

**Chapter 2**

**Trends in Federal Government  
Information Technology  
Management**

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# Trends in Federal Government Information Technology Management

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## SUMMARY

The Federal Government has been a major user of information technology since the development of the first generation of digital computers over three decades ago. With each new generation of technology, the government's computer applications have grown and diversified to the point where, today, information technology is vital to the performance of agency missions and the functioning of the government itself.

For the 142 agency components responding to OTA's Federal Agency Data Request, the total number of mainframe computer central processing units more than doubled from about 11,000 in 1980 to about 27,000 in 1985, mainframe computer terminals more than quadrupled from about 36,000 to over 170,000, and microcomputers increased (conservatively) from a few thousand to about 100,000. In sum, the Federal Government has amassed the largest inventory of computer equipment in the world, with a cumulative information technology budget conservatively estimated at over \$60 billion (current dollars) for the last five fiscal years.

The management of Federal Government information technology has received high-level congressional and executive branch attention for at least the last two decades, with a new round of studies, reports, and policy initiatives occurring at least every 5 years or so. Management issues involving planning, procurement, security, and the like must be revisited periodically because of the dynamic nature of the technology, among other reasons. Management approaches and policies that worked in the first-generation, centralized computer environment may not be effective or appropri-

ate for the decentralized computer and communication environment that exists today.

Major milestones in Federal information technology management include the:

- 1959 Bureau of the Budget study on the need for automatic data processing (ADP) leadership;
- 1965 Brooks Act (Public Law 89-306) establishing ADP management and procurement policies;
- 1977 Commission on Paperwork report on information resources management (IRM) as a management concept;
- 1979 Office of Management and Budget (OMB) Federal Data Processing Reorganization Project recommending management improvements;
- 1980 Paperwork Reduction Act (Public Law 96-511) establishing centralized information technology management by OMB and agency IRM officers; and
- 1983 Grace Commission report on needed improvements in information technology management and planning.

Major themes cutting across all of these activities include the need for the Federal Government to:

- be vigilant in staying abreast of advancing information technology;
- conduct effective planning to identify opportunities where the technology can help improve government performance;
- ensure that acquisition of the technology is cost-effective and competitive; and
- manage the technology, once acquired, efficiently and with sensitivity to the broader implications (e.g., privacy and security).

The Paperwork Reduction Act of 1980 is particularly significant because it was intended to change information technology management practices in two fundamental ways. First, it was intended to bring together previously disparate functions under one management structure—specifically ADP, telecommunications, office automation, information systems development, data and records management, and, possibly, printing and libraries. Second, the act reorients the focus of information technology management from only hardware and procedures to include the information itself, by establishing the importance of information as a resource and the concept of information resources management (known as IRM).

At the present time, IRM has been only partially implemented by the Federal agencies, and it is unclear whether it will eventually be implemented more completely throughout government. The General Services Administration (GSA) has just begun to carry out triennial reviews of agency IRM plans and activities, and OMB has issued guidelines for long-range information technology planning and a circular on "Management of Federal Information Resources." However, Congress may wish to provide further guidance through amendments to the Paperwork Reduction Act, which has not been updated since 1980 and is overdue for reauthorization. Some possible congressional actions are discussed in the next chapter.

Another recurring issue is information technology procurement. Continuing procurement problems have been the focus of numerous General Accounting Office (GAO) reports and congressional hearings. Government procurement is subject to multiple and possibly conflicting efforts to simultaneously expedite the procurement process (e.g., through GSA's increased delegation of procurement authority), increase the level of competition (e.g., through

congressional enactment of the Competition in Contracting Act), and more clearly demonstrate a significant return on investment in information technology (as now required by OMB).

OTA concluded that it is too early to fully assess the overall impact of these procurement initiatives. However, evidence available to OTA suggests that the average age of Federal computers has been decreasing. For example, the results of OTA'S Federal Agency Data Request indicate that the percentage of mainframe computers under 3 years old increased from about 30 percent in 1975 to 60 percent in 1984. And the percentage of mainframe computers over 6 years old decreased from about 60 to 10 percent over the same period of time. These results are generally consistent with those of related GSA and National Bureau of Standards studies.

As for the length of the procurement process itself, there are few reliable indicators, and available data are mixed. Responses to the OTA Data Request indicated that the most frequently reported average procurement time for mainframe computers was 1 to 1.5 years in both 1980 and 1984, with relatively few procurements reported to have taken longer than 2.5 years. These time periods may still be excessive, but do not appear to be as lengthy as generally perceived.

While there is a scarcity of reliable data about the government's ADP personnel, a variety of reports and expert opinion suggest that some agencies have serious problems attracting and retaining technical staff. Differing salary levels between the government and the private sector are the most visible cause of such problems, although other contributing factors include the extent to which agency staff can work with up-to-date information technology, and the time it takes to classify and fill positions.

## INTRODUCTION

The first part of this chapter provides background on policy issues and trends related to management of Federal information technology, while the second summarizes basic data on the extent of information technology use in government. Later chapters will analyze selected issues and policy options in detail.

It should be emphasized that the management of information and technology is not an end in itself, but rather is a tool to further the various missions of Federal agencies. The most important question is not how well agencies use information technology, but how well they accomplish their missions. OTA's analysis can identify trends, suggest problem areas, and suggest opportunities for further exploitation of information technology tools. Clearly though, each agency must consider these problems and opportunities in the context of its missions and circumstances.

More than three decades have passed since digital computers were first sold commercially. In the 1950s, the Federal Government pioneered many of the early uses of large-scale data processing. The first general-purpose data processing computer, the UNIVAC I, was installed at the Bureau of the Census in 1951. Since that time, tremendous changes have occurred in the technology itself, in government policies, and in organizations that use information technology.

The exponential increase in the power and economy of computers since the 1950s has been well documented.<sup>1</sup> As developments such as the transistor and the integrated circuit have been exploited, the size and cost of computing machines have decreased by several orders of magnitude, and their processing speed and versatility have increased by simi-

lar amounts. In addition, microcomputers burst onto the scene in the mid-1970s, changing the nature of the problems for which computers could be used and spreading the control of computing technology into the hands of more people, many without computing backgrounds.

Networking, another major technical trend affecting government information technology management, is closely related to the microcomputer explosion. The past decade has brought substantial improvements in the ease with which information systems can communicate with one another. Packet-switched networks, for example, allow fast and cheap transfer of large amounts of data, usually between larger machines far apart; for smaller machines, the local-area network (LAN) is being used extensively to connect microcomputers and word processors with each other and with larger machines within an office complex. The net effect is that it is much easier for information systems to be decentralized, linked, and interdependent. The management implications of this trend include the technical and administrative challenges of designing distributed computing networks, as well as the security considerations of increased interdependence.<sup>2</sup>

While these trends in computer and telecommunication hardware have received a great deal of attention, there has been an emerging consensus in the past few years that one of the most significant bottlenecks for expanded use of information systems is software, the instructions that make information systems perform useful tasks. The development and maintenance of software systems are still extremely labor-intensive, and both industry and government have begun to focus their management attention on software.<sup>3</sup>

<sup>1</sup>This report will not include a primer on trends in computer technology, because such material is readily available. See, for example, U.S. Congress, Office of Technology Assessment, *Information Technology R&D: Critical Trends and Issues*, OTA-CIT-268 (Washington, DC: U.S. Government Printing Office, February 1985); and U.S. Congress, Office of Technology Assessment, *Automation of America Offices*, OTA-CIT-287 (Washington, DC: U.S. Government Printing Office, December 1985).

<sup>2</sup>See, for example, *America Hidden Vulnerabilities: Crisis Management in a Society of Networks*, A Report of the Panel on Crisis Management of the Georgetown Center for Strategic and International Studies, October 1984. Many of the security issues are discussed in ch. 4.

<sup>3</sup>See, for example, Office of Management and Budget, *Management of the United States Government Fiscal Year 1986*, pp. 47-52.

## TRENDS IN INFORMATION TECHNOLOGY MANAGEMENT

### Major Studies and Policy Actions

Many common themes can be found in the key reports and policy measures in this area over the past three decades—in particular, the need to use information technology effectively and to control the costs of that use, the need for foresight and planning, and the need for policy leadership and coordination. While there has been progress since the first UNIVAC, the pace of change in information technology, and the evolution of organizations as a result of its use, requires almost continuous attention to issues of planning, effective use, procurement, and policy leadership. Appendix 2A at the end of this chapter presents some excerpts from key studies in this area.

Public Law 89-306 (known as the Brooks Act), enacted in 1965, was the earliest significant congressional action affecting Federal use of information technology. This legislation was prompted by a concern that one supplier (IBM) was dominating Federal automatic data processing, and by GAO reports that agency use of information technology was out of control and that agencies should more often purchase rather than lease equipment.<sup>4</sup> In addition, the Bureau of the Budget (BOB—now OMB) had issued reports and guidelines calling for coordination and “dynamic leadership” in government ADP management, but GAO and others considered BOB’s actions to be generally ineffective.<sup>5</sup> Thus Congress, with the

<sup>4</sup>See U.S. General Accounting Office, *Survey of Progress and Trend of Development and Use of Automatic Data Processing in Business and Management Control Systems of the Federal Government as of December 1957*, June 27, 1958; *Review of Automatic Data Processing Developments in the Federal Government*, Dec. 30, 1960; *Study of Financial Advantages of Purchasing Over Leasing of Electronic Data Processing Equipment in the Federal Government*, Mar. 6, 1963; and *Review of Problems Relating to Management and Administration of Electronic Data Processing Systems in the Federal Government*, Apr. 30, 1964.

<sup>5</sup>See Bureau of the Budget, “Report of Findings and Recommendations Resulting From the Automatic Data Processing (ADP) Responsibilities Study,” September 1958 to June 1959, and “Report to the President on the Management of Automatic Data Processing in the Federal Government,” March 1965. For views of BOB’s effectiveness, see the legislative history of Public Law 89-306, *U.S. Congressional and Administrative News*, 89th Cong., 1st sess., pp. 3873-3874.

leadership of Chairman Jack Brooks (D-Texas) and the House Committee on Government Operations, passed Public Law 89-306, which established central control over ADP in the Federal Government through three agencies: the Bureau of the Budget for policy, the General Services Administration for procurement, and the Department of Commerce/National Bureau of Standards for standards and other technical support.

