public) and information disclosure (an agency response to a specific request) can become unclear when both activities may be conducted at the same WWW site. Those agencies that sell information to a limited constituency may find that electronic technology provides both new capabilities and challenges (an example of the latter is the ease of electronic copying). In addition, the act of print publication implies a previous assessment

that the information is worthy of dissemination because the publication process requires significant effort. From a technological point of view, less effort is usually required to put up the same information on the WWW. Electronic information can also be easily revised and so preliminary or draft versions, which would not have been distributed in paper form, may often be made available on the WWW, which also raises concerns about what information should be publicly available.

Question #1: What are the different types of non-electronic information products and information containers used by the Government?

Question #2: Of the information containers in a non-electronic world that are used by the Government, which ones have continuing applicability in the tangible electronic information world? In the intangible electronic information world?

Question #3: Are there new information containers in the electronic information world (tangible or intangible) that do not exist in the non-electronic world?

Question #4: What would be a taxonomy of information products and information containers for tangible and intangible electronic Government information?

Question #5: How much information is disseminated via each of the information containers?

Question #6: Describe the editorial process for on-line / WWW based electronic information dissemination and whether that process differs from the editorial process for print publications.

The Optimal Media Mix for Government Information Products

It is a not uncommonly held view that Government information will and should be largely disseminated via on-line technology (e.g., WWW) in the not-so-distant future. The implication with this view is that paper, microfiche, CD-ROMs, and other tangible information products should be used less and less often for Government information dissemination. This proposition deserves closer scrutiny.

A transition to primarily electronic dissemination may affect access to Government information. Individuals and organizations obtain Government information from a variety of sources from articles in newspapers and segments on television news programs to visits to agency regional offices or federal depository libraries, and many more. Access is also dependent on the resources available to an individual or organization, such as the proximity to libraries and other information institutions and nature of computing resources available. Some federal depository libraries will be able to offer improved services that technological innovation make possible. Other federal depository libraries may encounter

difficulty in securing the resources to provide reasonable access to electronic Government information products to their users. Thus, the increasing electronic dissemination of Government information may facilitate access for some and may deter access for others.

There is a paucity of analyses of the life cycle costs of electronic dissemination and even less when seeking cost comparisons with paper or other dissemination alternatives. There is, however, no shortage in the belief that electronic dissemination has much lower life cycle costs than print dissemination. The introduction of computers into organizations--whether as data processing, office automation, or management information systems--was often based upon cost savings arguments. It is unclear whether these cost savings have been realized. In the present instance, therefore, we should be wary of the cost savings argument in the absence of a robust analytical model and supporting data-- which will be addressed in greater depth in a subsequent section of this report.

The caveats above are not intended to minimize the considerable advantages of on-line access to Government information, but rather to frame the question so that other potentially viable media are considered. Media selection should facilitate access to Government information and so the needs and technological capabilities of the intended audience should be in harmony with the medium of dissemination. Insofar as it is feasible, media selection should also facilitate unintended use of Government information.

Question #7: What are the different kinds of media and the mix of media used for information dissemination by Government agencies?

Question #8: How much information is disseminated for each media type?

Question #9: What is the expected future mix?

Question #10: What are the criteria used in determining the mix?

Question #11: How do individuals and organizations gain access to Government information?

Question #12: What are the factors that affect an individual's or organization's easy access to Government information?

Question #13: How does the transition to primarily electronic dissemination affect access to Government information?

Information Formats and Standards

A wide variety of Government information--data/statistics, text, geo-spatial, graphics, multimedia, audio, video, and combinations thereof--is disseminated using a multitude of formats--such as HTML, PDF, or ASCII. It is left to the user to determine how to access the information of interest. Reducing the number of different formats will serve to facilitate access to Government information by users and streamline information exchange among agencies of the Government.

OMB Circular A-119, which addresses the use and adoption of voluntary standards defines a standard as:

> "A prescribed set of rules, conditions, or requirements concerned with the definition of terms; classification of components; delineation of procedures; specification of dimensions, materials, performance, design, or operations; measurement of quality and quantity in describing materials, products, sytems, services, or practices; or descriptions of fit and measurement of size."

Circular A-119, which applies to the Executive branch, encourages agencies to adopt voluntary or defacto standards already established by industry. In the absence of established relevant standards, agencies may engage in setting their own standards. The Government itself has a number of standards managed by the National Institute of Standards and Technology (FIPS--Federal Information Processing Standards) and National Communication Systems (FED-STDS--Federal Telecommunications Standards), which are mandated for use by agencies.

Technology standards have beneficial effects because fewer formats across information containers reduce costs for the users of information, thereby allowing for common solutions to common problems. However, too many technology standards can inhibit innovation by agencies and result in suboptimal performance through the use of inappropriate technologies. In addition, because of the scope and influence of the Government, standards adopted by the Government can affect the behavior in other sectors of society, for better or worse.

There may be layers of standards. Media may have physical standards and specifications for how data is organized (e.g., tracks, sectors, blocks). Data may be represented via certain standards (e.g., ASCII). Information may conform to standards such as PDF. Other types or levels of standards may also be pertinent.

