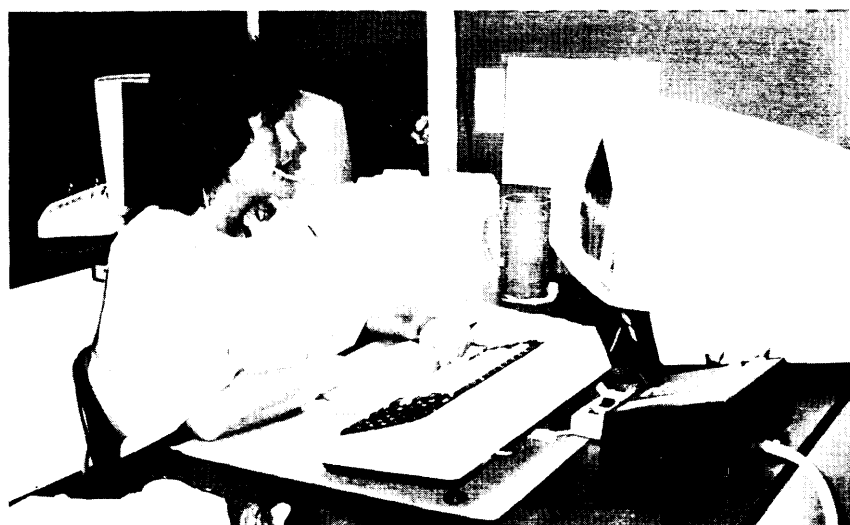


Chapter 12

Setting Future Directions for the Superintendent of Documents and National Technical Information Service



From the top: the GPO computer room (photo credit: U.S. Government Printing Office); and NTIS staff helps customer with document selection (photo credit: National Technical Information Service).

CONTENTS

	Page
Summary	295
Introduction.	296
The Competitive Electronic Environment	296
Institutional Alternatives for SupDocs and NTIS Electronic Information	
Dissemination.	300
Centralizing Government Electronic Information Dissemination	300
Privatizing SupDocs and NTIS	301
Reorganizing SupDocs as Part of a Legislative Printing Office	303
Consolidating NTIS with SupDocs and/or Reorganizing as a “Government Information Office” or Government Corporation	305
Authorizing SupDocs or the Consolidated SupDocs/NTIS to Produce and Disseminate Electronic Formats.	307
Broader Implications of SupDocs/NTIS Electronic Information	
Dissemination.	309
Government Productivity and Cost-Effectiveness.	309
Agency Missions and the Role of SupDocs and NTIS	310
Private Sector Economy.	312
Other Implications	316

Setting Future Directions for the Superintendent of Documents and National Technical Information Service

SUMMARY

Any electronic future for the Superintendent of Documents (SupDocs) within the U.S. Government Printing Office (GPO) and for the National Technical Information Service (NTIS) must take into account the increasingly decentralized, competitive environment that characterizes the electronic information marketplace. The Federal Government is moving in the direction of electronic information systems at the heart of most agency activities. Of particular significance for SupDocs and NTIS are the technological advances that are changing or blurring the traditional distinctions between printing and dissemination, reports and databases, and the roles of individual mission agencies (and the private sector) versus governmentwide dissemination agencies. This chapter addresses current and future opportunities for these two agencies and the broader implications of expanded roles in electronic dissemination.

In the long-term (10 to 20 years), the myriad of possible information dissemination alternatives facilitated by technological advances could transcend the current institutional framework. Full understanding of long-term alternatives will require several years of pilot tests, demonstrations, and experiments and related evaluation studies. Consideration of various alternatives needs to accommodate the results and "lessons learned" or run a high risk of failure.

In the short-term (3 to 5 years) and possibly medium-term (5 to 10 years), the future is more certain, and the basis for setting directions better established. Over at least this time frame, the need for some governmentwide information dissemination mechanisms is likely to con-

tinue. In the short- to medium-term, there are a number of institutional alternatives for SupDocs/NTIS electronic information dissemination, ranging from a highly centralized information dissemination infrastructure to fully privatized approaches, and all with various advantages and disadvantages.

The middle-ground alternative of including selected electronic formats in the SupDocs and NTIS sales programs, with individual agencies disseminating electronic products as well as private vendors reselling or further enhancing Federal electronic products, would appear to have significant favorable impacts on: public access, government productivity and cost-effectiveness, agency missions, the private sector economy, and international leadership. However, to implement this alternative, both SupDocs and NTIS would need to:

- obtain the necessary additional technical expertise,
- strengthen strategic planning capability,
- increase participation in governmentwide standard-setting and innovation activities,
- strengthen pilot testing and demonstration programs, and
- invest in state-of-the-art electronic equipment.

The middle-ground alternative is likely to have generally beneficial effects on business users of Federal information, especially small businesses. The information technology equipment and services industry and the printing industry are not likely to be significantly affected. Nor does it appear that SupDocs/NTIS offering electronic formats would pose any significant competitive or economic threat to the

commercial information industry as a whole. However, there could be a significant impact on a small segment of the industry—those firms that specialize in government information. The impact could be favorable, if new opportunities for repackaged or further enhanced

private offerings would result. And there is also the option of the SupDocs or NTIS contracting with various of these firms, perhaps at volume discount rates, where direct competition might exist.

INTRODUCTION

Previous chapters have discussed overall trends in technology, applications, user needs, and public policy issues that are relevant to the future of GPO and NTIS. The purpose here is to present a broader framework for setting directions for GPO and NTIS with respect to electronic dissemination.

This chapter begins with a discussion of the increasingly competitive environment that faces GPO and NTIS with respect to electronic dissemination, as contrasted with dissemination of paper formats.

The chapter then considers a number of institutional-alternatives for implementing GPO and NTIS roles in electronic dissemination. The future of these two institutions needs to be considered together, if for no other reason than the potential overlap with respect to sales

of electronic formats. The institutional alternatives range from:

- a fully centralized, consolidated governmentwide approach to electronic dissemination;
- to separate roles for GPO and NTIS for the legislative and executive branches, respectively;
- to a consolidated SupDocs and NTIS, possibly within a new Government Information Office or the equivalent; and
- to a privatized SupDocs and NTIS.

Finally, the chapter discusses some of the implications of an electronic GPO and NTIS for government productivity, agency missions, and impacts on the private sector, among other areas.

THE COMPETITIVE ELECTRONIC ENVIRONMENT

A major trend relevant to designing an electronic future for GPO and NTIS is the increasingly decentralized, competitive environment that characterizes the electronic information marketplace. Whereas the technology and economies-of-scale of paper formats tend to favor centralized approaches (at least for larger press runs and/or more complex documents), electronic formats lend themselves to decentralized approaches.

The Federal Government is moving in the direction of employing electronic information systems at the heart of most agency activities, including the collection, processing, and dissemination of information. The nature of this transition was discussed in earlier chapters

(especially chs. 2, 3, 4, 5, and 6), and is driven by the following key technological factors:

- a series of technological breakthroughs that make electronic dissemination of Federal information a viable option for many purposes;
- development of technology and related technical standards that offer, for the first time, the near-term prospect for integrated information systems utilizing the 'information life cycle' concept whereby the collection, processing, analysis, storage, and dissemination (and ultimately retention or archiving) of information in multiple formats (paper, microfiche, and electronic) are viewed and implemented as interrelated

functions rather than separate, unrelated activities;

- a significant increase in the demand for Federal information in electronic formats among various user groups, and especially the library community, private industry, Federal agencies themselves, and various groups or individuals with specialized needs (such as disabled or handicapped persons, educators, and rural citizens);
- a substantial ongoing investment by the Federal mission agencies in agency automation that, if planned and implemented properly, can incorporate multi-format information dissemination at little additional marginal cost compared to the total cost of automation and with significant net cost savings for agency information functions; and
- a rapidly growing base of Federal agency experience with pilot tests and applications of new electronic technology to Federal information dissemination.

Technological advances are changing or blurring the traditional distinctions between printing and dissemination, reports and databases, and the roles of individual mission agencies (and the private sector) versus government-wide dissemination agencies. This trend is particularly significant when considering alternative futures for GPO and NTIS.

First, technological advances are changing or even eliminating the distinctions between information creation, storage, printing, and dissemination. The integrated information system using the "information life cycle concept" is a plausible template for future Federal (and private sector) information dissemination. This means that information is captured in electronic form when collected or created and is retained in electronic form through whatever revision and processing cycles are needed. The information can then be converted into multiple output formats from the same electronic database. Illustrative output formats include:

- laser printing for proof copies and short press runs of paper documents,
- phototypesetting and offset press print-

ing for higher quality and/or longer press runs of paper documents,

- remote printing-on-demand using telecommunications and laser printers,
- optical disks (including high volume Compact Disk-Read Only Memory [CD-ROM] production),
- magnetic tape and diskettes,
- microform, and
- online electronic access.

Second, technological advances are changing or even, in some cases, eliminating at least the technical distinctions between reports, publications, databases, records, and the like. One template for the future is that almost all types of Federal information will exist in electronic form as an electronic database on a computerized system. The government and/or user will have a wide variety of output formats to choose from. For example, a typical 200 page OTA report could be available as:

- a high quality printed report,
- a microfiche,
- an online electronic file for information retrieval and selective printing-on-demand, and
- one of several electronic files on a CD-ROM.