In the late 1960s and early to mid-1970s, a variety of GAO reports and congressional oversight hearings focused on two topics relevant to information technology management: problems in the implementation of the Brooks Act, and concerns about excessive paperwork imposed by Federal agencies. Two important study groups were established to help grapple with these issues. In 1974, Congress established the Commission on Federal Paperwork, which reported recommendations on decreasing the paperwork burden in 1977; and in 1977, the President created the Federal Data Processing Reorganization Project, which issued a report in April 1979.<sup>6</sup> Both of these reports cited the need for increased coordination of information collection and use in the government, and advocated a more sophisticated, wide-ranging style of management for information technology. Building on these recommendations, Congress passed Public Law 96-511, the Paperwork Reduction Act of 1980. The act joins the two goals—reducing paperwork and improving information and technology management—under the banner of a new concept, information resources management (IRM).

### Information Resources Management

The IRM concept is intended to change management practices in two fundamental

<sup>6</sup>*Information Resources Management, Report of the Commission on Federal Paperwork*, Oct. 3, 1977 (Washington, DC: U.S. Government Printing Office, 1977); and *Information Technology and Governmental Reorganization: Summary of the Federal Data Processing Reorganization Project*, April 1979.

ways.<sup>7</sup> First, it brings together under one management structure previously disparate functions—specifically ADP, telecommunications, office automation, systems development, data and records management, and in some cases, printing and libraries. The rationale behind this integration is to adopt a management strategy consistent with the convergence of the technologies themselves, as well as a strategy that allows for information functions to be more comprehensively integrated, efficient, and complementary. See figure 2-1 for a graphic representation of this integration.

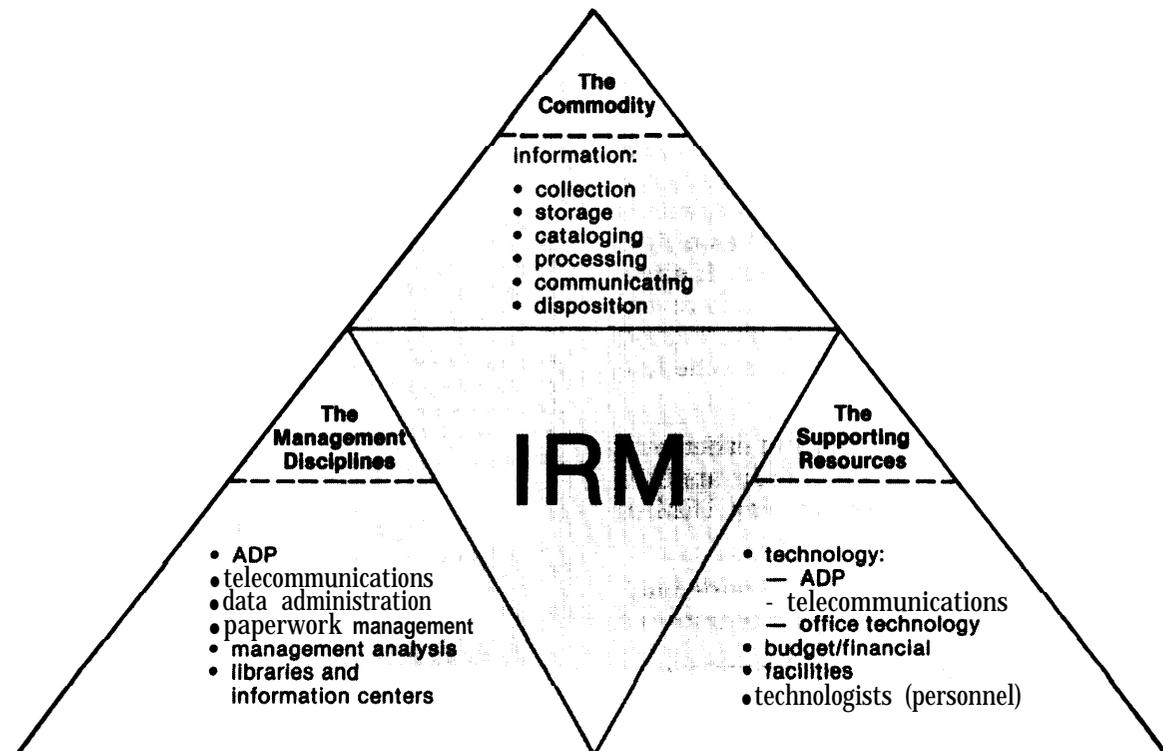
Second, IRM reorients the focus of information systems management from hardware and procedures to the information itself by firmly establishing the importance of information as

<sup>7</sup>For useful, broad-ranging discussions of information resources management see the report of the Commission on Federal Paperwork, op. cit.; and F. Woody Horton, Jr., and Donald Marchand (eds.), *Information Management in Public Administration* (Arlington, VA: Information Resources Press, 1982).

a resource. Proponents of IRM believe this move is essential as organizations become more information-intensive, because managers must recognize the costs of collecting and keeping information, and they must balance those costs against the value of the information to the organization. One of the chief proponents of the IRM concept writes:

The time has come to formalize the treatment of information and deal with data as a manageable and budgetable resource, in the same way organizations must deal with human, physical, financial, and natural resources. Dealing with the information explosion piecemeal simply is not working. Information and data costs are increasing, and individuals and organizations are not getting the information they need. Instead, they are being inundated with data to the point where the data cease to be informative. Sophisticated information-handling technologies, including data base management approaches, are leading individ-

Figure 2-1.—The Scope of Information Resources Management



SOURCE Roger Cooley, U S Department of the Interior

uals and organizations into a mire of information overload.<sup>8</sup>

In its paperwork-fighting role, the Paperwork Reduction Act mandates the establishment of a Federal Information Locator System so that agencies can determine whether information they want to solicit from the public is already available; it also requires agencies to calculate the number of man-hours required for the public to fill out its various forms, and to compile an "Information Collection Budget" for approval by OMB. In its role as an information resources management directive, the act requires that agencies designate a "senior official" to be responsible for IRM, and that agencies review and evaluate their information management activities. The act established a new Office of Information and Regulatory Affairs within OMB to manage both paperwork reduction and information technology management governmentwide.

One final important consequence of the Paperwork Reduction Act is its mandate for OMB and GSA to develop a "five-year plan for meeting the automatic data processing and telecommunications needs of the Federal Government" (see ch. 3), and for OMB and GSA to review agencies' information management activities at least every 3 years. GSA has just begun to implement a plan for these reviews, and has developed materials to help agencies examine their own IRM activities as a first step toward a GSA/OMB evaluation. If effective, these triennial reviews could help reveal weaknesses and help agencies to share good techniques. See table 2-1 for GSA's schedule for these reviews.

Based on OTA's workshops and other contacts with Federal agency officials, it appears that many agency staff seem to view IRM in one of two ways:

1. as an umbrella term, used in a wide variety of discussions about ways to improve

<sup>8</sup>F. Woody Horton, Jr., "Needed: A New Doctrine for Information Resources Management," p. 45, in Horton and Marchand, *op. cit.*

<sup>9</sup>General Services Administration, *IRM Review Handbook*, FIRMR 201-19, fiscal year 1985. The handbook contains a set of provocative questions for each aspect of an agency's IRM activities that are particularly helpful in assessing information technology management practices.

**Table 2-1.—Schedule for GSA Triennial Reviews**

First-year agencies are those information-intensive agencies (identified by OMB in initial review efforts) with the longest established review programs. Second- and third-year agencies are information-intensive agencies not included in the first year. Agencies have been listed if they are large enough to have an established IRM organization. All other agencies are also included in the third year.

**Beginning in FY 86, and every third year thereafter**

*Year 1 agencies:*

Department of Agriculture  
 Department of Commerce  
 Department of Education  
 Department of Energy  
 General Services Administration  
 Department of Health and Human Services  
 Department of the Interior  
 Department of Justice  
 Department of Labor  
 Department of Transportation  
 Veterans Administration

**Beginning in FY 87, and every third year thereafter**

*Year 2 agencies:*

Consumer Product Safety Commission  
 Environmental Protection Agency  
 Federal Energy Regulatory Commission  
 Federal Trade Commission  
 Department of Housing and Urban Development  
 Interstate Commerce Commission  
 National Aeronautics and Space Administration  
 National Science Foundation  
 Office of Personnel Management  
 Department of State  
 Department of the Treasury

**Beginning in FY 88, and every third year thereafter**

*Year 3 agencies:*

Action  
 Commodity Futures Trading Commission  
 Department of Defense  
 Department of the Air Force  
 Department of the Army  
 Department of the Navy  
 Federal Communications Commission  
 Federal Emergency Management Agency  
 Federal Reserve System  
 Nuclear Regulatory Commission  
 Securities and Exchange Commission  
 Selective Service System

SOURCE: General Services Administration, *IRM Review Handbook*

use of information technology in government, in many cases similar to the way the term ADP (automatic data processing) is used; or

2. as-an interesting and worthwhile concept, but much too broad to have substantial impact on down-to-earth problems.<sup>9</sup>

<sup>9</sup>"This observation is based on OTA work sessions with several dozen executive agency officials on Oct. 25, Oct. 31, and Nov. 2, 1984; several other OTA events that included exten-

On the other hand, to the extent that IRM serves as a vehicle for coordinating and addressing those down-to-earth problems—essentially planning, procurement, personnel, and prestige within the agency—it is viewed as a useful organizational approach. As is probably true with any new (or relatively new) concept, as the concept moves from its guiding principles through the various stages of implementation, the broad philosophy becomes more and more distant. Too, agency staff must cope with the realities of resource constraints, bureaucratic inertia, and internal and external politics. Essentially, at the operating level agency staffers appear to draw from IRM concepts and techniques that which they find useful. It is unclear at this early stage of implementation whether this partial implementation will continue to be the case, or whether IRM will eventually be implemented more completely throughout government.

One of the difficulties in determining the effectiveness of the IRM concept is the wide variation of problems, missions, and management styles in the Federal Government. As an OMB report notes:

... It is critical to keep in mind, however, that information resources management is simply a means to perform agency missions and is not an end in and of itself. As such, its use varies across agencies. It is a tool that managers use to achieve objectives that often have little or nothing to do with information resources management. It is successful if it enables managers to achieve those objectives cost effectively and it is unsuccessful if it does not. "

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sive participation by executive agency staff; OTA staff site visits to agencies; OTA staff attendance at professional meetings and seminars; and personal contacts. See also Robert Head, "IRM and Reality," *Government Data Systems*, May/June, 1984, pp. 45-46.

"Office of Management and Budget, General Services Administration, and Department of Commerce/National Bureau of Standards, *A Five-Year Plan for Meeting the Automatic Data Processing and Telecommunications Needs of the Federal Government*, June 1985, p. 17.

## Planning

The need for information technology planning has been apparent almost since the government began using information technology. For example, a 1960 GAO report,

... call(ed) attention to the need for more positive central planning of a long-range nature within the executive branch of the government to promote the maximum degree of efficiency, economy, and effectiveness in the administration and management of costly automatic data processing facilities. 'z

The Paperwork Reduction Act of 1980, as noted above, requires OMB and GSA to develop a 5-year plan for Federal Government information technology. The act does not assign specific planning tasks to agencies themselves, although it does include planning under the general rubric of the duties of the agencies' information resource managers.