Standards for locating information (i.e., metadata) may prove to be as important as standards for information formats. Well developed cataloging systems exist for the static and well-defined information containers of paper publications. Search tools such as the popular search engines on the WWW are primitive by comparison, although there have been some recent initiatives in the federal government (e.g., GILS) to try to improve locator services. Standards for coding data (so that the same data item has the same meaning in multiple sources) also facilitate data access.

In comparison to paper publications, electronic versions can be easily modified with the resulting changes virtually undetectable. Therefore, there is the concern for assuring the integrity of an electronic publication to protect from inadvertent changes, intended well-meaning changes, or deliberate attempts to mislead. Various technologies such as encryption and watermarks can serve to ensure the authenticity and integrity of an electronic publication.

Question #14: Describe the formats used in the creation and dissemination of electronic information by agencies.

Question #15: Are certain formats mandated for use throughout the agency? Accepted as standard agency practice? Recommended or suggested? How did these formats become formal standards or agency practice? On whose initiative? How successful are these formal standards or practices in facilitating access to Government information?

Question #16: What facilities are available to identify and locate an agency's electronic information? What facilities are available to identify non-agency electronic information that is likely to be pertinent to a user of the agency's electronic information?

Question #17: What are the issues in ensuring the authenticity and integrity of Government electronic information?

Question #18: What, if any, mechanisms are used to ensure the authenticity and integrity of publications disseminated electronically?

Question #19: What are the FIPS and FED-STDS that are relevant to this study? Do agencies comply with them? Are these standards helpful?

Question #20: What are agency plans with respect to Questions #14, 15, 16, and 18?

Question #21: What are the trends in standard formats in other sectors of society? Particularly in state and local government, the computer and telecommunications industry, higher education, and the communications industries (e.g., media, publishing)?

Question #22: What are the characteristics and models of successful standards?

Question #23: When the Government adopts a particular standard, which sectors of society are most affected? What is the impact on these sectors?

Question #24: Are there certain types of information content or media selection for which standards have (or could have) a more beneficial effect?

Question #25: Based upon the findings from questions #14 through #24 above, what are the implications for federal depository libraries?

Performance Criteria for Formats

An alternative to specific technology standards is the adoption of performance criteria, which are desirable characteristics for information dissemination that are encouraged or mandated by agencies. Performance criteria are more generalized than specific information formats and are intended to serve as guidelines through numerous product life cycles. As with technology standards, the objective is to simplify information access for the users of Government information. *Examples* of performance criteria could include:

a. Information is accessible by the blind
b. Individuals who have access to typical computer hardware and software
   (i.e., not state-of-the-art) for the intended audience can access the information
   in a reasonable manner.
c. Formats that are used must have open architectures.

Except for the distribution of bulk data, the WWW is fast becoming the medium of choice for Government electronic information dissemination. Particular characteristics of WWW sites can facilitate ease of use--such as simple and consistent look and feel and link navigation.

Question #26: Describe the performance criteria that the agency uses in its information dissemination. How are these criteria communicated within the agency?

Question #27: Describe agency plans for the development of performance criteria.

Question #28: Are there typical performance criteria in other sectors of society? Particularly in state and local government, the computer and telecommunications industry, higher education, and the communications industries (e.g., media, publishing)?

Technological Aspects of Permanent Accessibility

The preservation and permanent accessibility of Government paper publications and microfiche is well established through the holdings of the National Archives and federal depository libraries and their efforts to make information available to the public. Ensuring that electronic information is also permanently accessible is in its infancy and is not a straightforward application of the mechanisms for paper publications to electronic information because electronic information is qualitatively different.

The basic objective with paper-based archives is to keep what you have. For electronic information, this is a challenging objective because of the evolution in technology--all technologies become obsolete and seemingly at an ever increasing rate. One strategy is to retain the various old technologies indefinitely so that archived information can be properly interpreted.

There are other alternatives that involve technological migration. Information can be copied from old media to new media. Information can be converted from old formats to newer formats. Or new software applications can be designed to read old formats. Any conversion or re-interpretation of information allows for the possibility that the new version may differ from the original, raising the question of whether the new form of the information is officially or legally equivalent to the original.

Question #29: What are the specific issues regarding the migration of Government electronic information to support permanent accessibility?

Question #30: How do we ensure that electronic information that is converted to a new format is equivalent to the original information--in terms of content and legal/official status?

Question #31: How are agency WWW pages and other on-line information managed to ensure permanent accessibility? What are agency plans?

Question #32: How does an agency determine or ascertain which subset of its electronic information merits permanent accessibility?

Question #33: What are the electronic information formats most conducive to permanent accessibility?

Question #34: What are the alternate mechanisms that could be used to ensure that electronic documents that are made to be permanently accessible are authentic when disseminated and the integrity of the document may be easily determined after dissemination?