All of these products could be derived from the same electronic database. The type of output format would vary, of course, depending on the type of information and the desired use.

Third, technological advances are blurring the distinctions between the institutional roles of Federal agencies involved with information dissemination. For example, today the Federal mission agencies generally collect and create Federal information products that are disseminated in paper formats via the SupDocs, Depository Library Program (DLP), NTIS, and/or Consumer Information Center (CIC), depending on the nature of and demand for each particular document. A small portion of paper or microfiche documents are reprinted by private publishers, and an even smaller percentage are placed online or in other electronic formats.

In contrast, an agency electronic database (whether a report, model, or statistical series)

could, from a technical feasibility standpoint, be electronically disseminated directly from the agency to agency clients, to information users, and to the depository libraries, bypassing the SupDocs, NTIS, and CIC. Or the agency database could be disseminated via one or more governmentwide clearinghouse mechanisms. These could be the SupDocs/GPO or NTIS or CIC, but could also be the National Library of Medicine (NLM), National Agricultural Library (NAL), Library of Congress (LOC), and/or any of a variety of commercial electronic "gateways" used by the government. Also, since the electronic form of the agency database would not be copyrightable and assuming it is accessible under the Freedom of Information Act (FOIA) if not directly available, the database could be repackaged or enhanced by private information vendors. There are many possible combinations.

In sum, the myriad of possible information dissemination alternatives facilitated by technological advances could transcend the current institutional framework. The current framework, including the roles of GPO and NTIS and the relevant statutory provisions, was developed over decades largely to accommodate an historical era when Federal information was collected, stored, printed, and distributed only in paper format.

The advent of electronic information technology has contributed to the complexity and competitiveness of the current Federal information environment. While there is an urgent need for setting future directions, consideration of various alternatives needs to accommodate this complexity or run a high risk of failure. Thus, planning the future of such institutions as the GPO and NTIS is both blessed with many new opportunities, but fraught with new uncertainties and complexities since their future is inextricably tied to that of the overall Federal information dissemination enterprise.

In setting future directions for GPO and NTIS, a two-track strategy warrants serious consideration: long-term, and short to medium-term. For the very long-term (10 to 20 years),

the advancing technology and the by then almost fully automated Federal information infrastructure are likely to facilitate Federal electronic information dissemination in several different ways. These possibilities include:

- dissemination of Federal electronic information products directly from Federal agencies to customers using agency or Federal telecommunication networks for online products, and the U.S. mail and/or private courier services for offline products (e. g., CD-ROM, floppy disk, paper copies);
- electronic (online) dissemination as above and/or the use of commercial or nonprofit electronic gateway or networking services, including those offered by telephone and value-added carriers;
- electronic (online) dissemination by Federal agencies using one or more government-operated electronic gateways, clearinghouses, or switching centers—operated by GPO, NTIS, or another agency—not unlike those being developed by NLM and the Defense Technical Information Center (DTIC);
- production of offline electronic information products (e.g., tapes and disks) by Federal agencies directly or by agency contractors, and/or by GPO (or the equivalent central government electronic publishing office);
- sale of offline information products by Federal agencies directly or by agency contractors, and/or by GPO or NTIS (or the equivalent central government information sales office); and
- sale of repackaged and value-added Federal information products by a wide range of private vendors, including both online and offline information products and both profit and nonprofit sales outlets.

The range of technologies and technical trends discussed in earlier chapters (see especially ch. 3) could, in the long-term, be deployed to support a wide range of institutional roles and responsibilities in Federal information dissemination. It is likely that most sectors of American society will, in the long-term, make

extensive use of microcomputers in the home, community, and office. There will also be easy access to desktop publishing and online information retrieval capabilities interconnected via a plethora of governmental, commercial, and nonprofit networks, gateways, and database services. These electronic interconnections will be facilitated by a robust offering of satellite, fiber optic, microwave, cable, and hybrid transmission systems. It is also likely that most sectors of American society will have (or have access to) microcomputer-based expert systems software to assist with information search, retrieval, and management, and optical disk systems for storage and manipulation of large volumes of information.

A full understanding of the long-term alternatives and implications for Federal information dissemination will require several years of pilot tests, demonstrations, and experiments and related evaluation studies. These demonstrations will provide information crucial to setting future long-term directions, including future directions for GPO and NTIS. Many Federal mission agencies, GPO, and various private sector commercial and nonprofit organizations have tests and demonstrations underway. More are planned. And NTIS is giving attention to a demonstration program as well.

In the short-term (within 3 to 5 years) and possibly the medium-term (5 to 10 years), the future is more certain, and the basis for setting directions better established.

In setting short-term directions for GPO and NTIS, the issues discussed in chapter 11 (and ch. 7 regarding depository libraries) need to be considered as well as the electronic alternatives discussed in chapters 4, 5, and 7. The key directions involve the following elements:

- GPO provision of electronic publishing support to Federal agencies (recognizing that GPO will be competing with both agency inhouse capabilities and private sector electronic publishing service bureau capabilities);
- SupDocs sales of electronic formats (recognizing that SupDocs will be competing

with some private vendors, some Federal agencies who choose to sell their own electronic products, unless directed otherwise, and possibly NTIS, unless close coordination with SupDocs is maintained);

- NTIS sales of electronic formats (recognizing potential competition with SupDocs, vendors, and agencies, as above); and
- SupDocs distribution of electronic formats to the depository libraries (recognizing that libraries may also be receiving Federal electronic information from commercial vendors and nonprofit organizations as well as direct from some agencies).

Possibilities for GPO electronic publishing support have been discussed in chapter 4, and electronic dissemination to depository libraries in chapter 7. Technical aspects of SupDocs and NTIS electronic document sales were discussed in chapters 4 and 5. The remainder of this chapter considers a variety of institutional alternatives for and broader implications of implementing SupDocs and NTIS electronic sales programs.

This discussion assumes that the basic need for sales of government information continues, as reflected in the statutory and other congressional policy guidance applicable to GPO and NTIS, and that some kind of governmentwide information dissemination mechanisms are needed for at least the medium-term. This latter assumption reflects the reality that the information life cycle concept, multi-format output, decentralized networking, and the like will take many years to fully implement in the Federal Government. Governmentwide dissemination approaches are needed to minimize the burden on and hopefully the cost to the customers and also to ensure broad public access. Also, the results of the GAO surveys of Federal agencies (ch. 2) and Federal information users (chs. 4 and 5) suggest a significant and continuing need for the kinds of functions performed by *SupDocs* and NTIS in the dissemination of Federal information.¹

¹ For further relevant discussion of GPO, DLP, and NTIS, see, for example, Peter Hemon and Charles R. McClure, Federal information dissemination mechanisms are needed for at least the medium-term. This latter assumption reflects the reality that the information life cycle concept, multi-format output, decentralized networking, and the like will take many years to fully implement in the Federal Government. Governmentwide dissemination approaches are needed to minimize the burden on and hopefully the cost to the customers and also to ensure broad public access. Also, the results of the GAO surveys of Federal agencies (ch. 2) and Federal information users (chs. 4 and 5) suggest a significant and continuing need for the kinds of functions performed by *SupDocs* and NTIS in the dissemination of Federal information.¹

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eral Information Policies in the 1980 's: Conflicts and Issues (Ablex: Norwood, New Jersey, 1987); Charles R. McClure, Peter Herson, and Gary R. Purcell, *Linking the U.S. National Technical Information Service With Academic and Public Libraries* (Ablex: Norwood, New Jersey, 1986); and Peter Herson, Charles R. McClure, and Gary P. Purcell, *GPO Depository Library Program: A Descriptive Analysis* (Ablex: Norwood, New Jersey, 1985). For discussion of longer-term technological and societal futures, see, for example, Alvin Toffler, *The Third Wave*, William Morrow (New York, NY, 1980); John Naisbitt, *Megatrends* (Warner Books: New York, NY, 1980); Benjamin

M. Compaine, *Information Technology and Cultural Change: Toward A New Literacy?* (Harvard University Program on Information Resources Policy: Cambridge, MA, 1984), U.S. Congress, Office of Technology Assessment, *Intellectual Property Rights in an Age of Electronics and Information*, OTA-CIT-302, April 1986; Clement Bezold and Robert Olson, *The Information Millenium: Alternative Futures*, Report prepared by The Institute for Alternative Futures for the Information Industry Association (Washington, DC, November 1986); and U.S. Congress, *Communication Systems for an Information Age*, OTA-CIT, forthcoming Spring 1989.

INSTITUTIONAL ALTERNATIVES FOR SUPDOCS AND NTIS ELECTRONIC INFORMATION DISSEMINATION

The following institutional alternatives for SupDocs and/or NTIS are discussed in this section:

- centralizing all or most government dissemination functions in one office or agency,
- privatizing SupDocs and NTIS,
- reorganizing SupDocs as part of a legislative printing office,
- consolidating NTIS with SupDocs and/or reorganizing as a "Government Information Office" or "Government Information Corporation," and
- authorizing SupDocs or the consolidated SupDocs/NTIS to produce and disseminate Federal information in all formats.