While the Federal Government has begun to address the need for planning for information systems, the private sector has been actively pursuing such planning as well. Businesses have also become more dependent on information technology, and information technology management has gradually become more visible in corporate organizations. In fact, much of the business-oriented literature on information technology planning focuses on the use of computers not only to keep track of the business, but also to provide a competitive edge—for example, by enhancing the firm's flexibility and responsiveness, or by helping corporate executives focus only on information that is critical for competitiveness.<sup>13</sup>

Despite what seems to have been a groundswell of support for information technology

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"U.S. General Accounting Office, *Review of Automatic Data Processing Developments in the Federal Government*, December 1960, p. 1.

"see, for example, the work of the Center for Information Systems Research at the Sloan School of Management, Massachusetts Institute of Technology. Highlights include, John Rockart, "Chief Executives Define Their Own Data Needs," *Kar-var'd Business Review*, March-April 1979; John Rockart and A.D. Crescenzi, "Engaging Top Management in Information Systems Planning and Development: A Case Study," Paper # 115 in the Center's working paper series, July 1984.

planning, there continues to be a consensus that most Federal agencies do not plan as much or as effectively as they should, and that this is partly responsible for many problems, and for their failure to use information systems effectively. Clearly, this situation is also closely tied to weaknesses in many agencies' overall planning.<sup>14</sup>

In the past few years, the demands for effective planning for Federal information technology seem to have reached a crescendo. The Office of Management and Budget, the General Services Administration, and others have strengthened their policy guidelines and issued a variety of handbooks to help agencies plan effectively for information technology use.<sup>15</sup> (See ch. 3 for further discussion of information technology planning.)

### Procurement

As noted above, the procurement process has been a subject of much controversy since the 1960s, and concerns about the way agencies acquired and managed their computers were the prime motivating force behind the Brooks Act of 1965. Since the act was passed, the Federal Government's strategies for acquiring and managing information technology

<sup>14</sup>This consensus can be observed throughout congressional hearings and oversight, in many (perhaps most) GAO reports (e.g., *Continued Use of Costly, Outmoded Computers in Federal Agencies Can Be Avoided*, Dec. 15, 1980; *Inadequacies in Data Processing Planning in the Department of Commerce*, May 1, 1978; *Strong Centralized Management Needed in Computer-Based Information Systems*, May 22, 1978; *GSA Telecommunications Procurement Program Requires Comprehensive Planning and Management*, June 11, 1984), and in a variety of other fora (see, e.g., Robert Head, "Federal Information Systems Management: Issues and New Directions," a staff paper published by The Brookings Institution, 1982).

<sup>15</sup>These include volume 1 of OMB's *Five-Year Plan for Meeting the Automatic Data Processing and Telecommunications Needs of the Federal Government*, April 1984, which includes a primer on information technology planning and several examples of specific agencies' planning processes; OMB's Bulletin 85-12 (Mar. 29, 1985), which provides guidance to agencies on planning and requires them to submit planning documentation to OMB; GAO's *Questions Designed To Aid Managers and Auditors in Assessing the ADP Planning Process*, Sept. 30, 1982; and GSA's *IRM Review Handbook, fiscal year 1985*, and *Strategic Information Resources Management Planning Handbook*, February 1985. GSA has also begun a Federal IRM Planning Support Program to provide limited assistance to agencies in their planning process.

have been in a state of near-constant flux. Congress, and especially the House Committee on Government Operations, has continued to express concern, particularly about the use of noncompetitive or "sole source" procurement procedures to obtain information technology. A 1976 oversight report by the House Committee on Government Operations concluded that noncompetitive procurements were caused largely by a lack of adequate justifications for ADP acquisition, inadequate long-range planning, insufficient development and use of standards and high-level languages, failure of agencies to use existing ADP resources efficiently, and the infrequent use of functional specifications in procurement requests (rather than more restrictive technical specifications).<sup>16</sup>

Essentially, the key aspect of information technology that makes a fair and competitive procurement even more difficult than other procurements is the problem of compatibility between old and new systems. In most cases, new ADP technology will require modifications in system configuration, telecommunications, and especially software, that can become intricate, lengthy, and difficult to resolve. Hence, beyond other considerations that may push Federal managers toward limiting competition in their procurements—e.g., complex procurement processes, inadequate planning, personal preferences, or even corruption—managers in both the public and private sectors tend to prefer new technology that is as compatible as possible with existing technology to minimize disruption in the conversion process.

In general, the level of frustration in implementing the Brooks Act has been high, not only for Congress, but also for the central management agencies and the mission agencies. As one analyst observed:

Each step in developing the law and policy for ADP acquisition and management has been tested (by congressional staff, OMB, GSA, GAO, and by affected agencies) against

<sup>16</sup>House Committee on Government Operations, Report 94-1746, *Administration of Public Law 89-306, Procurement of ADP Resources by the Federal Government*, Oct. 1, 1976, p. 3.

its assumed ability to produce the objectives sought. Each applicable policy document (e.g., Public Law 89-306, GSA directives, NBS standards, and OMB circulars) has met the test of logic. Yet numerous GAO reports and congressional committee hearings support the conclusion that the end results have been astonishingly ineffective. In short, the law *meets all rational tests and has not achieved the expected gains in economy and efficiency.*"

In 1984, in part as a result of some of these frustrations, Congress passed the Competition in Contracting Act. The act considerably strengthens the regulations governing all procurements, requires each agency to designate a "competition advocate," and requires full and open competition in as many procurements as possible. Significantly, the new act considers both "competitive negotiation" and purchases from negotiated schedule contracts<sup>18</sup> as full and open competition, allowing contracting officers some welcomed options in an otherwise stringent law. The act prescribes certain exceptions that justify noncompetitive procurements. These are:

- the property or services are available from only one responsible source;
- there is "unusual and compelling urgency";
- it is desirable to award the contract to a particular source in order to maintain the existence of a supplier or to meet the terms of an international agreement;
- noncompetitive procurement is specifically authorized by statute;
- the disclosure of the agency's needs would compromise national security; and
- the head of the agency determines that it is "necessary in the public interest" to use noncompetitive procedures, and noti-

<sup>18</sup>Paul Richard Werling, *Alternative Models of Organizational Reality: The Case of Public Law 89-306*, doctoral dissertation for the University of Southern California, August 1983, p. 9.

<sup>19</sup>Competitive negotiation allows contracting officers to discuss the terms and conditions of a contract with bidders, and to consider factors other than price in the award of the contract. It is in contrast to "sealed bids," in which there is generally no discussion and the contract is awarded based on price alone. Purchases from "schedule contracts" are for lower dollar value items for which GSA has negotiated a government-wide price with the vendor. These vendors and prices are usually found in GSA's Schedule C.

fies Congress in writing 30 days before award of the contract.

In addition, the act sets up a special procedure to resolve disputes between agencies and vendors of ADP equipment. Under this procedure, the Board of Contract Appeals at GSA is given authority to suspend procurement authority if necessary, and to issue a decision on the protest within 45 working days after the protest is filed.<sup>19</sup>

The Competition in Contracting Act is also having a direct and immediate effect on GSA, where an effort is under way to rewrite the procurement regulations to conform with the act. In addition, GSA has been attempting for several years to simplify procurement procedures. For example, GSA recently combined its primary guidance on information technology procurement into a 100-page document, the Federal Information Resources Management Regulation. Also, in recent modifications of procurement guidelines, GSA has continued a key trend to decentralize procurement authority to the agencies and try to minimize GSA's centralized procurement role.

Agencies have blanket authority to procure ADP hardware without GSA approval when the cost is below certain thresholds (see table 2-2). GSA evaluates the procurement practices of agencies and occasionally raises or lowers their thresholds for delegation of procurement authority, based on performance in executing effective procurements and maximizing competition. Finally, in late 1985, GSA announced

— . . . ———  
 "The act also provides for a general procurement protest system that can be used for all contracts, although vendors cannot protest using both systems. It is this more general protest system that has been so controversial since the act was passed. It gives the Comptroller General authority to decide protests (normally within 90 working days of filing). OMB and the Attorney General argued that giving the Comptroller General such authority was a violation of Constitutional separation of powers because GAO is an arm of the legislative branch. Attorney General Meese initially instructed executive agencies not to comply with the act, but backed down after a U.S. District Court decision upheld the act, and a congressional committee voted to cut off procurement funds for the executive branch if they did not comply. The court decision is being appealed to the third U.S. Circuit Court of Appeals. (Myron Struck, "Meese Averts Showdown on GAO Contract Power," *Washington Post*, June 5, 1985.)

**Table 2-2.—Thresholds Below Which Agencies May Procure Information Technology Without a Specific GSA Delegation of Procurement Authority (DPA) (FIRMR Part 201.23)**

	Competitive	Sole source	Schedule
ADPE . . . . .	\$2.5 million (purchase price) \$1.0 million (annual rental)	\$250,000 (purchase price) \$100,000 (annual rental)	\$300,000 (purchase price) (whether leased or purchased)
Software . . . . .	\$.1 million (total procurement)	\$100,000 (total procurement)	Maximum order limitation <sup>a</sup>
ADPE maintenance . . . . .	\$.1 million (annual charges)	\$100,000 (annual charges)	Maximum order limitation <sup>a</sup>
Commercial ADP services . . . . .	\$.2 million (annual charges)	\$200,000 (annual charges)	\$2 million (if competitive) \$200,000 (if sole source)
ADP support services . . . . .	—Authority is granted for all acquisition actions—		

variables **according** to the particular contract or product.

NOTE: DPA thresholds were increased under FPR Temporary Regulation 71 to these levels and were permanently codified via FIRMR Amendment 4, effective Oct. 1, 1985.

ADPE = Automatic Data Processing Equipment.