Managing Access to Electronic Government Information

As previously discussed, standards for formats can facilitate access to Government electronic information. However, if it is not feasible to implement standards, an alternate process to arrive at the same outcome from the user's perspective is to have an information intermediary convert information from various formats to one of several preferred formats. This process already occurs within some agencies (e.g., Department of Education's WWW page--a central unit converts documents to one of a few standard formats before posting documents on the Department's WWW page). The conversion

proposal raises the issue of how much publishing activity should be undertaken by a Government information intermediary, rather than by private sector publishers. Where does "conversion" end and "value-added" begin?

Accessing information implies identifying relevant information and ascertaining where it may be obtained. Insofar as agencies make their own decisions with respect to electronic dissemination, what mechanisms are needed to identify and locate information among agencies?

The electronic environment provides opportunities for new models of dissemination. For example, the Department of State, University of Illinois at Chicago, and the Government Printing Office entered into a partnership whereby the University of Illinois at Chicago manages the Department of State Foreign Affairs Network, while fulfilling the requirements for the Federal Depository Library Program. The National Library of Education has an Internet reference desk, askERIC. Reference questions are submitted via email and answered by staff at Syracuse University, or referred to one of fifteen content specialty clearinghouses.

Question #35: The conversion of electronic formats by an information intermediary has been suggested as an alternative to developing format standards among information producers. What are the key issues in such a proposal?

Question #36: Besides the development of format standards for information producers and the format conversion alternative, what are other ideas (with respect to formats) to simplify access to electronic Government information?

Question #37: What are the different models for cooperative arrangements?

Question #38: What are the various cooperative arrangements in existence? Could cooperative arrangements such as the Department of State/University of Illinois at Chicago/Government Printing Office serve as the model for permanent accessibility?

Question #39: How can locator services be further developed? What mechanisms within agencies are necessary to ensure that relevant materials can be reasonably identified and located?

Costs of Electronic Information Products

As suggested earlier, it is a popular belief that the electronic dissemination of information is less expensive than other modes, particularly print publication. In a simple analysis in the short run, such a conclusion may seem plausible, if for example one compares the cost of putting up a document on the WWW with the cost of printing a

publication and distributing it to federal depository libraries. However, life cycle costs are what is important and their computation is complex.

Although all of the elements of life cycle costs for intangible (or tangible for that matter) electronic information dissemination cannot be articulated at this point, some of them may be. We shall use the WWW as an example. First, there are the costs associated with converting the information to one of the preferred WWW formats for the agency. There are the costs for the server and its associated software, maintenance, and staff support. There are also facilities, telecommunications, and overhead costs.

After a number of years, the server technology and information formats may become obsolete and need to be migrated to a new system, thus incurring new costs for hardware, software, and so forth. At some point, the agency may decide that the information does not require direct on-line access and so archival to a system for permanent accessibility would take place. This system of permanent accessibility has its own set of costs, both initial and ongoing, and in time will become technologically obsolete itself, necessitating a migration to a successor system.

The assumptions of a life cycle cost analysis can greatly affect the outcome. One of the critical assumptions is the rate of decrease in the cost of technology. In addition, there are assumptions about the inflation rate and useful life of technology, and average use of the collection per year.

The life cycle cost model will vary with the different kinds of media. The model for WWW-based dissemination will differ from initial dissemination via CD-ROM.

So far only life cycle costs for the suppliers (i.e., the Government) have been considered. Costs for the user or intermediary (e.g., a depository library) also vary based upon how electronic information is disseminated. For example, using a CD-ROM may not require Internet access, but because CD-ROM software is not standardized, staff resources may need to be allocated to supporting CD-ROM products, which as tangible information products imply costs for cataloging, storage, and ultimately media and/or format migration. Information disseminated via the WWW obviously requires access to a computer with Internet access. However, the ongoing storage costs in the CD-ROM case are absent in the WWW instance.

In the context of the Federal Depository Library Program, there is a long tradition of cost sharing between the Government and depository libraries. The Government provides the information for no cost, while the depository libraries assume the costs of storage, preservation, access, and reference services. There is evidence to suggest that the expenditure by depository libraries is considerably greater than that of the Government. In the transition from paper-based dissemination to electronically-based dissemination, the Government saves the cost of printing publications while the user incurs the costs of printing-on-demand. It is unclear whether these aggregate costs are higher, lower, or unchanged.

The cost of access to Government information also depends on an individual's or organization's particular circumstances. The factors that influence the access to Government information have costs associated with them (e.g., computing resources available, proximity to a library with relevant resources, time, effort and knowledge required).

Question #40: What are the elements for life cycle costs for the various kinds of media used in electronic dissemination?

Question #41: Of the various elements in life cycle costs, which ones are fairly stable or can be predicted with high confidence?

Question #42: What are the specific costs for the elements in life cycle costs for the various kinds of media used in electronic dissemination?

Question #43: What are the elements and costs associated with user access to electronic Government information?

Question #44: What is the cost impact to federal depository libraries in the transition to primarily electronic Government information dissemination?