Centralizing Government Electronic Information Dissemination

Under this alternative, dissemination of Federal electronic information products, whether for sale or for free, would be permitted only through SupDocs or the equivalent. NTIS and mission agencies would no longer be authorized to disseminate electronic information directly to the public. This alternative was strongly opposed by many Federal executive agency officials. Agency officials believe that Federal information activities and users are so diverse and complex that centralizing expertise on these information activities and users would be very difficult. They argue that close interaction between information providers and users is essential not only for effective dissemination, but also for effective de-

velopment of the information products and services.

The major benefits of totally centralized electronic information dissemination are easier public access and reduced overlap and duplication in government information functions. However, attempts to centralize electronic dissemination to this high degree would likely be heavily resisted with chaotic and possibly detrimental net impacts on public access. Also the central dissemination agency probably would require increased financial and organizational resources which probably would not be offset by cost and organizational reductions in the mission agencies. Agencies would be likely to retain as many functions as they could on the grounds that most extant personnel and capabilities are necessary to the creation of the electronic information products, regardless of how and by whom the products were disseminated.

The centralized alternative was also criticized as increasing the risks of excessive or improper control over or manipulation of Federal electronic information dissemination, and as inconsistent with the checks and balances inherent in diversity and decentralization of information control. In addition, if the central information office were located in the legislative branch, the alternative would be likely to exacerbate separation of powers issues. Many Federal agency officials participating in the OTA study expressed considerable support for the central index and standards (discussed in

ch. 11), but not as part of a totally centralized institutional alternative.

Another variation of the centralized alternative would be to combine the electronic information sales functions of the mission agencies in one central office, such as SupDocs or a Government Information Office. Agencies could continue to otherwise disseminate their own information as they do today. At present, agency electronic information product sales are handled directly by the agency or in some cases by the NTIS clearinghouse and/or by inter-agency agreement with NTIS or in a very few cases by SupDocs. Agency sales of paper formats are handled by SupDocs for items accepted into the SupDocs sales program (including subscriptions to agency periodicals), by the agency for other paper formats, and by NTIS for items included in the NTIS clearinghouse. Under a more centralized arrangement, all sales functions (for both paper and electronic formats) would be combined in one office (which could be SupDocs, NTIS, a consolidated SupDocs/NTIS, or a Government Information Office). Agencies would still handle free dissemination of their own information products, except for items handled through CIC.

This partially centralized alternative is viewed by many Federal executive agency officials participating in the OTA study as less threatening than a fully centralized government information dissemination function. However, any mandatory requirement to sell electronic formats solely through a central government office would conflict with numerous existing agency activities, be likely to meet considerable agency opposition, and could precipitate legal and political challenges to the statutory basis for such a requirement.

A third variation of the centralized alternative would be for SupDocs or NTIS or a consolidated SupDocs/NTIS to include selected agency electronic information products in the SupDocs or NTIS or combined sales program, but not to the mandatory mutual exclusion of agency sales. Under this alternative, agencies could decide to rely entirely on a centralized sales office, but this would be at agency dis-

cretion. While this alternative would mean some degree of overlap and duplication in sales activities, it would strengthen the government-wide information dissemination mechanisms while at the same time preserving a considerable degree of agency independence with respect to their own information dissemination activities. (This alternative is discussed further later in this chapter.)

Privatizing SupDocs and NTIS

Privatizing NTIS has been advocated by the Administration over the last several years, and, from time to time, privatizing GPO has been suggested. Some other countries have privatized both government printing and document sales functions. Theoretically, a Federal electronic information sales program could be contracted out to the private sector. Three major criteria for evaluating privatization proposals are: the inherently governmental (versus commercial) nature of the government activity; the cost-effectiveness of privatization to the government; and the impact of privatization on the commercial marketplace.

Inherently Governmental v. Commercial Functions

NTIS and SupDocs activities are generically similar to private sector functions. Certainly private firms can and do carry out information clearinghouse, printing, marketing, sales, and dissemination activities. However, NTIS and SupDocs are arguably inherently governmental because they:

- operate pursuant to public law,
- carry out important public responsibilities in promoting public access to Federal information,
- facilitate an informed citizenry,
- assist the *mission* agencies in carrying out their statutory responsibilities, and
- advance scientific and technical progress in the United States as is especially the case with NTIS.

Second, NTIS and SupDocs receive almost all of their source materials from other Federal agencies, on a voluntary basis in the case

of NTIS and subject to Title 44 requirements for SupDocs. There is no guarantee or requirement that Federal agencies would continue to provide information to a privatized NTIS, and, indeed, some Federal science agencies have said that they would not. The possibility of requiring Federal agencies to participate in a privatized publication sales program in lieu of the SupDocs program would appear to raise serious legal problems (including the necessity to amend Title 44 and possible ramifications for numerous statutes), and some agencies might be expected to not cooperate with a privatized SupDocs.

Third, both NTIS and SupDocs have active programs for the international exchange of reports and materials with various countries. This is an important element in the free and open flow of information between governments and across national boundaries. There is no guarantee or requirement that foreign countries would continue to cooperate with a privatized NTIS and SupDocs. In the debate over NTIS privatization, some foreign governments indicated serious concerns about cooperating with a privatized NTIS.

Fourth, both NTIS and SupDocs carry out a variety of other functions, some explicitly required by statute, others on a voluntary, reimbursable basis for various Federal agencies. For example, NTIS is responsible for technology transfer, patent licensing, and Japanese literature translation programs, and also for reimbursable information processing and sales for other agencies. Also, NTIS serves as an outlet for FOIA requests (for materials placed by agencies in NTIS) and as the repository for OMB-mandated agency inventories of electronic information products. SupDocs is responsible for administering DLP and also operates the CIC on a reimbursable basis for the General Services Administration (GSA). The debate over NTIS privatization suggests that many of these kinds of activities are not amenable to privatization.

In sum, both NTIS and SupDocs have developed a complex, intricate web of relationships with Federal agencies (and other govern-

ments) and carry out numerous functions that are either required by law or that support the ability of other agencies to fulfill their statutory obligations.

Cost-Effectiveness

The cost-effectiveness of privatizing NTIS or SupDocs has yet to be established. With respect to NTIS, analyses conducted by the Department of Commerce concluded that privatization would cost—not save—the Government money. A cost-effectiveness study would need to consider not only transition costs and residual costs to the government but also the costs to all relevant government agencies—not just the Department of Commerce (for NTIS) or GPO or Congress (for SupDocs). For example, NTIS performs roughly \$1 million worth of reimbursable production services per year for other agencies, and also performs billing and collection services through reimbursable agreements with NLM, DTIC, and NAL. The financial impact on these and other agencies would need to be considered.

As another example, SupDocs is able to obtain copies of agency reports at marginal rather than full cost by “riding” the agency orders for the additional copies needed for SupDocs sales and depository library distribution. If SupDocs were privatized and many agencies no longer cooperated, the SupDocs cost of obtaining copies would be likely to increase significantly, thereby increasing the cost to the customers (of SupDocs sales) and taxpayers (who finance DLP distribution).

In addition, a cost-effectiveness study would need to consider NTIS and SupDocs privatization in light of the plans and activities of other Federal agencies with respect to Federal information dissemination. Most of these agencies are pursuing a variety of technical options, with numerous possible implications for the future of NTIS and SupDocs—whether privatized or not. For example, DTIC, which accounts for roughly one-quarter of NTIS source materials, is planning to shift to an optical disk-based electronic printing-on-demand operation. This and similar actions by other Federal agen-

cies could have major implications for how and what information is transmitted to NTIS and/or SupDocs. The opportunities to improve cost-effectiveness (e.g., via the information life cycle with multi-format output) could be complicated if NTIS and SupDocs were privatized.

Finally, both NTIS and SupDocs operate with no public appropriations for their basic sales functions. NTIS operates on a break-even basis with annual revenues and costs of roughly \$22 million and no appropriation for the basic NTIS collection, archiving, clearinghouse, and dissemination functions. The SupDocs sales program is totally self-supporting, and in recent years has actually been returning a net annual profit of several million dollars on annual sales in the \$70 million range. This makes it especially difficult to establish the cost-effectiveness of privatization.

Impact on the Private Marketplace

Most NTIS and SupDocs documents are not copyrightable, since documents prepared by or for the Federal Government at public expense cannot be copyrighted. This means that any individual or organization can resell NTIS and SupDocs reports without authorization from or reimbursement to the government, and that the government has no legal basis for preventing such sales. Indeed, some private vendors do resell various NTIS and SupDocs documents based on their own evaluation of the marketplace. Vendors need only buy one copy of the government document and can (and do) use it as camera-ready copy (with a new cover and title page). In this way, the vendor eliminates the keyboarding, layout, and composition costs, which could otherwise be substantial. When documents are available in magnetic tape format from SupDocs, some vendors buy the tapes and convert them into online formats, and more recently CD-ROM formats.

Thus privatizing NTIS and SupDocs would not appear to make a difference at least with respect to private marketplace availability of paper formats, since these are already readily available at very nominal cost to any vendor who wishes to resell or enhance these materials.

With respect to NTIS privatization, views of the information industry span a broad spectrum, including those that oppose full privatization due to concern about adverse effects on those firms that are already in the market of reselling or adding value to NTIS documents. The same generic concern could apply as well to SupDocs privatization.