SOURCE: General Services Administration.

a new program, "Go for 12," whose goal is to help other agencies get computers delivered within 12 months after budget approval. GSA is developing the details of the program in cooperation with selected Federal agencies.<sup>20</sup>

Agencies can now obtain small computer systems with virtually no restrictions except normal internal review of purchases. The procedures for acquiring equipment costing less than \$25,000 have been streamlined. And GSA has opened two new routes for purchase of such smaller systems: a retail store operated under contract (Office Technology Plus), and a centrally negotiated "schedule" of prices with a wide range of vendors. Responding to concerns about relatively uncontrolled purchase of personal computers, GSA has also issued some (nonbinding) guidance to agencies on such procurements.<sup>21</sup>

OMB has also made significant changes in guidance regarding information technology procurement. In a report submitted with the fiscal year 1986 budget, OMB required agencies to document a 10 percent return on their information technology investments, implement standards permitting communication between systems, encourage the procurement of commercially available software instead of custom-written software, and reduce their software maintenance costs by 25 percent, and

by 5,000 FTEs, over fiscal years 1986 to 1988.<sup>22</sup> Though the effectiveness of these measures remains to be seen, the refocusing of some attention to software, rather than hardware, appears well advised. As OMB noted in its report, software costs amounted to less than 20 percent of Federal computer expenditures in 1965, but represent 60 percent of expenditures today. Yet, the government still develops custom software for 90 percent of its applications, which results in redundancy of software development projects, difficulties in system conversions and upgrades, and added expense. However, in some cases the nature and size of Federal applications may require custom software. For example, while "off-the-shelf" software is likely to be useful for common administrative applications such as budgeting or personnel management, it is less likely to be useful for management of immense databases (e.g., Social Security Administration or Internal Revenue Service).

The Federal Government's information technology managers have been arguing for at least a decade that the procurement process is hopelessly complex and is blocking attempts to use information technology effectively and innovatively.<sup>23</sup> As far as OTA can discern, this group is just as vehement on this point as

<sup>20</sup>General Services Administration, "Draft Executive Summary of the Go For 12 Program," February 1986.

<sup>21</sup>Managing End User Computing in the Federal Government, June 1983; and End User's Guide to Buying Small Computers, August 1984.

<sup>22</sup>OMB, *Management of the United States Government, Fiscal Year 1986*.

<sup>23</sup>See, for example, Robert Head, *Federal Information Systems Management: issues and New Directions*, op. cit.

ever.<sup>24</sup> Nevertheless, a small and perhaps growing group of officials say that with some resourcefulness it is indeed possible to get through the apparent maze of processes and regulations and conduct successful and competitive procurements.<sup>25</sup>

In its December 1985 Policy Circular, "Management of Federal Information Resources" (discussed in more detail below), OMB's endorsement of competitive procurement is less wholehearted than that of Congress. An appendix to the circular states:

While competitive procurement is generally to be valued, its costs should be taken into account, including the cost to program effectiveness of unnecessarily lengthy procurement processes. Other conditions, such as the need for compatibility, may also be legitimate limitations on the competitive process."

Federal managers would support this statement and, indeed, the lifecycle costs of information systems to the government include the costs of procurement. However, the spirit of this statement reflects the divergence in views between Federal managers, who would prefer to err on the side of effectiveness even if that means less competition, and congressional oversight committees such as House Government Operations, whose preference (expressed both in legislation and in hearings) has been for competitive procurements in the absence of extremely compelling circumstances indicating otherwise.

Other recent administrative changes in the process also seem to be pulling procurement in different directions. GSA is attempting to give agencies greater autonomy in procurements and simplify the regulations, while at the same time OMB is requiring demonstrated

returns on investment. Most executive branch officials seem to see the Competition in Contracting Act as likely to lengthen and complicate many procurements, because of the ease with which vendors can file protests and delay the process, and because it is unclear under the new law to what extent agencies can conduct "compatibility-limited" procurements (that is, requiring that vendors' proposals only include products compatible with a certain kind of system or architecture) and still be considered fully competitive.<sup>27</sup>

Yet, many of the delays in procurement processes may be due to procedures within the agencies, as well as to regulations imposed on the agencies by GSA, OMB, or Congress. One participant at an OTA meeting, for example, said that he had been trying to procure 40,000 feet of coaxial cable—presumably a simpler procurement than, for example, a large computer system—and that after 15 months it was still not clear when the paperwork would clear his internal bureaucracy. Experienced observers of Federal procurement report that procurement offices are frequently understaffed and besieged by changes in regulations and in technology. In addition, the procurement officers themselves often believe that delay is desirable, either because the time may allow a better deal for the government, or because their jobs make them exceptionally vulnerable to criticism for a mistake in procurement procedures.<sup>28</sup>

A 1981 study on acquisition of ADP equipment for the Air Force may be somewhat indicative of the problems in government ADP procurement, although the Defense Department has many more layers of hierarchy than other, smaller agencies. The report's findings indicated that the procurement process is unnecessarily lengthy (the Air Force takes an average of three times as long as industry to procure ADP equipment, according to the report), resulting in sacrifices in acquisition cost and capabilities; and that the agency was fo-

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"The impression that Federal managers' dissatisfaction with the procurement process has not eased significantly comes from OTA's meetings with Federal agency representatives, Oct. 25, Oct. 31, and Nov. 2, 1984; and from a variety of conferences and other personal contacts.

"See, for example, Frank Guglielmo, Acting Director, Computer Technology and Telecommunications Staff, Office of Information Technology, Department of Justice, "Streamlining Acquisition," address to Government Computer Expo, Washington, DC, June 13, 1985.

"OMB Circular A-130, p. IV-13.

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"Francis McDonough, General Services Administration, letter to OTA, September 1985.

"OTA work session on information technology management, planning, and procurement, June 26, 1985.

cluding on a misplaced notion of short-term economy and efficiency (i.e., spending the least money to purchase the machine) at the expense of achieving its mission effectively.<sup>29</sup>

### ADP Personnel

The availability of staff to manage and operate Federal information technology is another ongoing problem in Federal information technology management. Although there is a wide spread perception among Federal managers that the government cannot compete effectively in hiring and retaining computer staff,<sup>30</sup> there is only sketchy and largely anecdotal evidence to support this assertion and identify the magnitude of the problem. Further, agency personnel problems differ greatly because of variations in management and personnel practices, and in levels of sophistication in information technology use.

The perceptions of potential employees can be a significant factor in attracting them to an agency. For example, the extent to which an agency uses state-of-the-art technology is an important attraction for ADP staff, and some agencies, such as the National Aeronautics and Space Administration (NASA), report that their image as a leader in technology continues to help them attract good technical staff.<sup>31</sup> In other cases, reports of budget cuts or hiring freezes, in addition to a perception that many Federal agencies use obsolete ADP equipment (a perception that may be increasingly inaccurate, as noted below), tend to make recruiting and retention more difficult.

One of the key arguments is that computer specialists can command higher salaries in the private sector, and thus are not attracted to lower paying jobs in the Federal Government.

<sup>29</sup>Booz-Allen & Hamilton, Inc., *Defense ADP Acquisition Study*, prepared for U.S. Air Force ADP Acquisition Improvement Group and Defense Systems Management College, Nov. 30, 1981.

<sup>30</sup>See, for example, President's Private Sector Survey on Cost Control (known as the Grace Commission), *Report on Automated Data Processing/Office Automation*, spring-fall 1983, pp. 85-103; and S.M. Menke, "Budget Blues: Agencies Losing AD-Pers," *Government Computer News*, Mar. 8, 1985, p. 1.

<sup>31</sup>Charles Mason, National Aeronautics and Space Administration, personal communication, January 1986.

An Office of Personnel Management (OPM) study provides some support for this argument, indicating that pay differences are greatest at entry level, where Federal GS-5 salaries are 24.2 percent below those in the private sector. This difference drops to 12.3 percent at GS-12 (see table 2-3).<sup>32</sup> While the Federal Government is by law supposed to pay its employees salaries comparable to average salaries in the private sector, the pay increases in the last few years have lagged behind the government's analysis of what is necessary to maintain comparability.

Further, comparisons between Federal and private sector pay are not entirely straightforward because of differences in position definitions, fringe benefits, and regional costs of living.<sup>33</sup> Other indicators do support pay-related personnel problems in this area, however. A study conducted by the Dallas region of OPM indicated that:

- GS-334 (the designation for Federal computer jobs; see footnote 32) positions have a higher vacancy rate than other comparable government jobs in the region (8.4 v. 5.5 percent as of April 1984);
- positions at the GS-5, GS-7, and GS-14 levels have even higher vacancy rates (23.1, 14.5, and 13.2 percent, respectively);
- GS-334 jobs take longer to fill than comparable jobs (a median of 83 days vacant v. 60 for other jobs); and
- turnover rates are particularly high at the GS-5, GS-7, and GS-14 levels.<sup>34</sup>

<sup>32</sup>Office of Personnel Management, *Computer Specialist (GS-334) Classification Study: Agency Compliance and Evaluation*, February 1984. To the extent that there is information available about Federal ADP personnel, it tends to focus on the GS-334 series, which includes programmers, programmer analysts, systems programmers, systems analysts, equipment analysts, and computer specialists. There is considerably less information available about computer scientists, or other Federal technical staff who work with computers but whose classification is not strictly computer-related.

<sup>33</sup>Grace Commission, op. cit.

<sup>34</sup>Dallas Region, Office of Personnel Management, "Report of Regional Probe: Recruitment and Retention of Computer Specialists," August 1984.

**Table 2.3.—Average Annual Salaries for Programmers/Programmer Analysts in Private Industry v. Average Annual Salaries for Federal Employees in the GS-334 Series, March 1983**

BLS level	GS grade	BLS <sup>a</sup> average	Federal <sup>b</sup> average	Difference Federal v. BLS	1983 range		1984 GS range	
					Minimum	Maximum	Minimum	Maximum
I	5	19,777	14,998	-24.20/o	13,369	17,383	13,837	17,986
II	7	22,148	17,640	-20.40/o	16,559	21,527	17,138	22,277
III	9	26,224	21,553	-17.8 <sup>o</sup> /o	20,256	26,331	20,965	27,256
IV	11	31,446	27,155	-13.60/o	24,508	31,861	25,366	32,980
V	12	38,125	33,448	-12.30/o	29,374	38,185	30,402	39,519

SOURCES: <sup>a</sup>Office of Personnel Management, using data from National Survey of professional, Administrative, Technical, and Clerical Pay, March 1983 (BLS Bulletin 2181 dated September 1983); <sup>b</sup>PATCO Report, March 1983 (OPM, Office of Workforce Information)

Virtually all of the data on ADP personnel are preliminary or based on limited samples. Until more authoritative studies are done, it is difficult to assess the magnitude of the problem and determine appropriate policy steps.<sup>35</sup>

A final issue in assessing ADP personnel is the classification system used by the Federal Government to assign jobs to position levels based on the responsibilities and skills needed in the job. Preliminary findings from a study begun by OPM show that 28.5 percent of Federal employees in the GS-334 series are overgraded (that is, their grades are higher than their responsibilities and skills indicate). In the civilian agencies, this figure rose to 44.7 percent. By comparison, a 1981 study found an overgrading rate of 14.3 percent in white-collar government jobs as a whole.<sup>36</sup> It is not clear to what extent overgrading is a result of agency attempts to make pay more competitive, or other factors such as inappropriate use of the classification schemes. In any case, the classification system—and in particular, the Federal practice of reclassifying most positions when they fall vacant—can exacerbate other recruitment problems because it can extend the time necessary to fill a position.