The Larger Policy Context

The transition from a primarily print world to a primarily electronic world implies changes in the definition of information containers, information formats, models for information dissemination, permanent accessibility, and the structure of costs. These extensive changes in the process of information dissemination suggest that there may be new roles and responsibilities for Government information intermediaries--those entities that facilitate the dissemination of Government information from information producers to information users--and agencies that produce electronic information--particularly for intangible electronic information products. The data and analyses from this study should serve to inform the debate on the larger policy issues concerning Government electronic information dissemination, although it is unlikely that these questions can be fully answered within the context of this study.

In some respects, the role of federal depository libraries could be unchanged for the foreseeable future. There is a large store of existing paper and other tangible information products in federal depository libraries. Additionally, although the Government's production of tangible information products may decline in the coming years, there is still expected to be a significant amount of tangible information products. For these information products, federal depository libraries could continue to serve as repositories and provide service to citizens who wish to access Government information. However, in

the context of electronic Government information, especially intangible electronic information, what is the role of federal depository libraries?

Question #45: What are the Government information intermediaries? What are their missions and current activities?

Question #46:   Which agency(ies) should have the responsibility to ensure that Government electronic information is reasonably locatable across agencies? What alternatives are there to achieve this outcome?

Question #47:   Which agency(ies) should have the responsibility to ensure that the appropriate set of information is maintained for permanent accessibility? What are the roles of agencies that produce information as compared to Government information intermediaries?

Question #48: How does the role of the federal depository library change in the electronic environment?

Question #49: Based on the findings in this study, what are the potential changes in the role of private sector publishers in the electronic environment?

ASSESSMENT OF FORMATS AND STANDARDS FOR THE CREATION, DISSEMINATION, AND PERMANENT ACCESSIBILITY OF ELECTRONIC GOVERNMENT INFORMATION PRODUCTS

STATEMENT OF WORK
FOR PHASE II

Table of Contents

Background

   Advances in computer and telecommunications technology fundamentally alter information dissemination. Established concepts such as the definition of a book or directory become unclear in the context of analogues on the WWW. Users in the electronic environment need to know a lot more about the processes of information dissemination than in the print world.

The Government disseminates an enormous quantity and variety of information in a myriad number of formats and media. The use of electronic media for dissemination is emerging as the Government's preferred option over print or other non-electronic mechanisms during the last few years. The context for this study are the electronic Government information products that are available to federal depository libraries.

Objective

This study focusses on the electronic dissemination of Government information in the effort to improve accessibility by the users of Government information. The objective of Phase II of the study is to collect data that describes certain aspects of the dissemination process. What information formats and media are used to create Government information? Through which technological mechanisms is this information disseminated? Are there standards or guidelines used to facilitate the dissemination process and are they effective? What mechanisms are in place to assure permanent access to Government information? How much does all of this cost?

Scope

The scope of this study is electronic Government information products, which are defined as discrete sets of Government information, either conveyed through tangible (i.e., physical) electronic media, or made publicly accessible via a Government electronic information service, available to federal depository libraries.

This is a staff working paper. It is not an NRC report.

INFORMATION COLLECTION FOR SELECTED AGENCIES

Recommended Agencies

Because it is not feasible to study a statistically valid sample of agencies, a small number of agencies is recommended for in-depth information gathering. Moreover, this approach is consistent with the objective of this study to develop an understanding of how electronic information is disseminated and which standards and formats are used, how policies and procedures evolved, and future directions, rather than a formal test of hypotheses.

Agencies are recommended on the basis of the desire to have: 1) a broad representation across agencies, 2) a range of information types--text, statistical/data, geo-spatial, graphics, audio, video, traditional and new document formats, 3) the inclusion of agencies involved with a variety of electronic dissemination technologies, 4) a diversity in the intended audience for the agency's electronic information dissemination, 5) a range in the size of agency, 6) the representation of a regulatory agency, and 7) the representation of a government information intermediary.

For each agency, the Office of the Chief Information Officer and the Office of Public Affairs should be contacted in addition to the specific units listed below.

1. *Department of Agriculture: National Agricultural Library (including Information Centers), Economic Research Service, and National Agricultural Statistical Service.*

In the past few years, the National Agricultural Library has committed itself to a policy that emphasizes electronic operations. The preference for new acquisitions is in electronic format. Initiated its first venture to archive its collection digitally. Began providing document delivery via fax and Internet. Recently developed a WWW policy.

The Library, in collaboration with several land grant universities, established AGNIC, a distributed network to provide a focal point for seamless Internet access to agriculture related information and resources. Another major collaboration is with Cornell University to establish a digital archive.

There are ten subject specific information centers that provide customized services to the agricultural community and others. The information centers are: Agricultural Trade and Marketing, Alternative Farming Systems, Animal Welfare, Aquaculture, Biotechnology, Food and Nutrition, Plant Genome Data, Rural, Technology Transfer, and Water Quality.

The Economic Research Service and National Agricultural Statistical Service disseminate a wide variety of information products via a sales program for tangible products and via the WWW and are engaged in cooperative agreements with the University of Minnesota and Cornell University.