Several private firms already realize several million dollars in annual revenues from selling the NTIS bibliography in electronic online format and reselling various NTIS products. To the extent that NTIS (or SupDocs) privatization provided market advantages to a prospective contractor, such as the opportunity to develop and sell value-added products and services as long as certain core functions were carried out, it could have adverse effects on those firms that are or would like to resell or enhance government materials. A potential problem, from an industry point of view, is that one firm (the contractor) would be granted a preferred competitive position by the Government. From the governmental and public access perspective, a potential problem is that significant user groups could be priced out of the value-added market, unless there is some kind of effective "information lifeline" or "information safety net" protection.

There is also concern within the information industry about the competitive impacts of governmental electronic offerings. Possible effects of NTIS and SupDocs electronic sales on the private information marketplace are discussed in a later section.

Reorganizing SupDocs as Part of a Legislative Printing Office

Another institutional possibility is to limit SupDocs to legislative branch information products (NTIS would remain in the executive branch). This legislative branch SupDocs alternative would require statutory changes and would presumably be part of a legislative branch GPO (sometimes referred to as a Legislative Printing Office or LPO). The rationale for an LPO is as follows.

At present, GPO is a statutory agency of the legislative branch of the government, but with its chief officer (the Public Printer) appointed by the President, and with roughly seven-eighths of its total printing work done for the executive branch. The split between legislative and executive printing is about 50:50 for the GPO main plant, and almost all procured work is done for executive agencies. If key governmental process items (such as the *Federal Register*, Budget of the United States, passports, postal cards) are included with the congressional work, then the legislative to executive split would be about 75:25 at the main plant.

One possible scenario would be to transfer the GPO procurement function to GSA in the executive branch, gradually phase out executive branch filler work at the GPO mainplant (or place such work on an agency discretionary basis), and limit GPO's inplant work to congressional and specified key governmental items. This alternative would eliminate any separation of powers issues, especially if the Public Printer were made a congressional rather than presidential appointment. This also would permit GPO to focus or refocus on legislative branch needs and avoid the frequently conflicting requirements of the executive branch. GPO began as almost exclusively the legislative branch printer, with the few executive branch items produced as congressional documents. But executive branch work has gradually increased to the point today where only about one-eighth of total work is purely congressional. This alternative might also make it somewhat easier for GPO to actively pursue a variety of electronic options for congressional information dissemination by focusing attention and resources on just one branch of government.

However, this so-called legislative branch alternative has several limitations. First, separating the printing procurement function from printing operations may, over time, reduce the competence and effectiveness of the procurement staff. Establishing a separate executive branch printer (in addition to the existing GPO) might solve this problem, but at

a substantial additional cost. Second, the cost of congressional printing would increase significantly, all other things being equal. Executive agency work done at the GPO main plant helps to take up slack capacity during periods of lower congressional work load. GPO must staff up to handle peak congressional work load, and thus executive branch work helps utilize some of this capacity during off-peak periods. Without executive agency work, total GPO costs would be spread over a smaller base, thus increasing the per unit cost of the remaining work. The cost impact would be lessened to the extent a legislative branch GPO was able to retain adequate executive branch work on a voluntary basis, perhaps partly through the use of special rates for GPO main plant work that more closely approximate procured printing rates (see discussion in chs. 4 and 11). Third, the cost increases would probably necessitate significant GPO labor force reductions, which in the worst case could be as much as 40 percent of the main plant employees (see ch. 4 for further discussion.)

A fourth potential problem is the reduction in congressional control over agency printing and information dissemination. While the executive branch might view this as an advantage, congressional oversight committees might find it more difficult to keep abreast of agency activities, absent more effective reporting by and cooperation from the executive branch. While some executive agencies are critical of what they perceive as inappropriate micromanagement by some oversight committees, it is not clear whether the agencies (and OMB) would support other, substitute oversight mechanisms. Congress could address oversight concerns, in part, by strengthening and restructuring committee jurisdictions (e.g., by creating a Joint Committee on Government Information) and by statutory amendments providing more specific guidance to the executive agencies.

The implications for SupDocs are several. SupDocs is dependent on the central role of GPO vis-a-vis all government printing, to be aware of what is being printed, assess market potential, ride the printing order for additional

copies as needed, and ensure proper distribution to depository libraries. If responsibility for executive branch printing is moved to the executive branch, provision would need to be made to ensure that functions now carried out by SupDocs for the executive branch are continued. This could involve reorganizing existing executive agency public information or printing offices into agency sales offices, or creating new offices if needed, all at what could be significant additional costs. Having the equivalent of multiple SupDocs offices throughout the government might complicate the indexing, cataloging, marketing, quality control, ease of public access to, and international exchange of government documents. In addition, to preserve the integrity of the depository library program, executive agencies would need to advise the legislative branch SupDocs of their publishing activities, and provision would have to be made to produce and pay for enough copies to meet depository library needs.

**Consolidating NTIS with SupDocs
and/or Reorganizing as a
“Government Information Office” or
Government Corporation**

The consolidation of NTIS and SupDocs is a key element of government information legislation introduced in the past two Congresses. The consolidated entity could be located in either the legislative branch or executive branch. An NTIS-GPO consolidation in the legislative branch has received more attention recently, in part as an alternative to NTIS privatization. As noted in chapter 11, the Public Printer has publically stated his willingness to consider and implement this alternative, and the Librarian of Congress has suggested consolidating NTIS with the Library of Congress. In the debate over NTIS privatization, some agency officials and users have stated a preference for NTIS-GPO consolidation over NTIS privatization.

NTIS-GPO consolidation would appear to offer several significant advantages but also create some problems. On the plus side, a consolidation would retain NTIS as a govern-

mental entity, and this is thought to be critically important by Federal science agencies. These agencies are very uncomfortable, from procedural, legal, and philosophic perspectives, with the prospect of dealing with a privatized NTIS. While a consolidated NTIS, presumably located within GPO in the legislative branch, may not be ideal, it appears to be preferable to many when compared with privatization. Also, a consolidation would increase the possibilities of economies of scale, and synergy between NTIS and SupDocs marketing, sales, and distribution programs. A consolidation should eliminate public confusion about their respective roles, and could lead to a more efficient and rationale approach to Federal information dissemination.

NTIS and SupDocs have a lot in common. They are both essentially resellers of information products generated by Federal mission agencies. They both operate on a financially self-sustaining basis (SupDocs actually made a significant profit in recent years), with no public appropriation except for specially mandated activities. Both NTIS and SupDocs are small, although the SupDocs sales program has about three times the total revenues (about \$70 million per year versus about \$22 million for NTIS). They both develop bibliographic products.

The major differences are that NTIS handles largely scientific and technical material with limited demand (10 copies per item) spread over a large inventory (about 60,000-70,000 items added yearly and a total inventory of roughly 2 million titles), while SupDocs handles the entire range of government publications, but selects items with a larger demand (typically, in the several hundreds to thousands of copies per item) and maintains a much smaller inventory (about 20,000 titles). NTIS has a major archival responsibility, while SupDocs does not (although some of the depository libraries do).

With respect to technology, NTIS is constrained due to the absence of a revolving fund or other mechanism to finance capital investment in new technology (although this would

be partially remedied in pending legislation). Since SupDocs printing is done by GPO, SupDocs is an indirect beneficiary of any technology enhancements that GPO finances for its own purposes out of the GPO revolving fund. Also, SupDocs can finance its own capital investment needs out of the GPO revolving fund with the cost recovered as a depreciation charge against sales. It is also possible that SupDocs (and, by extension, NTIS) would be permitted to contribute some portion of net revenues, if any, to the revolving fund to finance new dissemination technology and experiments. In general, the combined activity and resource base of NTIS and SupDocs would appear to offer potential opportunities for testing implementation of new technologies (such as CD-ROM, printing on demand) and marketing techniques. A NTIS-GPO consolidation would also appear to provide potentially fruitful cross-fertilization of staff expertise, and would meet congressional concerns about retaining direct control over vital Federal information dissemination functions.

The major potential problem would appear to be the actual transfer of NTIS from an executive branch agency (Department of Commerce) to a legislative branch agency (GPO). The Department and OMB are likely to oppose this alternative. It could be viewed as further exacerbating concerns about separation of powers and executive control. There would be some costs associated with the transition, although they might be minimal. The cooperation of the Federal science agencies would be essential to make this transfer work.

Rather than moving NTIS to the legislative branch, SupDocs could be transferred to the executive branch and combined with NTIS. Legislation introduced in the past two Congresses would consolidate NTIS and SupDocs (along with a few other agency information sales units) into a Government Information Office to be established as an independent agency of the executive branch. First of all, this legislation would transfer only SupDocs, and not the printing procurement and inplant printing functions of GPO. Theoretically, the entire GPO could be transferred, although this ap-

pears unlikely so long as GPO operates as the congressional printer (with highest priority assigned to congressional work).

Part of the rationale for moving SupDocs to the executive branch is to minimize separation of powers problems and facilitate relationships with executive agencies. It is not clear whether separation of powers is really a problem with respect to SupDocs functions. The ongoing debate over the applicability of *Chadha v. INS* to certain provisions of Title 44 of the U.S. Code has focused primarily on the constitutionality of the requirement for Joint Committee on Printing advance approval of executive agency printing and related activities, not on the constitutionality of SupDoc functions. Transfer of SupDocs or any or all of the rest of GPO to the executive branch would be likely to aggravate congressional concerns about control over government information dissemination policy. These concerns might be mitigated, to a degree, by strengthening congressional oversight.