A variety of solutions have been tried or proposed to ease ADP personnel problems. One agency, for example, provides a training program for persons hired in the GS-334 series. The program recruits graduates with advanced

degrees, little computer experience, and good academic records to enter a 2- to 3-year program. As they are being trained to become computer specialists, they are able to enjoy pay raises and prove themselves in the field. The disadvantages of this training program are that it is expensive, not all recruits become skilled in the use of computers, and some may leave the government after training.<sup>37</sup>

The Federal Employees Recruitment and Retention Improvements Act of 1985 (H.R. 2836, sponsored by Representative Frank Wolf, and S. 1327, sponsored by Senator Paul Trible) has been proposed to exempt computer specialists from pay freezes in order to retain employees in computer-related fields, and to reduce the lag between the time a position becomes available and the time a candidate is approved by QPM for hire. Another draft bill circulating within OPM and the Office of Science and Technology Policy, the Federal Science and Technology Revitalization Act, is said to propose allowing public sector wages to match those of the private sector, and to provide for merit raises and the abolishment of automatic raises in enumerated science and technology jobs.<sup>38</sup>

Finally, the Grace Commission's report suggested that:

- OPM and GSA should collaborate on

<sup>35</sup>The Office of Personnel Management has been working on a more authoritative and indepth study of ADP personnel, but completion and release of the report are indefinite. (Tony Ingrassia, OPM, personal communication, January 1986.)

<sup>36</sup>OPM, *Computer Specialist Classification Study*, op. cit.

<sup>37</sup>Carl Lowe, Bureau of Labor Statistics, personal communication, January 1986.

<sup>38</sup>Eric Fredell, "ADPer Shortage a Myth? Some May Escape Freeze," *Government Computer News*, Oct. 11, 1985, p. 1; and Eric Fredell, "Reagan Eyes Higher Tech Pay: Bill Designed to Support Recruitment, Retention," *Government Computer News*, February 1985, p. 1.

ways to streamline the classification system;

- agencies should find ways to speed the hiring cycle, for example by reclassifying positions on a fixed schedule instead of when vacated;
- the government should investigate ways to make the classification system more flexible; and
- the agencies should increase the use of cash incentives to reward performance for ADP personnel.

GAO concurred with the essence of these recommendations.<sup>39</sup>

### Recent Issues

Since the Paperwork Reduction Act was passed, debate and controversy continue around the issues of information technology management:

- The Senate Governmental Affairs Committee and the House Government Operations Committee have held hearings on progress in implementing the Paperwork Reduction Act, and both Representative Jack Brooks and Senator John Danforth introduced amendments to the act in the 98th Congress that specified further paperwork reductions and clarify and enhance other portions of the act.<sup>40</sup> The amendments passed the full House and the Senate Governmental Affairs Committee, but were not taken up in the full Senate. As of January 1986, similar legislation had not been introduced in the 99th Congress, although Senator Dale

<sup>39</sup>“Grace Commission, op. cit.; and General Accounting Office, *Compendium of GAO's Views on the Cost Savings Proposals of the Grace Commission*, Feb. 19, 1985, p. 1024.

<sup>40</sup>U.S. Senate, Subcommittee on Information Management and Regulatory Affairs, hearings on the Paperwork Reduction Act Amendments of 1984, Apr. 4, 1984; U.S. Senate, Committee on Governmental Affairs, Report 98-576 to accompany S. 2433, the Paperwork Reduction Act Amendments of 1984; House Committee on Government Operations, Subcommittee on Government Information, hearings on the Paperwork Reduction Act Amendments of 1983 (H.R. 2718), Apr. 27, 1983. In the 99th Congress, the Senate Governmental Affairs Subcommittee on Intergovernmental Relations also held hearings on implementation of the Paperwork Reduction Act, Jan. 28, 1986.

Bumpers has proposed an amendment to the Paperwork Reduction Act that would further reduce the paperwork burden on small businesses.

- The President's Private Sector Survey on Cost Control, also known as the Grace Commission, issued a report calling for a variety of changes in Federal ADP management, including steps that would enhance central leadership of information technology use, and steps that would provide more autonomy for agencies in their use of ADP.<sup>41</sup>
- The General Accounting Office has evaluated progress in implementing the Paperwork Reduction Act, noting that although OMB has reportedly achieved the paperwork reduction goals, many other aspects of the act still need a great deal of attention.<sup>42</sup>

### Recent OMB Activities

Much of OMB'S activity in the first few years of implementation of the Paperwork Reduction Act has concerned establishment and clarification of paperwork reduction procedures. In the area of information and technology management more broadly, there are two significant sets of actions that OMB has recently undertaken. First, OMB has begun to set guidelines and incentives for agencies to conduct long-range planning. These topics are discussed in more detail in chapter 3. Second, in December 1985, OMB issued a circular, "Management of Federal Information Resources, which supersedes several other circulars and essentially provides guidance for agencies in adopting the IRM approach mandated by the Paperwork Reduction Act. It is essentially OMB'S first major attempt to take a leadership role in IRM policy.

<sup>41</sup>“President's Private Sector Survey on Cost Control, *Report on Automated Data Processing/Office Automation*, spring-fall 1983.

<sup>42</sup>*Implementing the Paperwork Reduction Act: Some Progress, But Many Problems Remain*, GGD 83-85, Apr. 20, 1983.

**Table 2-4.—Excerpts From OMB Circular A-130 on Information Technology Management**

**Information systems and information technology management**

*Agencies shall:*

1. Establish multiyear strategic planning processes for acquiring and operating information technology that meet program and mission needs, reflect budget constraints, and form the bases for their budget requests.
2. Establish systems of management control that document the requirements that each major information system is intended to serve; and provide for periodic review of those requirements over the life of the system in order to determine whether the requirements continue to exist and the system continues to meet the purposes for which it was developed.
3. Make the official whose program and information system supports responsible and accountable for the products of that system.
4. Meet information processing needs through interagency sharing and from commercial sources, when it is cost-effective, before acquiring new information processing capacity.
5. Share available information processing capacity with other agencies to the extent practicable and legally permissible.
6. Acquire information technology in a competitive manner that minimizes total lifecycle costs.
7. Ensure that existing and planned major information systems do not unnecessarily duplicate information systems available from other agencies or from the private sector.
8. Acquire off-the-shelf software from commercial sources, unless the cost-effectiveness of developing custom software is clear and has been documented.
9. Acquire or develop information systems in a manner that facilitates necessary compatibility.
10. Assure that information systems operate effectively and accurately.
11. Establish a level of security for all agency information systems commensurate with the sensitivity of the information and the risk and magnitude of loss or harm that could result from improper operation of the information systems.
12. Assure that only authorized personnel have access to information systems.
13. Plan to provide information systems with reasonable continuity of support should their normal operations be disrupted in an emergency,
14. Use Federal Information Processing and Telecommunications Standards except where it can be demonstrated that the costs of using a standard exceed the benefit or the standard will impede the agency in accomplishing its mission.
15. Not require program managers to use specific information technology facilities or services unless it is clear and is convincingly documented, subject to periodic review, that such use is the most cost-effective method for meeting program requirements.
16. Account for the full costs of operating information technology facilities and recover such costs from government users.
17. Not prescribe Federal information system requirements that unduly restrict the prerogatives of heads of State and local government units.
18. Seek opportunities to improve the operation of government programs or to realize savings for the government and the public through the application of up-to-date information technology to government information activities.

SOURCE Office of Management and Budget, "Management of Federal Information Resources," OMB Circular A-130, Dec 12, 1985, Sec 8b

Table 2-4 displays some of the key points of the circular that affect information technology management. Essentially, it sets forth in one place a collection of extremely desirable goals for Federal information technology management. According to the circular, agencies should, for example, use strategic planning, procure information systems in a timely fashion (with the assistance of GSA), control and review major information systems, share resources with other agencies, not duplicate software or resources available commercially, and operate information systems effectively and securely. The fact that these goals are all stated clearly and in one place is an accomplishment; however, few of these goals represent significant changes from previous OMB and congressional policies, and in only a few cases does the circular provide enough detail to be of substantial help to agencies in achieving the goals.<sup>43</sup> Thus, while the circular is a key organizing document for policy, it was intended to be a very general policy statement and thus does not, in itself, make much progress in addressing problems of information technology management.

<sup>43</sup>The only areas that are treated in some detail in the circular are dissemination of information, which is discussed in ch. 7 of this report; the treatment of records about individuals, which is discussed in OTA report on *Electronic Record Systems and Individual Privacy* (forthcoming); and to a lesser extent, information systems security, which is discussed in ch. 4 of this report.

## BASIC DATA ON FEDERAL INFORMATION TECHNOLOGY USE

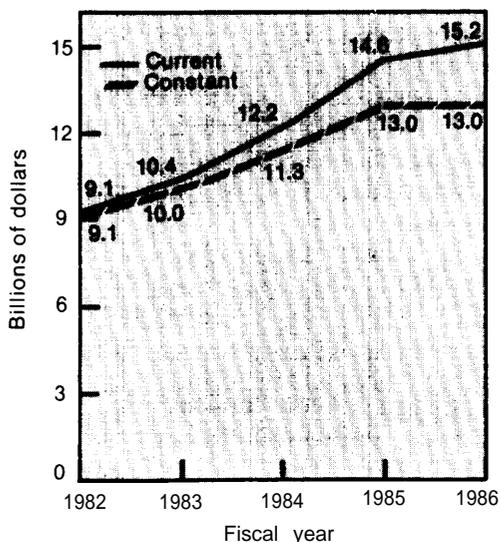
### Total Expenditures

As noted in figure 2-2, OMB expects expenditures for information technology to rise from \$9.1 billion in fiscal year 1982 to \$15.2 billion in fiscal year 1986. This amounts to a 17 percent annual growth rate between fiscal years 1982 and 1985, and a 4 percent growth between fiscal years 1985 and 1986; adjusted for inflation, the growth rate for fiscal years 1982 to 1985 is 13 percent annually, while fiscal years 1985 to 1986 is constant after inflation.<sup>44</sup> A growth rate higher than general government spending is expected to continue, despite austerity measures throughout government. As shown in table 2-5, an International Data Corp. forecast expects sales to the Federal Government to reach \$23.8 billion per year by 1988.<sup>45</sup> Although the Gramm-Rudman-Hollings

<sup>44</sup>OMB, GSA, and Commerce/NBS, *A Five-Year Plan for Meeting the Automatic Data Processing and Telecommunications Needs of the Federal Government*, June 1985.