Key reasons to include the Department of Agriculture: cooperative arrangements, emphasis on transition to electronic dissemination, information centers allow for efficient coverage of the Department.

2. *Department of Commerce: Bureau of the Census*

The Census Bureau collects, analyzes, and disseminates data and information about the U. S. population, housing, business patterns, agriculture, state and local governments, foreign trade, manufacturers and mining industries, distributive trades, construction, and transportation. This data and information are made available in databases, as well as in report summaries.

Census information products are made available in floppy disk, CD-ROMs, magnetic tape, printed reports, printed maps, printed brochures, and on the WWW. The Bureau operates Censtat, a fee-based subscription service that provides on-line access to various databases. A number of formerly paper reports are now disseminated via electronic formats only.

Key reasons to include Census: Diverse data types, diverse dissemination technologies, case studies for paper to electronic dissemination, broad range of information content.

3. *Department of Commerce: National Technical Information Service*

NTIS provides a wide range of services for government-sponsored scientific, technical, engineering, and business-related information. The integration of on-line services--WWW servers, intranets--is supported by FedWorld. NTIS has an archive of upwards of 3 million paper documents, which is converted to TIFF as documents are requested. New documents that are not received in TIFF are scanned and converted. Electronic Media Services, a division of NTIS, performs data capture and conversion, applications development, optical disk mastering and replication, and electronic media recording. NTIS recently initiated a pilot project with the University of California at Davis Library to provide NTIS electronic documents (in TIFF) for no charge to depository library users.

Key reasons to include NTIS: wide scope in information managed and users served, archival/permanent accessibility issues, expertise and experience in electronic conversion issues, member of CENDI, pilot project with the University of California at Davis.

4. *Department of Defense: Defense Technical Information Center*

DTIC provides information about planned, ongoing, or completed Defense-related research to U. S. government agencies and their contractors, and to the public. All publicly available information (about 50% of total) is scanned and maintained as TIFF files. Has responsibility for the official home page of the Department of Defense.

Key reasons to include DTIC: imaging and print-on-demand activities, reasonable entry point to study the Government's largest Department within the resources of this study, has good cost data.

5. *Department of Education.*

The National Library of Education manages the Department's WWW home page, has published formal WWW guidelines and standards, converts electronic documents to appropriate formats prior to posting on the WWW, and recently conducted an Internet customer survey. The Department of Education has more than 200 affiliated WWW sites, which typically reside on the computer controlled by a grant or contract recipient and is working towards a query system throughout this network. askERIC is the Library's on-

line reference librarian and is a cooperative venture with Syracuse University and clearinghouses across the country.

The National Center for Education Statistics, Office of Reform Assistance and Dissemination, and Office of Postsecondary Education should be part of the data collection effort. As leads develop through the course of data collection, other units within the Department should be included.

Key reasons to include the Department of Education: Initiatives with WWW, on-line reference service, converting electronic documents, range of activities and user community, size of the Department allows for wide coverage of activities, large but resource constrained constituencies.

6. *Department of Health and Human Services: Food and Drug Administration*

The Food and Drug Administration (FDA) is responsible for ensuring that foods, drugs, biological products, medical devices, cosmetics and products that emit radiation are safe. The operations for the agency are organized into eight units: Centers for Biologics Evaluation and Research, Devices and Radiological Health, Drug Evaluation and Research, Food Safety and Applied Nutrition, Veterinary Medicine; National Center for Toxicological Research; Office of Orphan Products Development; Office of Regulatory Affairs.

As a regulatory agency, the FDA has extensive relationships with industry players and researchers, but also is distinctive because the agency disseminates a great deal of information to consumers. Much of this information is available on the extensive WWW site, which includes archives as far back as 1988 in some instances. The agency is also engaged in defining the criteria for acceptance of electronic records and signatures.

Key reasons to include the Food and Drug Administration: regulatory agency, extensive information dissemination to industry participants and consumers, extensive WWW site, work on electronic records/signatures/authentication, WWW archives.

7. *Department of the Interior: U. S. Geological Survey*

A case study of the U. S. Geological Survey (USGS) would highlight the issues concerning the dissemination of large quantities of scientific and geo-spatial data. The USGS has a number of CD products and in some instances, a product may comprise of more than 1000 CDs. The web site at USGS has thousands of web pages and so would be an excellent environment to evaluate the limitations of bulk data delivery on the WWW. Also, there are still many print publications as well.

The USGS also provides the context to study the evolution of a standard as SDTS (Spatial Data Transfer Standard) became an accepted standard (and FIPS 173) through the leadership of USGS and others.

Key reasons to include USGS: large quantities of geo-spatial and scientific data, extensive CD and WWW dissemination, direct involvement in the establishment of a standard.

It should be noted that it was not an objective to recommend only agencies within the Executive Branch of Government. The recommendations are based on the criteria listed above and suggestions from those who were consulted.