A change in name to "Government Information Office" would help demarcate the already well advanced transition of the Federal Government from a world of paper documents and reports to a world of information in all formats, electronic as well as paper and microfiche. A name change need not be limited to an NTIS-SupDocs consolidation. On the down side, in the American political system, there has always been some reluctance to establish central governmental information offices, for fear they will become or at least be perceived as government information control or propaganda instruments. This of course need not and presumably would not be the case for the institutional alternatives discussed above, but it is a concern that warrants attention.

Yet another possibility would be to establish a Government Information Office as a government corporation. This alternative has been seriously proposed and studied for NTIS. The National Academy of Public Administration has reviewed the history and nature of NTIS functions and concluded that NTIS met the commonly accepted criteria for a government

corporation, including the need to: be revenue-producing, be self-supporting, and conduct a large number of transactions with the public. The academy also concluded that, despite the requirement to be self-supporting, NTIS is not provided the operational flexibility (for staffing and capital investment, in particular) necessary to respond to market forces. The House Committee on Science, Technology, and Space largely concurred with the Academy's findings, and has included the incorporation of NTIS as a provision of the NBS Authorization Act for fiscal year 1989. (See ch. 11 for discussion.)

The government corporation approach for NTIS would appear to capture some of the benefits that had been suggested from an NTIS-SupDocs consolidation, especially with respect to capital investment. Also, providing NTIS with an explicit statutory charter presumably would strengthen the ability of NTIS to carry out its mission with less interference from OMB and others who have questioned the existence of NTIS as a government entity. On the other hand, the corporation approach as currently proposed would not capture possible marketing, staffing, and technology synergies that might result from an NTIS-SupDocs consolidation. Another alternative would be to extend the current "National Technical Information Corp." concept to include SupDocs (and perhaps some other related government activities, such as those of the Consumer Information Center) to become a "National Government Information Corp."

A full analysis of these alternatives is beyond the scope of this study but would necessitate consideration of all the factors discussed previously, including the implications for: the cost-effectiveness of NTIS and SupDocs functions; the intricate web of relationships between NTIS, SupDocs, and the mission agencies which are the source of NTIS and SupDocs sales items; the implementation of relevant statutes including various provisions of Title 44 of the U.S. Code; and the private sector firms that currently (or might in the future) make a market in reselling or adding value to NTIS and SupDocs materials. It should be

noted that in 1986, the Department of Commerce not only recommended against wholesale NTIS privatization, but also recommended against consolidation with GPO or creation of a corporation.

Authorizing SupDocs or the Consolidated SupDocs/NTIS to Produce and Disseminate Electronic Formats

The convergence of several trends has opened up a window of opportunity for SupDocs, or a consolidated SupDocs/NTIS should that alternative be implemented, with respect to the production and dissemination of Federal information in electronic formats as well as paper and microfiche. While paper is expected to be the dominant format for years to come, the GAO survey results (see ch. 2, 4, and 5) document the transition that is already underway. The volume of Federal information products in electronic formats is increasing rapidly. Also, automation of the document creation process in most Federal agencies is proceeding rapidly, such that electronic capture of the original keyboarding should be possible a large percentage of the time, given the necessary technical standards. GPO already receives roughly 70 percent of incoming material in electronic format, primarily magnetic tape, and has converted entirely from hot type to electronic photocomposition (between 1976-1986). GPO has the capability to accept input in a wide range of floppy diskette formats, and is experimenting with both dial-up desktop publishing input and mainframe computer-based electronic data transfer. GPO electronic output is currently limited to several dozen magnetic tape products, including some major products such as the *Congressional Record* and *Federal Register*.

OTA's independent printing consultant concluded that as much as 60 percent of the GPO's current publications could be produced in an electronic database-oriented format, and that about half of that, or 30 percent, is "releasable" in electronic format in that the material is: (1) suited for electronic receipt; (2) not con-

fidential or otherwise restricted; and (3) has an audience with or access to the technology needed to use the material in electronic form. While one can debate these percentages, and the methodologies used to estimate them, the results suggest significant levels of potential electronic penetration. GPO has questioned the basis for these estimates, but the difference, if any, cannot be resolved in the absence of a detailed review of a statistically valid sample of GPO's printed products. Such a review appears to be warranted, and could be conducted by SupDocs.

With respect to NTIS, constraints on capital investment have limited its deployment of new electronic technology. NTIS does serve as a clearinghouse for a variety of electronic format (machine readable) products, including about:

- . 300 computer software items;
- . 800 numeric and statistical databases;
- . 300 textual databases; and
- 10 bibliographic databases, all provided by mission agencies.

These represent only a small fraction of total agency electronic products in these categories. NTIS could be positioned to take advantage of relevant technology applications under development and demonstration at various civilian and military agencies.

Some technologies appear to offer large potential for both SupDocs and NTIS. One of these is compact disk/read only memory (CD-ROM). The National Oceanographic and Atmospheric Administration (NOAA), Bureau of the Census, and U.S. Geological Survey (USGS) have prototyped CD-ROMs and found that disks with about 500-600 megabytes of data (equivalent to about 250,000 pages of double-

spaced typed text) can be recorded on a single disk at a full cost of about \$50/disk at a volume of 600. This includes \$15,000 for data preparation (converting the electronic data into the format suitable for CD-ROM), \$5,000 for software development (preparing the software needed for CD-ROM access), and \$10,000 for the actual mastering of the first 600 disks. At a larger volume of, say, 2,000, the total would increase to about \$40,000 but the per disk cost would drop to about \$20. At a volume of 5,000, the total cost would be about \$50,000 and per disk cost about \$10. SupDocs and/or NTIS could take a lead role in facilitating the preparation and dissemination of CD-ROMs for individual agency databases and for a consortia of agencies who might wish to place a variety of databases on a single disk.

The combination of CD-ROMs, optical disk storage for large scale archiving, and electronic print-on-demand systems could revolutionize NTIS and/or SupDocs dissemination operations, especially for low volume, out-of-print, and/or reference or bibliographic material. While governmentwide standards for these (and other) technological applications are critical, it is not clear to what extent centralized production is more cost-effective. In other words, the conventional printing procurement model may not necessarily apply to electronic information product procurement. In general, however, once the content of a document, publication, or other information product is captured in a compatible electronic format, then it is easy to manipulate the contents into a variety of outputs—paper, microfiche, and electronic. In this way, the output formats can be cost-effectively tailored to particular types of products and user needs and capabilities. (See chs. 3, 4, and 5 for further discussion.)

BROADER IMPLICATIONS OF SUPDOCS/NTIS ELECTRONIC INFORMATION DISSEMINATION

Some broader implications of SupDocs/NTIS electronic dissemination, irrespective of the particular institutional structure, are considered in this section. The impact areas discussed include:

- government productivity and cost-effectiveness,
- agency missions and the role of SupDocs and NTIS,
- private sector economy, and
- other areas.

Government Productivity and Cost-Effectiveness

A major continuing concern of government officials and taxpayers is that government functions be conducted as cost-effectively as possible, consistent with other governmental objectives such as public access and open government. With respect to Federal information dissemination and related activities, there appear to be substantial opportunities for SupDocs and NTIS to improve the productivity and cost-effectiveness of government information activities. This could occur directly through their own activities and indirectly by encouraging or stimulating agency productivity improvements, and without compromising other important goals such as public access. Indeed, there is the possibility of financing enhanced public access to Federal information largely out of productivity improvements.

Numerous vendors and business users report productivity improvements of typically 30 to 50 percent and similar rates of return on investment. Payback periods are in the 2 to 3 year range. Various Federal agencies have projected similar returns in justifying equipment and systems acquisitions, and these estimates should be applicable to SupDocs and NTIS information products.

These estimates do not include other important elements of cost avoidance, such as pa-

per and postage. Electronic publishing facilitates the use of typeset text and tables for reports (or other documents), rather than typewritten (or word processed) text and tables. The result is that the length of reports can be reduced by, on the average, about 35 percent, and thus the cost of printing (including paper) would be correspondingly reduced. The reduced length (and weight) of the report would also reduce the cost of postage for mailing the report. Again, these kinds of savings should accrue to SupDocs and NTIS information dissemination as well as to individual mission agencies.

Another potential area of cost reductions for SupDocs and NTIS document sales involves the use of CD-ROMs for dissemination of scientific, statistical, and other kinds of information that are best suited for electronic formats. For example, the full texts of patents are currently sold by the Patent and Trademark Office (PTO) at a cost of \$2,250 per week for paper format, and only \$345 per week in magnetic computer tape format, all priced to recover the marginal cost of reproduction. PTO estimates that the same information could be sold in CD-ROM format (one disk per week) for only \$50 per week, depending on sales volume, or about 2 percent of the cost in paper format. The NOAA, USGS, and Bureau of the Census have estimated that scientific and statistical information totally unsuited for paper formats could be provided on CD-ROM at about 10 percent or less of the cost of the same information in magnetic tape format (\$50 for one CD-ROM compared to \$500 to \$625 for 4 or 5 magnetic tapes at \$125 each). These kinds of cost reductions should apply as well to electronic products sold by SupDocs and NTIS.