<sup>45</sup>The OMB and IDC numbers are only roughly comparable due to differences in data sources and definitions. IDC, "Federal Market Spending Analysis, 1983-88," June 1984.

Figure 2-2.—Information Technology Obligations in Current and Constant Dollars



SOURCE: Office of Management and Budget, General Services Administration, and the Department of Commerce/National Bureau of Standards, *A Five-Year Plan for Meeting the ADP and Telecommunications Needs of the Federal Government*, June 1985.

deficit reduction measures are sure to affect spending for information technology, the magnitude of those effects is difficult to foresee. Determining the fiscal year 1987 budget for information technology requires a cross-agency analysis that OMB will not release until spring 1986. Nevertheless, OMB staff expect that cuts in information technology budgets will not be as severe as cuts in other areas, because of the labor-saving and efficiency-increasing capabilities of the technology.<sup>46</sup>

The scope and accuracy of these data should be viewed with some caveats. The numbers are provided to OMB in agencies' annual budget submissions, and they exclude computers and telecommunications used, for example, in classified activities, in weapons systems, in space exploration systems, or in the legislative or judicial branch. In addition, GAO has criticized the agencies for being unable to adequately break out and analyze computer and telecommunication costs.<sup>47</sup> GAO officials estimate that the actual level of Federal expenditure for information technology is approximately twice that reflected in the OMB figures, or roughly \$30 billion in fiscal year 1986.<sup>48</sup> A further consideration is that, as agencies have grown more sophisticated in identifying costs, they have included more items not captured in previous years, particularly in office automation and telecommunications. Thus, according to GSA, the growth rates for information technology expenditures in OMB's figures are deceptively large because the agencies are now including items that they did not include previously.<sup>49</sup>

<sup>46</sup>John McNicholas, OMB, personal communication, February 1986. Also see, e.g., Grace Commission, op. cit.; Ellen Law, "Wright: 'Big Bucks' To Be Invested in ADP," *Government Computer News*, Mar. 8, 1985.

<sup>47</sup>U.S. General Accounting Office, *Accounting for Automatic Data Processing Costs Needs Improvement*, FGMSD-78-14, Feb. 7, 1978.

<sup>48</sup>Walter Anderson, GAO, interview with OTA staff, September 1985.

<sup>49</sup>GSA letter to OTA, September 1985.

Table 2-5.—IDC Projections of Information Technology Sales to the Government

Section	Sales (hundreds of thousands of dollars)			
	Actual 1983	Part of total	Projected 1988	Part of total
1 ADP equipment rental and purchase . . . . .	\$2,282	17% <sup>0</sup>	\$4,046	17% <sup>0</sup>
2 ADP services . . . . .	1,795	13 % <sup>0</sup>	3,392	14 % <sup>0</sup>
	\$4,077	30 % <sup>0</sup>	\$ 7,438	31 % <sup>0</sup>
3 Communication equipment rental and purchase . . . . .	1,861	14 % <sup>0</sup>	3,117	13% <sup>0</sup>
4 Telephone utilities . . . . .	1,800	13 % <sup>0</sup>	2,300	10 % <sup>0</sup>
5 Telephone communication services (maintenance, technical repair FM) . . . . .	1,150	80/0	2,025	80/0
6 R&D electrical and communications . . . . .	3,832	280/o	7,707	320/o
R&D space tracking and data acquisition. . . . .	171	10/0	208	1%
	\$8,814	640/o	\$15,357	640/o
7 Office equipment . . . . .	127		109	
8 Office services. . . . .	42		60	
	\$ 169	1 %	\$ 169	1%
9 Electric and electronic instrument purchase . . . . .	591		754	
Electric and electronic instrument maintenance . . . . .	101		123	
	692	5%	877	4%
Total . . . . .	\$13,752 <sup>a</sup>	100 % <sup>0</sup>	\$23,841 <sup>a</sup>	100 % <sup>0</sup>

<sup>a</sup>Excludes Facility Management (primarily Department of Energy) of \$85 billion

SOURCE International Data Corp., "Federal Market Spending Analysis, 1983-88

### Medium- and Large-Scale Computers

GSA reported 18,183 computer central processing units (CPUS) in its revised inventory as of the second quarter of fiscal year 1985. The new inventory contains only computer equipment costing more than \$50,000, or with a monthly rental exceeding \$1,667. Seventy-nine percent of the CPUs are owned by the Federal Government, and the remainder are leased.<sup>50</sup> Figure 2-3 presents the distribution of dollar value of equipment (that is, all components, including not just CPUS but disk drives, peripherals, etc., that fall above the reporting threshold) by agency. Note that roughly 45 percent of the total is in Department of Defense agencies. OMB has estimated that there will be 25,000 mainframe systems in the government by 1990.<sup>51</sup>

<sup>50</sup>General Services Administration, *Automatic Data Processing Equipment in the U.S. Government: First and Second Quarter 1985 Summary*. GSA's earlier inventory of ADP equipment regardless of cost had a count of 20,011 CPUs at the end of fiscal year 1983. However, because of data reliability problems in the system, and the paperwork burden on agencies of reporting low dollar-value systems, GSA developed the new system and instituted the \$50,000 threshold.

<sup>51</sup>Joseph Wright, Deputy Director, OMB, testimony to Senate Governmental Affairs Subcommittee on Oversight of Government Management, hearings on "Computer Security in the Federal Government and the Private Sector," Oct. 25-26, 1983, p. 52.

Data from OTA's Federal Agency Data Request strongly support the hypothesis of rapid growth of computer use in government. Of the 142 agency components polled by OTA,<sup>52</sup> figures 2-4 and 2-5 show that the number of mainframe CPUs<sup>53</sup> has more than doubled, from 11,300 in 1980 to 26,700 in 1985, and the number of terminals has increased more than four-fold, from 36,400 in 1980 to over 170,000 in 1985. Defense, Treasury, and NASA account for almost the entire gain in number of CPUs. However, a better indicator of the pervasiveness of information technology may be the number of terminals, in which almost every agency showed dramatic increases between 1980 and 1985.

### Microcomputers

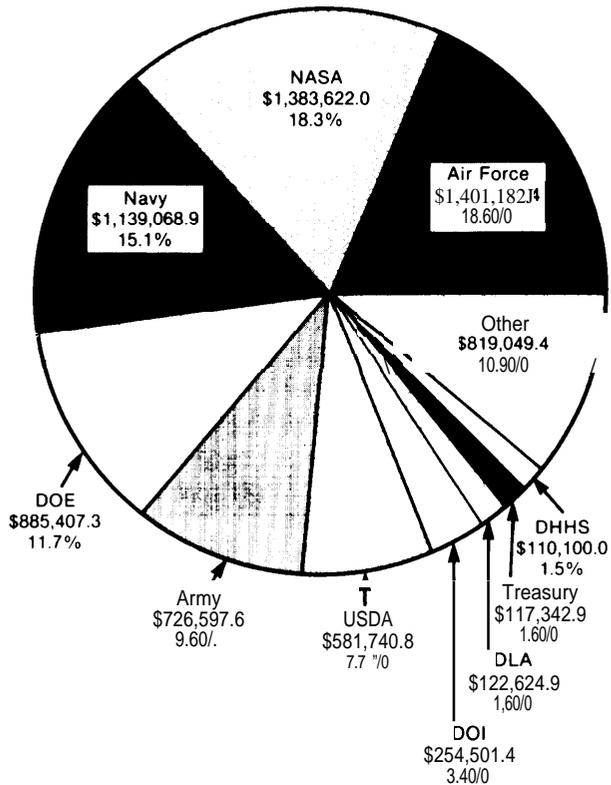
Tracking mechanisms are just beginning to catch up to the microcomputer's relatively sudden penetration into the Federal Govern-

<sup>52</sup>OTA's data request was sent to all major units of the cabinet level agencies plus 20 selected independent agencies. Each sub-cabinet agency's response, along with the 20 independent agencies, is counted as a separate response in calculating the total of 142. See app. B for a list of agencies responding.

<sup>53</sup>There were some differences in agencies' interpretation of the wording of OTA's data request. Some agencies included minicomputers in their tally of mainframe CPUs, while others did not.

**Figure 2-3.—Distribution of ADPE Dollar Value by Reporting Agency**

Total ADPE dollar value (in thousands of dollars): \$7,541,237.6



- KEY:
- NASA - National Aeronautics and Space Administration
  - DOE - Department of Energy
  - Army - Department of the Army
  - USDA - Department of Agriculture
  - DOI - Department of the Interior
  - DLA - Defense Logistics Agency
  - Treasury - Department of the Treasury
  - DHHS - Department of Health and Human Services

SOURCE: General Services Administration, *Automatic LX?ta Processing Equipment in the U.S. Government, First and Second Quarter FY 1985 Summary*.

ment. Although there is no authoritative count of the number of microcomputers in government, a 1983 GSA report makes a very rough estimate of 82,000 word processors and as many as 210,000 personal computers.<sup>54</sup> GSA

"U.S. General Services Administration, Office of Information Resources Management, *Managing End User Computing in the Federal Government*, June 1983. Ironically, GSA, the official collector of data on government information technology, calculated the 210,000 figure by multiplying a *Time* estimate of 3.5 million personal computers in the country by the government's traditional 6 percent share of the country's computing resources. The 210,000 estimate is probably high because the government owns a disproportionate share of large-scale computing equipment.

has also begun to conduct annual surveys of agency purchases of computers costing less than \$10,000. The first survey reported that 7,908 systems costing less than \$10,000 were purchased in fiscal year 1983 (excluding NASA); GSA staff considered this number to be low by a factor of three to five times or more. The second survey showed 37,277 units bought in fiscal year 1984, for a total expenditure of \$137.2 millions' (see table 2-6).

In response to OTA'S Federal Agency Data Request, agencies reported an increase from 2,307 microcomputers in 1980 to about 100,000 in 1985 (see figure 2-6). Defense was again the largest user with 44 percent of the total reported, but all agencies reported large increases. In many agencies (i.e., Departments of Agriculture, Commerce, Health and Human Services, Interior, Justice, Transportation, Treasury; the Environmental Protection Agency; GSA; NASA; and the Veterans Administration), literally thousands of new machines are being installed compared to almost none 5 years ago—a phenomenal rate of change for the Federal Government that has important implications for management.