Nature of the Information to be Collected

Collect the following information for each of the agencies listed above:

1. Government information products are made up of one or more information containers, which are the different conceptual ways that information may be packaged. Examples of information containers include articles and directories.
      a. Describe the different types of Government information products
      b. Describe the different types of information containers for paper and other non-electronic information dissemination.
      c. With electronic information dissemination, information containers may assume familiar forms such as articles, or may be viewed in new ways. For example, a WWW page with hyperlinks doesn't have a print analogue. Describe the different types of information containers used for electronic information dissemination.

2. Ascertain how much information is disseminated for each type of information container.

3. For each type of information container, briefly describe the different categories of information content. Categories may be based on major content areas (e.g., primary education, secondary education, community college, colleges and universities, vocational education), geographic areas (e.g., Federal Reserve Bank regions), or other logical divisions that are appropriate for the agency. In general, the number of categories for each container should not exceed ten. If more than 10 emerge, report the top 10 by volume.
      a. Who are the users of the various information containers and for each of the categories within each container?

4. For each type of electronic information container, describe the editorial and approval process for disseminating electronic information through mechanisms other than the WWW.
      a. Obtain a copy of any policies, procedures, memoranda, or other documentation describing editorial and approval processes.
      b. Describe how these processes differ with the comparable processes for print dissemination.

5. For each type of electronic information container, describe the various forms of media (e.g., CD-ROM) used for dissemination.
    a. Determine the relative mix for the various forms of media for each container.
    b. Describe the criteria used in determining the media selected.

6. For each type of electronic information container and media, describe any processes and products that are used to ensure authenticity (i.e., information from government electronic sources is accurate) and continuing integrity (i.e., the information remains verifiable as an intact document through its life).

7. For each type of electronic information container, what are the predominant information formats and software used to create information products? Examples include PDF, dBASE, and TIFF. Information formats include those for creation, compression, encryption, authenticity, integrity, dissemination, and permanent accessibility. If possible, obtain a percentage breakdown for each type of electronic container.

8. Of the formats identified in (7), which of these are:
    a. formal standards of the agency? Obtain a copy of the procedure, memorandum, or other document establishing this format as a formal standard of the agency. Describe the process through which this became a formal standard.
    b. informal standards or agency practices? If available, obtain a copy of documentation establishing this format as an informal standard or agency practice. Describe the process through which this became an informal standard or agency practice.
    c. recommended or suggested formats? If available, obtain a copy of documentation establishing this format as a recommended or suggested one. Describe the process through which this became a recommended or suggested format.

9. For the formats found in (8a), (8b), or (8c) above, are there any group(s) within the agency responsible for the conversion of electronic information from its native format to one of the formats in (8a), (8b) or (8c)?
    a. What is the name of the group(s)?
    b. Describe the total volume of conversion completed in a typical month for each pair--native and conversion formats.
    c. Describe the conversion process. What parts are automated? What parts require manual intervention?

10. For the formats found in (8a), (8b), or (8c), which of these formal standards, informal standards or agency practices, or recommended or suggested formats have been the most successful in facilitating access to the agency's electronic information? Why?

11. Performance criteria are desirable characteristics for electronic information dissemination that are encouraged or mandated by agencies. Performance criteria are

more generalized than specific information formats. Examples include "information is accessible by the blind" and "WWW pages in a site must have a consistent look and feel."

     a. Describe any performance criteria used in electronic information dissemination.

     b. How are these performance criteria communicated and enforced within the agency--as formal requirements, agency practices, recommendations?

12. For the agency's official WWW site and for other WWW sites under the control of the agency:

     a. Describe the editorial process. Who has the authority to add, modify, or delete a WWW page or links to non-agency WWW pages?

     b. Obtain a copy of any WWW policies, procedures, guidelines, or style guides that are mandated, endorsed, recommended, or used in the agency.

     c. Collect usage data--how many users, how often files accessed. Obtain time series data since launch if available.

     d. Obtain any data related to customer satisfaction. Which features of the WWW site do users like? Dislike? Collect any customer survey information or summaries of user feedback, comments, or questions.

     e. Obtain customer demographic data if available. If the data is not available, develop a qualitative assessment of users. Are there significant differences between WWW users and users of the agency's non-electronic information?

     f. What are the preferred formats of the users of the WWW site (for displaying and downloading information)?

     g. Collect all documents that describe WWW sites.

13. Federal Information Processing Standards (FIPS) and Federal Telecommunications Standards (FED-STDS) are formal information technology standards promulgated respectively by the National Institute for Standards and Technology (NIST) and National Communications Systems (NCS).

     a. Which of the FIPS and FED-STDS are particularly relevant to electronic information dissemination, from the agency's view?

     b. To what extent do the FIPS and FED-STDS identified in (13a) have an influence on the agency's electronic information dissemination? Describe.

14. Of the electronic information disseminated by the agency, identify those information containers, media, or formats for which greater standardization may be especially desirable.

     a. Why is greater standardization desirable in these instances?

     b. What are the best candidates for the standards? Why?

15. Permanent accessibility provides for public access to information indefinitely into the future.

     a. Describe those mechanisms that are in place to ensure permanent accessibility for agency electronic information.

b. Describe how the agency decides what subset of its electronic information merits permanent accessibility.

c. Which information containers, media, and formats are used for permanent accessibility? How were they selected?

d. What responsibilities do other agencies have to ensure the permanent accessibility of this agency's electronic information?