However, the realization of these benefits by the Federal Government is hampered by the general lack of or confusion about common technical standards to ensure compatibility and interconnectivity, inadequacy of effective mechanisms to share expertise and experience.

and the like. As noted in chapters 2, 3, and 11, there are some efforts ongoing in all of these areas, but the total effort appears to be moving too slowly, especially when considering the substantial yearly investment of the Federal Government in these technologies and the large number of tests, demonstrations, and, operational applications. SupDocs and NTIS electronic dissemination programs could help stimulate faster progress in these areas.

In addition to beneficial productivity impacts on the creators and disseminators of Federal information, other alternatives that could be implemented by SupDocs and NTIS (such as the governmentwide information indexing, see ch. 11) should help improve the productivity of Federal (as well as other) users of Federal information. At present, it is difficult and time-consuming for many Federal employees to determine what relevant information is available from elsewhere within their own agency, let alone from other agencies. While there are no known estimates of the total time spent searching for information, it must be substantial. Moreover, while an improved index to major government information (in all formats) is only one part of a total solution, it should be of significant help if done well.

Estimating the productivity improvements from SupDocs and NTIS electronic dissemination activities (including related standards, innovation, and index initiatives) is very difficult if not impossible. However, given the very large government investment in relevant areas, even a small productivity improvement translates into large savings or cost avoidance.

There are several ways to estimate savings for the government, although estimating an allocation of savings to SupDocs/NTIS versus the individual mission agencies is difficult and beyond the scope of this analysis. One way to calculate savings is as a percentage of total government expenditures in relevant areas. Assuming that the government spends at least \$6 billion annually on information dissemination-related functions (see ch. 2), even just a 10 percent productivity improvement, which is at the very low end of private sector esti-

mates and experience, would translate into a potential \$600 million per year productivity improvement. Even if only partially realized, this would provide a substantial opportunity for cost avoidance, budget reductions, and/or new or improved dissemination activities. For example, a one percent productivity improvement would equate to \$60 million per year, which by comparison is an amount about triple the depository library program appropriation.

Other methods of estimating productivity improvement also give significant results. For example, a conservatively estimated 30,000 Federal employees are involved with information dissemination-related activities, as discussed in chapter 11. Assuming an average salary (including benefits) of \$40,000 per year, the total cost would be \$1.2 billion. Assuming further an average productivity improvement of 25 percent when using electronic publishing (equates to a payback period of 4 years), the potential productivity improvements or cost avoidance would be about \$300 million per year for Federal salaries alone. As another example, an estimated 100,000 scientific and technical reports are produced by or for the Federal Government each year. Assuming that the average report length is 125 double-spaced typewritten pages and the average press run is 400 copies per report, then the total printing and postage cost per report would average about \$1,400 per report (at \$3.50 per copy or 1.6 cents per page plus \$1.50 postage) or \$140 million total (for 100,000 reports). Using the estimated 35 percent savings figure, the potential savings by using electronic publishing would be about \$50 million annually for printing and postage alone.

Agency Missions and the Role of SupDocs and NTIS

As discussed throughout the report, Congress has assigned numerous information dissemination responsibilities to Federal agencies in the performance of their statutory missions.

In general, agency statutory missions would be enhanced by those SupDocs/NTIS alternatives that facilitate and improve the dissemi-

nation of mission-specific information to agency clientele (e.g., users, researchers, media, interest groups). To the extent this could be done more cost-effectively, agency missions would also be enhanced. Overall, the scenario that seems to have broadest support among mission agencies is the alternative that retains agency discretion to disseminate electronic information directly to agency clients, but with the central governmentwide dissemination offices (SupDocs, NTIS, or a combination thereof) having the discretion to include agency items in governmentwide sales, archiving, and distribution programs. This is somewhat similar to the way paper documents and publications are handled now. The agencies are able to distribute printed copies directly to their own clients. SupDocs "rides the printing order for additional copies for the GPO sales program and depository library distribution, if the particular report is judged to be suitable for inclusion. NTIS receives scientific and technical information (STI) documents from the agencies, and places the materials in the archives for dissemination on demand.

At present, while many agency reports are transmitted in electronic format to GPO for printing, SupDocs does not disseminate electronic formats (with the exception of some magnetic tapes). NTIS, on the other hand, receives and disseminates about 1,400 electronic format products, although demand per product is generally low. Some agency officials expressed concern about having SupDocs disseminate their electronic format products. This appears to reflect: a desire to retain control over their own electronic products to the extent possible; concern about possible competition with SupDocs (and potential reduction in agency revenues from electronic sales); and a perception that SupDocs could not effectively maintain an electronic dissemination program.

On the other hand, under a decentralized scenario, NTIS and/or SupDocs activities would augment and supplement, not supplant, agency activities. Also, agency sales of electronic information products are, in many cases, quite modest; so the involvement of NTIS and/or

SupDocs might actually stimulate greater sales and therefore greater dissemination of agency materials. The agencies probably would not receive any additional direct revenues (which would presumably be retained by NTIS/SupDocs, returned to the Treasury, or applied to offset public appropriations elsewhere).

As for concern over the capability of SupDocs and NTIS to handle electronic formats, both SupDocs and NTIS would need to obtain the necessary additional expertise. GPO as a whole is averaging about a 5 percent annual net attrition rate (250 persons a year from a current base of about 5,000), which provides considerable flexibility to hire persons with electronic information skills to the extent needed. Beyond this, as many as 10 to 15 percent of the employees in several major GPO work groups are at or near retirement age (see ch. 4). There may be additional attrition through higher retirement rates in the next few years, which would provide GPO with additional staffing flexibility. In sum, GPO is in a favorable position with respect to any necessary personnel adjustments within the current statutory ceiling on full time equivalent staff levels. Changes in or removal of the ceiling would require congressional action. The NTIS personnel situation is in a state of flux due to the uncertainties associated with the privatization debate. Morale has been adversely affected, and many employees apparently are prepared to retire or transfer to another Federal agency. A complete evaluation of NTIS personnel resources would seem prudent.

With respect to equipment (hardware, software, systems) needed for electronic dissemination activities, there would likely be the need for significant capital investment requirements on the part of SupDocs and NTIS for such things as:

- additional desktop and high-end electronic publishing units,
- graphics work stations,
- magnetic tape and floppy disk conversion and duplication equipment,

- possibly online database support capability, and
- possibly CD-ROM premastering equipment.

However, for GPO, the cost of these items is, in many cases, comparable or less than the cost of conventional printing and binding equipment. GPO currently spends about 1 percent of total revenues on capital investment (\$8 million out of \$800 million), which is equivalent to about 4 percent of inplant revenues. Over time, one scenario is a gradual shift in the GPO capital expenditure budget from conventional to electronic printing and publishing equipment. All major expenditures, whether for new conventional presses or CD-ROM premastering equipment and the like, would need to be carefully scrutinized to validate need and cost-effectiveness relative to other options and taking into account estimates of future demand. NTIS has not had a significant capital investment program in the past, and would need a capital program to support electronic dissemination activities.

Should SupDocs and NTIS seek a significant role in electronic dissemination, several other actions appear to be prudent. One would be the establishment of high level and well-staffed strategic planning offices in SupDocs (or GPO) and NTIS that would include expertise in technology, economics, marketing, and human resources, among other considerations. These offices would need to be permanently established. The planning offices could be tasked with developing short, medium, and long-range plans on a rolling basis. At GPO, the recent establishment of an Office of Financial Policy and Planning appears to be a step in this direction. Congress could require that periodic SupDocs and NTIS planning reports be submitted to the appropriate oversight, authorizing, and appropriations committees. A second action would be to enhance the SupDocs and NTIS research, development, and demonstration program. The few pilot and research projects underway, while noteworthy, do not have the critical mass necessary to place SupDocs and NTIS on a par with various of the Federal executive agencies (such as the Navy, DTIC, USGS). If SupDocs and NTIS aspire to—or

Congress desires SupDocs and NTIS to take a leadership role in such areas as technical standards and state-of-the-art technical applications, then a more aggressive program appears to be necessary. A third action would be to further increase the profile of SupDocs and NTIS participation in various Federal Government standards-setting and technology development activities. SupDocs and NTIS could seek formal participation in these activities, and promote or train from within or hire from the outside the best available qualified persons to participate in these forums. (See chs. 4, 5, and 7 for related discussion.)

Private Sector Economy

A major concern of the information industry, government, and others is how SupDocs and NTIS electronic dissemination programs, if implemented, would affect the economic health of the U.S. private sector economy. The private business sector has multiple interests in Federal information dissemination. First, many businesses are users of Federal information for a wide variety of purposes. Second, the equipment manufacturers and systems integrators sell the government the hardware, software, and related technologies and services that are needed to implement Federal information dissemination systems. Third, the printing industry sells composition, printing, and binding services to the government. Fourth, the information industry repackages, resells, and/or adds value to government information.

The interests of the business users of Federal information are presumably generically the same as many other users—to get the information when needed and at a reasonable price. The larger businesses with greater resources are likely to be less sensitive to price than independent small businesses, and the larger businesses also are better able to use the information industry to obtain Federal information on a resale or enhanced basis. The equipment manufacturers and related companies, while probably users of Federal information, are primarily interested in expanding and

developing the government market for their technologies and services. Similarly, the printing industry largely views the Federal Government as another market segment for sales of printing services. The information industry, however, has a more complex view of its relationship to the Federal information infrastructure.