In particular, the microcomputer explosion means that agencies must cope with decentralization of information manipulation capabil-

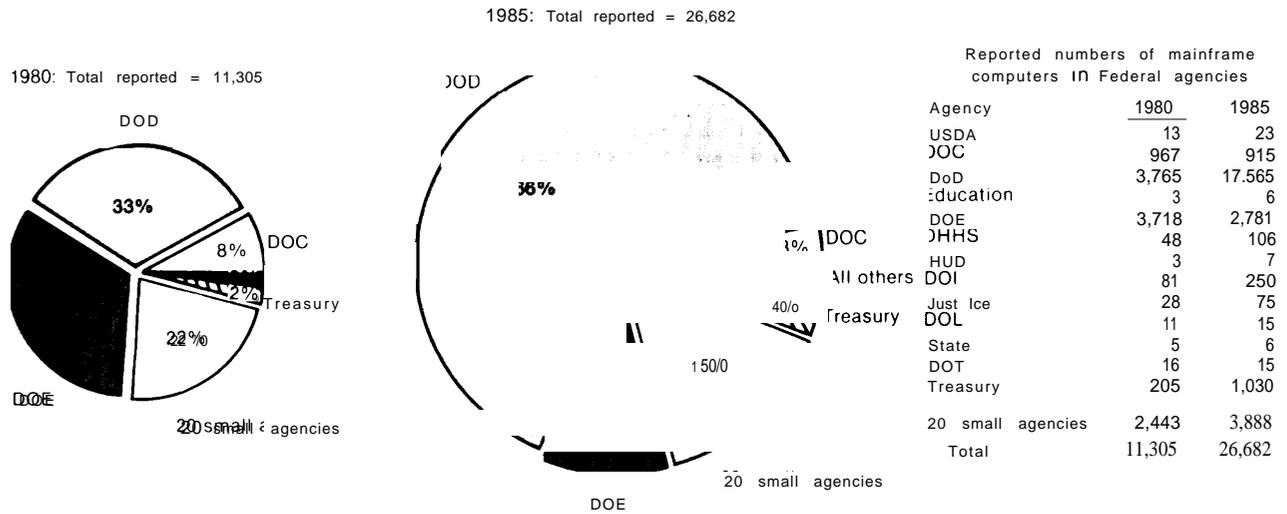
<sup>54</sup>GSA reports: "U.S. General Services Administration Survey of Fiscal 1983 Purchases of Small Computers by Federal Agencies," January 1984; "Survey of Small Computers Bought by Government in Fiscal 1984," January 1985.

**Table 2%.—Purchase of Small Computers by Federal Agencies, Fiscal Year 1984**

Agency	Quantity	Price (thousands)
Department of the Navy . . . . .	10,649	\$28,700
NASA . . . . .	4,029	14,080
Department of the Air Force . . . . .	4,009	13,797
Environmental Protection Agency . . . . .	1,910	9,893
Department of Transportation . . . . .	1,729	10,324
Department of Agriculture . . . . .	1,501	5,914
Department of the Interior . . . . .	1,348	5,364
General Services Administration . . . . .	1,066	3,988
Department of Energy . . . . .	924	3,662
Department of Commerce . . . . .	924	3,698
Subtotal . . . . .	28,069	\$99,420
All others (51 agencies) . . . . .	9,188	37,800
<b>Total . . . . .</b>	<b>37,277</b>	<b>\$137,220</b>

SOURCE: General Services Administration.

Figure 2-4.— Mainframe Computers in Federal Agencies



NOTE Consistency in definitions of mainframe central processing units cannot be assured because of different interpretations of the term  
 SOURCE OTA Federal Agency Data Request

ities. In many cases, both in government and industry, information system managers are finding that they must reorient themselves to respond to disparate needs and to encourage, rather than require, microcomputer users to use their equipment productively and to adhere to guidelines for equipment use. For example, many agencies and corporations have developed "information centers" where microcomputer users can receive training, peruse software libraries, and in some cases get access to mainframe data.<sup>56</sup>

Many Federal agencies have begun to focus on the use of microcomputers and on developing supporting efforts. GSA, for example, has published guides for purchasing and managing small computers, has negotiated schedule contracts for agencies to purchase the machines, and has taken the unprecedented step of awarding a contract for the operation of retail computer stores for government agencies at its offices in Washington, DC, Atlanta, and

<sup>56</sup>Institute of Computer Science and Technology, National Bureau of Standards, *Microcomputers: A Review of Federal Agency Experiences*, NBS Special Publication 500-102, June 1983. See also OTA's study, *Automation of America Offices*, December 1985, for more extensive discussion of the use of microcomputers in office automation.

Philadelphia.<sup>57</sup> NBS has issued a variety of guidance documents as well, and has developed a popular microcomputer bulletin board for Federal microcomputer users and managers to share their experiences. The board now includes information not only on microcomputers, but also on computer security and information resources management generally (the latter in cooperation with GSA).<sup>58</sup>

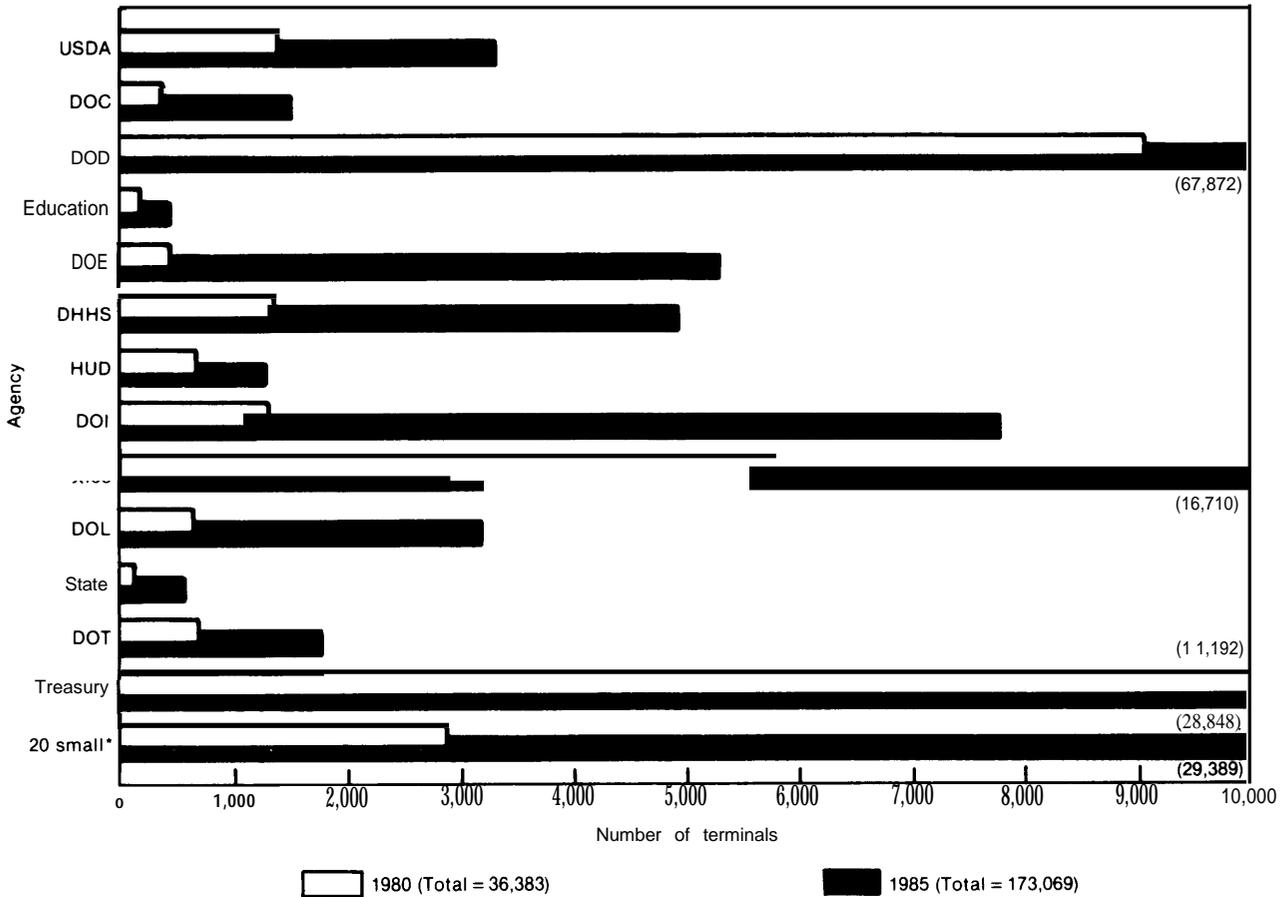
### Age and Obsolescence of Federal Computers

One indicator of the health of the Federal Government's procurement process is the extent to which the government is, in fact, using up-to-date technology. There is a long-standing and widespread perception that many of the government's computers are antiquated,

<sup>57</sup>See GSA, "Managing End User Computing in the Federal Government," June 1983; "End User's Guide to Buying Small Computers," August 1984. GSA is currently coordinating an interagency study committee that aims to develop further guidance on Federal end-user computing.

<sup>58</sup>NBS, *op. cit.*; also NBS Special Publication 500-110, *Microcomputers: Introduction to Features and Uses*, March 1984; NBS Special Publication 500-120, *Security of Personal Computer Systems: A Management Guide*, January 1985. NBS staff report that there are roughly 1,100 calls to the bulletin board each month.

Figure 2.5.—Computer Terminals in Federal Agencies



\*20 selected Independent agencies that received OTA's data request  
 SOURCE OTA Federal Agency Data Request