16. Locator services assist the user to identify pertinent information and to determine where the information may reside.

a. Does the agency have any electronic locator services? If so, describe and obtain documentation. How did the locator get started?

b. Do the locator services provide for access to related, non-agency electronic information? If so, to what sources?

c. Does the agency participate in external (managed outside of the agency) locator services? If so, describe.

17. Identify the cooperative projects that the agency has entered into with other agencies or entities outside of the Government that provide or facilitate electronic information dissemination.

a. Describe the projects: who are the participants, what is the goal, when was it established, what is the budget, what are the outcomes.

b. Obtain copies of documentation.

18. Identify all of the life cycle cost data (which includes the costs associated with permanent accessibility) related to the electronic dissemination of information.

a. Identify life cycle cost factors for electronic Government information products and electronic information containers. Articulate detailed cost factors for dissemination (including conversion) and permanent accessibility. Examples: cost of server, telecommunications costs, cost of facilities/overhead, staff.

b. Obtain cost data for the cost factors identified above. If cost data cannot be derived for specific information containers or products, then obtain whatever aggregated data that is available. Obtain in Excel or ASCII format if possible.

c. Obtain any cost analyses, studies, or reports prepared by the agency.

d. Ascertain whether there have been recent focussed projects where products or services made the transition from print to electronic dissemination. If so, describe and obtain cost data. Were there cost savings in the short-run? Are cost savings projected for the long run? Also describe changes in functionality, quality, user accessibility/ease of use and access.

19. What does the agency anticipate for the future with respect to the issues listed below? What are the driving forces for change? Obtain copies of planning documents. Solicit "best guesses" from agency staff.

a. The mix of media for information dissemination--the relative use of paper, CD-ROM, microfiche, WWW, etc.

b. Formal standards, informal standards or agency practices, recommended or

suggested information formats.
c. Permanent accessibility.
d. Cooperative projects with other agencies or entities outside of the Government.
e. Universal access--providing for access by the disabled and low income individuals.

20. Solicit ideas about how to simplify and/or improve public access to the agency's electronic information in the coming years. These ideas need not be "realistic" or "politically palatable." If budget and political constraints were relaxed, what might be possible?

Methodology

The first step should be a search for materials about the electronic information dissemination for each agency. Relevant articles may be found in trade publications related to the mission of the agency, trade publications associated with government computing (e.g., Federal Computer Week, Government Computing News), or scholarly journals. The Bibliography, Ongoing & Recent Studies, and Other Resources sections from the Phase I Report will provide pointers to useful information sources.

Information should also be solicited from each agency's Office of Public Affairs and Office of the Chief Information Officer. Publications, newsletters, and general information about the agency (e.g., organization chart) and its electronic information dissemination activities (e.g., catalog of products/services) can be obtained prior to any meetings with agency personnel, so that meetings can be based on focussed questions shaped by this preliminary work and that meeting time is not wasted on communicating basic information. These Offices should also be able to provide pointers to pertinent articles. Certainly, each agency's WWW page needs to be reviewed, and each major link traversed.

The site visit is primarily an information gathering exercise and is particularly relevant for questions 1a, 1b, 1c, 2, 3 3a, 4, 4a, 4b, 5, 5a, 5b, 6, 7, 8a, 8b, 8c, 9a, 9b, 10, 11a, 11b, 12a-f, 13a, 13b, 14a, 15a, 15b, 15c, 16a, 16b, 17a, 17b, 18a-d.

Several focus group meetings should take place after the site visit. The number of focus group meetings will vary with each agency depending on the scale and diversity of its electronic information activities. The primary purpose of the focus group meeting is to solicit impressions and opinions regarding issues related to this study. Questions that are particularly relevant are 1b, 10, 13a, 13b, 14b, 18a, 18d, 19a-e, 20. Participants in focus group meetings should provide different perspectives from within the agency and should include technical experts, managers, and if possible, users of the agency's information.

The contractors will develop a protocol for site visits and focus groups. Agency participants will be assured that their comments will not be attributed to them by name

without specific permission in the final report. Contractors are expected to refine the questions above to reflect the information that is collected prior to the site visit and focus group meeting(s).

The contractors, in consultation with agency staff, will determine who should participate in the meetings. Initially, the following individuals or units are recommended for advice: Contact person from Phase I of this study; Head of the agency, Office of Public Affairs, Office of the Chief Information Officer.