On the one hand, that portion of the information industry that makes a market in Federal information is dependent on obtaining the information on a timely and relatively inexpensive basis so that it can be repackaged, resold, and/or enhanced at a competitive price. If Federal information is available too slowly, at too high a price, and/or in a difficult format, the potential market value and profit potential of repackaging and/or enhancing that information declines accordingly. Therefore there is a clear interest in obtaining Federal information on a timely and reasonable cost basis. The industry appears to oppose (along with others) pricing of Federal information to recover some or all of the cost of developing the information, because, in many instances, that would make it too costly to repackage, resell, and/or enhance the information at a profit. The industry (and others, including libraries, researchers, public interest groups, and the like) note that the development of the information is paid for with taxpayer dollars, so charging for the information development costs would amount to paying twice.

The conflict arises when government information is made available in electronic form. The information industry apparently does not see paper formats as a competitive threat, but not so for electronic formats. This is because it is the electronic form (and format) that permits the information industry and others to repackage and enhance the information. Thus users who want and can afford the advantages of electronic information (e.g., such as timely search and retrieval capability) provide the primary market for information industry products and services. As a result, proposals to make Federal information available in electronic form directly from the government (e.g., via individual agencies and the depository li-

brary program as well as SupDocs and NTIS) have raised serious concerns on the part of OMB, information industry trade associations, and some individual companies.

The primary information industry concern is over a possible adverse impact of government-provided electronic information on information market opportunities. OMB and information industry representatives make a distinction between government dissemination of Federal information in raw electronic form (e. g., on a magnetic tape or floppy disk) without software enhancements or searching aids, which OMB and the industry representatives support, and government dissemination of enhanced or so-called "value added" information, which at least some in OMB and the industry oppose. This places information industry companies in the position of advocating dissemination of raw electronic formats which they can use as resellers and value adders (because the electronic formats are much cheaper to work with and minimize costly rekey boarding), but apparently resisting sales of enhanced electronic formats by individual agencies or government-wide dissemination agencies (such as SupDocs or NTIS) directly to the public.

The industry position raises several issues. First, historically the government has produced and disseminated a wide range of enhanced or value-added information products in paper format. These include, for example, statistical analyses and projections (e.g., from the Bureau of Labor Statistics and Bureau of the Census), natural resource trends and projections (e.g., from USGS), domestic and international commodity demand, supply, and price fluctuations (e.g., from the U.S. Department of Agriculture), and domestic and international market trends and forecasts (e.g., from the Department of Commerce). Thus the government has a long-established role in providing enhanced information products.

Second, increasingly, users are seeking these information products in electronic formats, in order improve the timeliness, accessibility, and/or manipulability of the information, and/or because the information is available

only in an electronic format. Limiting the government to electronic dissemination of only the raw information would be akin to distributing the words of a book without the page and chapter formats or the table of contents and index, or to distributing statistical data without the tables, figures, or summary presentations and analyses. Limiting the government's role to raw electronic data could aggravate concerns about equity of information access and impair the performance of agency missions and governmental functions.

Third, although OMB circular A-130 asserts that information dissemination is subject to OMB circular A-76 on contracting out, and that "maximum feasible reliance" should be placed on the private sector, neither of these circulars nor any other governmentwide policy guidance define under what conditions enhanced or value-added electronic information products are inherently or appropriately governmental versus commercial in nature. (See ch. 11 for further discussion.)

In terms of the various alternatives discussed in chapter 11, it does not appear that the business community has any serious objections to and indeed, supports technical standards, innovation centers, improved Information Resources Management (IRM), and electronic FOIA (also see ch. 9) as they relate to information dissemination. Many of these would benefit the business community as taxpayers through improved government productivity, and as corporate citizens interested in an open government. The governmentwide information index and electronic press release service (also see ch. 10) likewise appear to raise relatively minor objections, although information industry representatives have noted that these offerings could be (and to some extent already are) provided by private vendors independently or under contract to the government. The major industry objections seem to arise with respect to electronic dissemination of enhanced Federal information via SupDocs, NTIS, and DLP (also see chs. 6 and 7), and also by mission agencies with respect to specific enhanced information products that are perceived as having significant market value.

Analysis of possible economic impacts suggests the following general results. The general business user community would appear to, if anything, benefit from the availability of enhanced electronic formats via SupDocs and/or NTIS, especially small business. (Small business might also benefit from depository library dissemination.) Business users already are the major customers of both SupDocs and NTIS, accounting for about 75 percent of SupDocs subscription sales customers, 45 percent of SupDocs publication sales customers, and 65 percent of NTIS customers.

Except as users of Federal information (e.g., for strategic planning or research and development purposes), it does not appear that the information technology equipment and services industry or the printing industry would be significantly affected. The information technology industry already realizes conservatively \$8 billion per year in sales to the Federal Government, and it is hard to see how this would be affected by SupDocs/NTIS electronic dissemination. Also, even the \$8 billion is but a small fraction (about 4 percent) of the \$200 billion annual U.S. market (for computer and business equipment, software, and services). Likewise, the U.S. printing industry's current Federal market share is about \$600 million annually or roughly one percent of total annual industry revenues of about \$55 billion. Conceivably, this market share could decrease slowly over time, should SupDocs/NTIS increase electronic products at the expense of paper products. However, the impact on the printing industry's revenues would appear to be marginal to insignificant.

The information industry is the one area where some adverse economic impact might be anticipated. While the information industry includes a variety of traditional paper document and microform services, the most dynamic and dominant sector of the industry is the online database business. CD-ROM business may also become significant, but today is just emerging as a viable electronic format. The online database industry provides a reasonable basis for estimating the relative im-

pact of SupDocs/NTIS enhanced electronic offerings.

The growth of the online database market segment of the information industry has been phenomenal. From less than \$500 million in annual revenues in 1978, this segment has grown to about \$3 billion total revenues in 1987 and is projected to reach about \$4 billion by the 1990-1991 time frame. This reflects, in part, an increase in the number of databases, from about 400 in 1979-1980, to 1,350 in 1982-1983 to about 2,900 in 1986, and about 3,500 in 1987. As of early 1987, financial and credit information accounted for almost three-fifths of all online database revenues. Business and industrial information (including real estate and economics) accounted for about another one-fifth. Legal information accounted for about one-tenth, and scientific and technical information for about one-twentieth. This leaves about 5 percent for all other types of information, including library support (about 2 percent), consumer (about 1 percent), and governmental (about 1 percent) information. Thus, government information per se appears to directly represent a very small portion of total online database revenues. However, it should be noted that some of the other types of databases presumably utilize government information, although not as a major product offering.

Taking as a rather improbable example, if one-fifth of the NTIS and SupDocs sales were converted to online database sales, this would amount to about \$20 million annually, or less than one percent of the 1987 online industry, a very small segment of the total online market. In reality, it would take NTIS/SupDoc several years to reach \$20 million annual online revenues, if then. By that time, say 1990-1991, the online industry likely would have grown to \$4 to 5 billion and the NTIS/SupDocs market share would be down to less than one-half of one percent.

Thus it would not appear that SupDocs/NTIS offering of electronic formats would pose any significant competitive or economic threat to the online industry as a whole. However,

the hypothetical \$20 million SupDocs/NTIS market share would be somewhat more significant (about 4 percent) when compared to the combined market share of legal, scientific and technical, and purely governmental online services (all grouped together as loosely governmental, about 15 percent of the total online market), and would be very significant when compared to the purely governmental segment alone. SupDocs/NTIS involvement in enhanced electronic dissemination is not a realistic threat, or even a significant potential competitor, to the information industry as a whole, but could have a significant impact on the small segment of the industry and those relatively few firms that specialize in government information.

Of course, the impact need not necessarily be negative. The availability of enhanced electronic products may open up new opportunities for repackaged and further enhanced private offerings and could stimulate the overall market, with a net gain for the private firms. Moreover, there is also the option of government contracting with various of these firms.

The online *Congressional Record* illustrates how commercial vendors could be involved as government contractors. The *Record* is printed by GPO, sold by SupDocs, and distributed in paper (and some microform) to members of Congress, congressional committees and offices, other designated government officials and agencies, and participating depository libraries. GPO also sells magnetic tapes of the *Record* to vendors. Vendors then enhance the database and place the *Record* online as a commercial offering, at typical yearly subscription rates of \$3,000. As discussed in more detail in chapters 4, 7, and 8, depository libraries and others have expressed strong interest in the *Record* online, but many cannot afford the commercial rates.

One alternative would be for GPO, the House Information Systems office, the Library of Congress, or some other congressional agency to provide the *Record* online at no or reduced charges to the libraries. However, another alternative would be for Congress to contract

with one or more vendors for some or all of this service. Vendors have indicated that they would offer a heavily discounted bulk rate for the depository library program. Indeed, a pilot project testing this concept is underway with 50 depository libraries participating. For example, for 1,100 access accounts with a maximum simultaneous sign-on of 70 libraries, the estimated annual fee would be about \$300 per library, or only 10 percent of the full rate. If the number of simultaneous sign-on libraries were 280, the annual fee would be about \$1,000, which is still only one-third of the full rate. This type of scenario could benefit both the libraries and the industry. Nonetheless, the possibility—however remote—of adverse effects on innovation and competition in the industry is yet another reason for consideration of congressional policy alternatives discussed in chapter 11 (and in ch. 8 with regard to congressional information and ch. 7 on the depository library program).

Other Implications

Electronic dissemination of Federal information by SupDocs and NTIS has implications for several other areas. These areas are summarized briefly below.

State/local government use. OTA's commissioned research² on state/local government use of Federal information concluded that current Federal systems for disseminating information are not adequately serving state/local needs. State/local officials were skeptical about major government reorganization and point to failed state efforts to establish strongly centralized information dissemination offices. However, officials were generally supportive of alternatives such as the electronic information index, common technical standards (as long as they were developed with meaningful state/local participation), and other measures to improve access to Federal information in all formats—including electronic.

²Mark Haselkorn, Philip L. Bereano, and Barbara Lewton, "Perspectives of State and Local Governments, OTA contractor paper, October 1987.

The dissemination of electronic formats by SupDocs and NTIS should improve the ability of State and local governments to learn about and obtain desired Federal information. In order to help ensure that State/local information needs are considered, SupDocs and NTIS could include representatives of State/local governments as participants in user forums, marketing surveys, and advisory panels for electronic dissemination. The related activities of some Federal mission agencies, such as the Bureau of the Census and the Agricultural Extension Service, could be used as prototypes for SupDocs and NTIS. Also, several States have their own innovative electronic dissemination activities, which may be adaptable for use by SupDocs and NTIS as well as Federal mission agencies.

Access by disabled persons. Another area of particular note is the potential of electronic formats to significantly improve access to Federal information by physically disabled persons. OTA's staff research³ found that many impaired individuals are handicapped with respect to obtaining Federal information, for example, because paper formats cannot be read by the blind (with the exception of the limited amount of material in braille) or manipulated by those with serious impairment of the upper extremities. With the advent of Federal information in electronic form, the potential exists to geometrically increase the amount of information accessible to disabled persons through the use of specially adapted microcomputers, optical disks, floppy diskettes, and related electronic technology.

The dissemination of electronic formats by SupDocs and NTIS should improve the ability of disabled persons to obtain and use Federal information, as would electronic dissemination by Federal mission agencies. Electronic access could significantly increase the functional mobility, capability, and productivity of these individuals.

³Carol Nezzo, "Access to Federal Information by Physically Handicapped Persons," OTA staff paper, June 1987.

The primary technological window for disabled persons is the microcomputer. Through use of a microcomputer, disabled persons can access online databases, electronic mail and bulletin boards, CD-ROMs, and the like. Microcomputers can be adapted to make them useable through special applications software, special systems software, and hardware adaptations or devices (such as a keyguard, key-latch, optical printer, over and undersized keyboard, or smart keyboard) that permit the disabled person to use standard software running on a standard microcomputer.

The keys to realizing this potential are: 1) the availability of Federal information in electronic formats; 2) the availability of relatively low-cost microcomputers and adaptive software and devices; 3) the development of standards for microcomputer keyboards and physical design to ensure that microcomputers are compatible with adaptive devices; and 4) the development of standards on text markup and page description. Items 2 and 3 above are being implemented through the joint efforts of the disabled community, equipment manufacturers, researchers, and Federal agencies (especially the General Services Administration, Veterans Administration, and Department of Education). SupDocs and NTIS could play a significant role in items 1 and 4, along with the mission agencies and the National Bureau of Standards. In order to help ensure that the needs of disabled persons are met, disabled persons could be included in SupDocs and NTIS user forums, marketing surveys, and advisory panels.

Electronic archiving. To be complete, the disposition of information should be included as an integral part of the information life cycle. The National Archives and Records Administration has responsibility for archiving of Federal records that have permanent value. NARA archives records in all standard formats—including paper, microform, and machine readable. As the Federal agencies increase their use of electronic formats, archival procedures will need to be continuously reviewed and updated to ensure that the accuracy, integrity, and com-

pleteness of the records are maintained even when in electronic form.

NARA is in the process of issuing updated draft regulations on the maintenance, retention, and disposition of electronic records. The proposed regulations will cover such topics as:

- creation and use of databases and numeric data files, including the need for adequate and up-to-date documentation;
- creation and use of text information in office automation systems;
- selection and maintenance of electronic storage media, including consideration of longevity, cost, portability, and the like;
- retention of electronic records; and
- destruction of electronic records.

The implications of SupDocs and NTIS sales of electronic formats are two-fold. First, ideally, technical standards should be consistent through all stages of the information life cycle—from creation to processing to dissemination to disposition. SupDocs and NTIS involvement in electronic dissemination, along with mission agencies, could provide an opportunity to help ensure that dissemination needs are fully considered. Second, to the extent SupDocs and NTIS offer databases, numeric data files, and the like in a variety of electronic storage media, SupDocs and NTIS sales programs could include a larger percentage of Federal information that currently is available primarily only through Freedom of Information Act requests (for active databases) or searches of NARA archives (for inactive and archived databases).

International leadership. OTA's commissioned research⁴ on foreign government information dissemination activities concluded that the U.S. Government currently has a leadership position with respect to electronic dissemination, followed by the European Economic Community, Canada, other European nations, and Japan in that order. SupDocs and NTIS involvement in electronic dissemination could

⁴Thomas B. Riley, "A Survey of International Trends in Government Information Dissemination," OTA contractor paper, November 1987.

help further strengthen this leadership position through:

- SupDocs/NTIS participation (along with other Federal agencies) in international standards-setting activities,
- SupDocs/NTIS demonstrations of how legal and institutional protections for public access can be extended to an electronic information environment, and
- an enhanced SupDocs/NTIS role in stimulating the domestic economy through improved government information dissemination and the creation of new value-added opportunities for the information industry.

On the other hand, there is some concern that with a strengthened SupDocs/NTIS role, U.S. Government information might become even more accessible to adversaries. As it is, foreign nations and corporations have much easier access to U.S. information than does the U.S. Government (and corporations) to foreign information. Since information is an important tool in international economic and political competition, further increases in the information gap could adversely affect the U.S. competitive position. While this concern has been strongly articulated by U.S. military and intelligence agencies, the factual basis has not been well established.

The institutional, technical/management, and policy alternatives considered in this report are focused on the dissemination of "public" information, defined as Federal information that is not classified, proprietary, or private in nature (or subject to any other exemptions under the Freedom of Information Act). Thus, for example, classified information is screened out of SupDocs and NTIS sales programs at the outset, so greater involvement of these dissemination agencies in electronic dissemination should have no effect on foreign access to U.S. Government classified information.

Concern has also been expressed about dissemination of Federal information that is unclassified, but that is subject to U.S. export control laws. Here again, the governmentwide dissemination agencies such as SupDocs and

NTIS are secondary sources of information. The original sources are the mission agencies themselves. Two problems have arisen. One is the concern that foreign nations who are subject to export controls may be able to get restricted Federal information from third party foreign nations or companies or from U.S. domestic nongovernmental sources. A second is that the secondary dissemination agencies may not fully implement restrictions on source agency information. While these may be legitimate policy problems, they exist irrespective of the format of the information. Access via third parties (whether foreign or domestic) is very difficult to control at best, and electronic dissemination could aggravate this problem. However, limiting the roles of SupDocs/NTIS (as well as the mission agencies) in electronic information dissemination would run a high risk of handicapping U.S. domestic companies (and the U.S. public) and U.S. allies far more than U.S. adversaries. As for SupDocs and NTIS compliance with export control requirements, interagency policy coordination would seem to be the appropriate avenue rather than across-the-board limitations on electronic dissemination. Only a very small percentage of SupDocs and NTIS materials would seemingly be subject to export controls in the first place.

A final, and perhaps most difficult, dimension of concern involves unclassified and unrestricted, but so-called "sensitive" Federal information. Some Department of Defense officials have argued that certain unclassified, unrestricted Federal information, such as economic or agricultural statistics when aggregated and disseminated in electronic formats (especially online databases), becomes sensitive for national security purposes. Sensitive means that foreign adversaries would gain significant advantages from accessing the information in electronic form, presumably on a more timely and integrated basis than would otherwise be possible. Defense and intelligence agency efforts to monitor foreign access to U.S. commercial and governmental unclassified online electronic databases have met with heavy opposition from the civilian agencies, library and research communities, and U.S. information

industry. The industry has responded that such monitoring and potential control of unclassified, legally unrestricted Federal information is not only a threat to open government and a freely competitive marketplace, but could have a seriously adverse economic effect on the industry. Nonetheless, a significantly enhanced SupDocs/NTIS role in electronic dissemination could aggravate defense community concerns.

Related issues are examined in five prior OTA reports:

- *Federal Government Information Tech-*

nology: Management, Security, and Congressional Oversight, OTA-CIT-297, February 1986;

- *The Regulatory Environment of Science, OTA-TM-SET-34, February 1986;*
- *Commercial Newsgathering From Space, OTA-TM-ISC-40, May 1987*
- *Defending Secrets, Sharing Data, OTA-CIT-310, October 1987;*
- *Science, Technology, and the First Amendment, OTA-CIT-369, January 1988.*

These reports should be consulted for further discussion.