Deliverables

1. All documents collected from agencies.
2. Documents determined to be relevant to this study that are discovered in the search for information from published sources, and not previously identified in Phase I.
3. List of all personnel consulted. Include organizational affiliations.
4. Copy of site visit and focus group protocols.
5. A written report for each agency that includes sections as defined below. This report should include all of the substance derived from published and on-line materials, the site visit, and focus group meeting(s). Submit one paper copy and one machine-readable copy in MS-Word 6.0.
     a. A section for each information container that reports everything learned about that information container.
     b. Performance criteria.
     c. Web sites.
     d. FIPS and FED-STDS.
     e. Permanent accessibility.
     f. Locator services.
     g. Cooperative projects.
     h. Costs
     i. Future plans
     j. Ideas for greater standardization and improving access to government information access.
     k. Commentary from the observers. Summary of general observations or conclusions, or interesting anecdotes or findings that cannot be appropriately reported elsewhere.
6. A summary matrix for items 5a through 5k by agency.
7. A summary report for each item, 5a through 5k, for all agencies.
8. A written report that summarizes information formats and formal standards, informal standards, agency practices, recommendations & suggestions for standards across agencies, including success stories.

SURVEY OF GOVERNMENT INFORMATION INTERMEDIARIES

For the purposes of this study, a Government information intermediary facilitates the dissemination of Government information from information producers to information users. Government information intermediaries are generally not the originators of most of the information that they disseminate and their primary mission is the performance of the intermediary role. The facilitation of information dissemination may manifest itself in several ways, among them distributing information products and services; supporting locator services to identify and find information; developing, implementing, and enforcing policies related to information dissemination; and facilitating cooperative efforts to improve the dissemination of Government information. Government information intermediaries may reside in the Government, private sector, or in the non-profit sector and be constituted as agencies, firms, committees, task forces, associations, or in other ways.

Nature of the Information to be Collected

1. Identify Government information intermediaries. Limit to 100. Exclude those agencies already selected for in-depth data collection in this study. Identify the 30 most influential intermediaries in terms of the magnitude of their impact on Government information dissemination. The remainder of this section concerns only these 30 intermediaries.

2. Determine the mission of each intermediary as specified in statutory language, the founding document, or equivalent. If there are revisions, obtain the most recent version.

3. Determine the scope of information content for each intermediary.
Describe the magnitude and mechanisms for disseminating information. For primarily policy-oriented intermediaries, describe the nature of the policies addressed by the intermediary.

4. Within the constraints of the methodology, describe the electronic Government information dissemination activities in as much detail as possible. Describe information containers, media, and formats used. Describe any standards, guidelines, or preferences for information formats, cost analyses, and future plans. Describe plans for permanent accessibility, including legal requirements

Methodology

To identify Government information intermediaries, consult publications such as the U. S. Government Manual. Contact people who were consulted in Phase I of this study for

ideas. Contact the Office of Public Affairs or Marketing Departments of known intermediaries for suggestions. Contact the Information Industry Association, American Library Association Washington Office, and other relevant associations. Government WWW sites may also provide valuable leads: www.fedstats.gov, www.wings.gov, www.fedworld.gov, www.business.gov, Thomas, GPO Access, White House.

For the selected 30 intermediaries, obtain official publications (e.g., annual reports) and other information from the Office of Public Affairs, Marketing Department, or comparable unit within the intermediary. Review each intermediary's WWW site. Conduct a search of the published literature and review relevant materials that were published within the past five years. The Bibliography, Ongoing & Recent Studies, and Other Resources sections from the Phase I Report will provide pointers to useful information sources.

Deliverables

1. All documents collected.
2. List of all Government information intermediaries identified.
3. A report for each of the 30 intermediaries with the following sections:
    a. Mission
    b. Information dissemination activities
    c. Electronic Government information dissemination details
    d. Permanent access plans

SURVEY OF ELECTRONIC INFORMATION FORMATS AND STANDARDS

Nature of the Information to be Collected

1. Trends in electronic information formats and standards. For the various types of Government information products (and the associated information containers), what are the formats and media that are gaining in national market share? Likely to become (or already are) defacto standards? Why are these formats and media the "winners?"

a. Also consider (1) for state and local government, the computer and telecommunications industry, higher education, and the communications industries (e.g., media, publishing)?

2. For the various types of Government information products (and the associated information containers), what are the associated costs?
      a. For producing these products? Distinguish between first copy and subsequent copy costs.
      b. Costs associated with varying media?
      c. Costs associated with varying formats?
      d. Cost comparisons between paper dissemination, tangible electronic dissemination, and intangible electronic dissemination.
      e. Trends in the costs (2a) through (2d).

Methodology

A literature review of trade and scholarly publications should be undertaken to identify pertinent materials. Aggregated data should be obtained from such sources as trade associations (e.g., Information Industry Association, Association of American Publishers), market research firms (e.g., Gartner Group, Yankee Group), and industry analysts. The Bibliography, Ongoing & Recent Studies, and Other Resources sections from the Phase I Report will provide pointers to useful information sources.

The National Institute for Standards and Technology should be consulted for information and advice.

Deliverables

1. All materials collected.
2. List of people and organizations consulted.
3. Summary report for formats, media, and standards.
4. Summary report for costs.

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Task Force on Archiving Digital Information (1996)

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Defense Technical Information Center, Department of Defense
National Technical Information Service, Department of Commerce

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and a number of informal discussions with depository librarians at the Depository Library Conference, April 1997, Arlington, Virginia