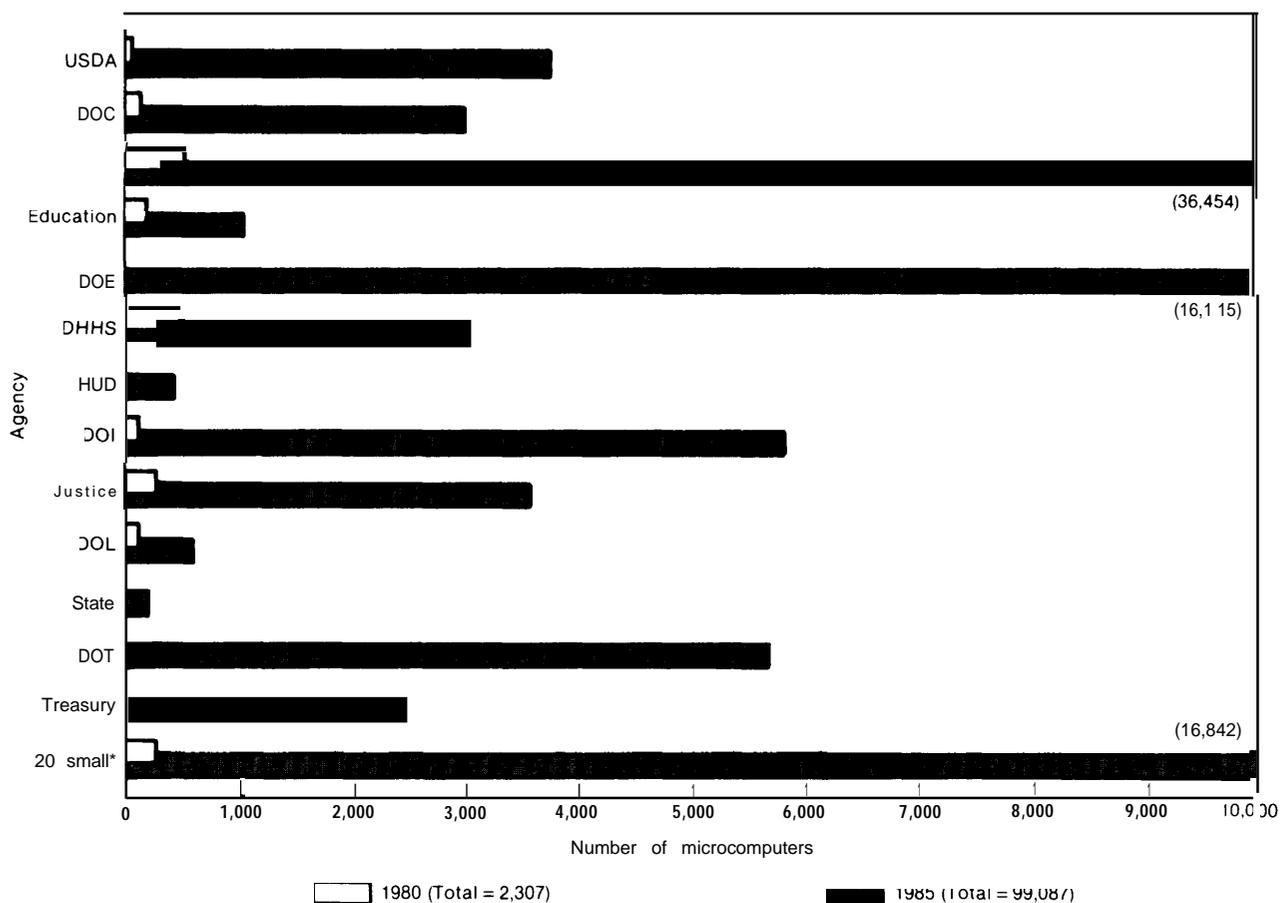
and that the procurement process makes obtaining more effective technology difficult, if not impossible. For example, a 1980 GAO report noted:

The current murky acquisition cycle, which is long, complicated, and frustrating, has contributed to the obsolescence of Federal computers.<sup>59</sup>

<sup>59</sup> "GAO, *Continued Use of Costly, Outmoded Computers in Federal Agencies Can Be Avoided* (Dec. 15, 1980), p. i. See also GAO, *Non-Federal Computer Acquisition Practices Provide Useful Information for Streamlining Federal Methods* (Oct. 2, 1981), for essential background in this area. For a discussion of the popular perception that Federal computers are obsolete and that procurement processes are excessively complex, see A. Neely, "Can Old Computers Learn New Tricks? Federal Managers Try Hi-Tech Comeback," *National Journal*, June 23, 1984; and L. Wynter, "Federal Bid to Update Agencies' Computers Faces Many Obstacles," *Wall Street Journal*, Feb. 13, 1985.

There are two important caveats in any discussion of the age of Federal information technology. One is that there is tremendous variation among and within agencies. Certain applications, particularly some of those in research and in defense "C<sup>3</sup>I" (Command, Control, Communications and Intelligence—as opposed to the routine business of Pentagon budget and logistics, for example), use state-of-the-art information technology tools. Second, there are important differences between the Federal Government and the private sector, such as the complexity of Federal applications, the emphasis in government on maximizing competition and obtaining careful cost justification, and the tax treatment that encourages private companies to purchase new equipment. In addition, Federal expenditures

Figure 2-6.—Microcomputers in Federal Agencies



\*20 Independent agencies selected by OTA to receive the data request

NOTE The data request used GSA's definition of microcomputer, slightly adapted: "Any microprocessor-based workstation capable of independent use — including stand-alone and networked personal computers, professional computers, intelligent terminals, word processors, and other similar devices — costing less than \$10,000 per unit, but excluding peripherals and separately purchased software."

SOURCE OTA Federal Agency Data Request

and mistakes are much more highly visible than those of the private sector.<sup>60</sup>

Three key reports form the essential background for examining obsolescence in Federal computers. The first was GAO's 1980 report previously mentioned. Focusing on computers that had a central processing unit purchase price of more than \$250,000 or a leasing price

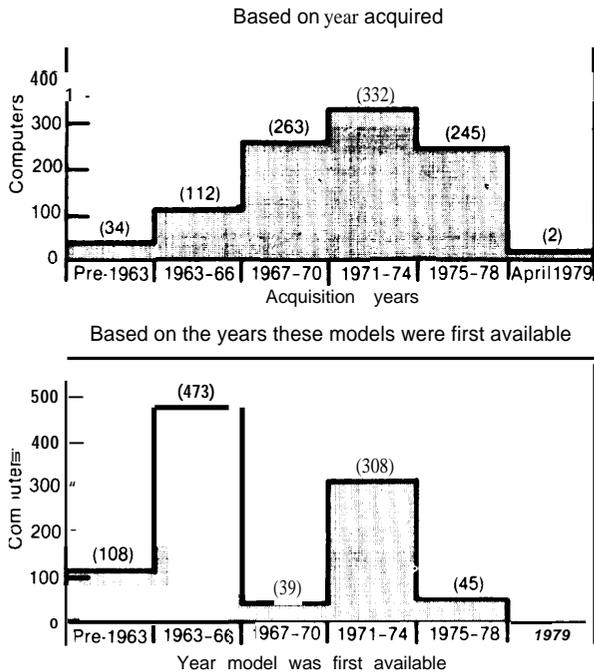
of over \$10,000 per month, GAO concluded (see figure 2-7):<sup>61</sup>

The Federal inventory of medium- and large-scale computers is outmoded. Of the 1,366 such processors included in the April 1979 inventory, over half were technologically of the 1971 era or earlier. Almost a third of them were technologically 15 years old or older. Only 2 percent used the technology of 1975 or later. Unless action is taken to modernize the government's computers, avoidable costs and unnecessary problems will continue.

<sup>60</sup> "See, for example, Mitch Betts, "Speaker Says Bias Colors Criticism of Federal DP Shops," *Computerworld*, May 13, 1985, p. 34. The speaker was Robert Head, a Federal computer veteran and at the time an official of the Federal Computer Performance Evaluation and Simulation Center (FEDSIM).

<sup>61</sup> "GAO, 1980, op. cit., p. 5.

**Figure 2-7.—Age of 978 Large- and Medium- Scale Federal Computers**



SOURCE: U. S. General Accounting Office, *Continued Use of Costly, Outmoded Computers in Federal Agencies Can Be Avoided*, ARM D-81-9, Dec. 15, 1980.

Our work showed that the operational costs of obsolescent, government-owned equipment can exceed the costs of using newer equipment even if the newer equipment is obtained on a short term lease basis. The maintenance, power, and cooling costs of outmoded, owned equipment were greater than the leasing, maintenance, power, and cooling costs of newer equipment. This alone can justify immediate replacement.<sup>62</sup>

The second key report on Federal ADP obsolescence, by the National Bureau of Standards in 1982 (using fiscal year 1981 data), had a similar though slightly more optimistic conclusion:

In general, our current statistics indicate that the situation of obsolescence is not as

“Partly in response to GAO’s 1980 report on obsolescence in Federal computers, GSA has since 1982 been granting authority to agencies to conduct “technology updates.” This program allows agencies to replace obsolescent computer systems with compatible newer systems of approximately the same computing power, if there are substantial savings. GSA is now re-evaluating this program in light of the Competition in Contracting Act.

bad as portrayed in the General Accounting Office report, but there is still a large number of older computers in the Federal inventory. Our analysis suggests that certain agencies, particularly the Navy Department, Department of Justice, Department of Commerce, and the Department of Transportation, should analyze their computer inventories to see if upgrading their state of computer technology is in order.<sup>63</sup>

Finally, the third and most recent major study of obsolescence downplays the problem significantly. GSA identified 100 major systems “considered crucial to the nation,” and found that “ADPE obsolescence in the Federal Government is not as extensive as has been claimed.” GSA defined an obsolete CPU as one that is more than two production cycles old, and assumed an average production cycle for large-scale computers of 4 years. Hence, since the study used fiscal year 1984 data, any machine that has an “original production date” (i.e., was first manufactured) earlier than 1976 would be considered obsolete. Of the 100 systems studied:

- 11 use commercial timesharing resources, and, as such, are presumed to be processed by modern ADPE;
- 57 are 1976 or newer, and 39 (over two-thirds) of these are supported by CPUS with a 1978 or newer first production date;
- 19 have CPUS with pre-1976 original production dates, but 14 of these are in some stage of upgrade or replacement; i.e., agency procurement request pending, award granted, but equipment not yet installed, etc.; and
- 13 are mixed; i.e., CPUS supporting these systems have first production dates of both pre-1976 and 1976 or newer. (In general, 1976 or newer technology is predominant in these applications, and four of these systems are being upgraded or replaced.)<sup>64</sup>

<sup>62</sup>Martha Gray, National Bureau of Standards, Institute for Computer Sciences and Technology, *Federal ADP Equipment: A Compilation of Statistics-1981*, November 1982, p. 35.

<sup>63</sup>General Services Administration, *Assessing ADPE Obsolescence in Major Federal Systems*, February 1985, p. 9.

This analysis shows that only 5 percent of these major systems are being totally supported by obsolete CPUs that are not in the process of being upgraded or replaced. In addition, OMB's 1984 5-year plan asserted that "the average length of time in service for Federal computers is decreasing. At the end of fiscal year 1979, it was 7.3 years; at the end of fiscal year 1983, 6.6 years."<sup>65</sup> However, GSA's data, which is the base information for several of these analyses, are known to be inaccurate.<sup>66</sup> GSA's revised database should ultimately provide further information.

Responses to OTA's data request (see figure 2-8) also provided evidence of a modernization trend in Federal computers. When asked to specify the average age of their mainframe computers, the number of agency units reporting average ages of their mainframe computers from 0 to 3 years jumped from 31 percent in 1975 to 60 percent in 1984, and the number of units reporting average ages greater than 6 years declined from 49 percent in 1975 to 11 percent in 1984. Because of methodological differences, OTA's data are not strictly comparable with the length of service data above. For example, OTA's data request asked agencies to report average ages of all of their mainframes. OTA's data may also be optimistic about obsolescence because agency components with only a few newer computers are given the same weight in these statistics as agency components with thousands of computers.

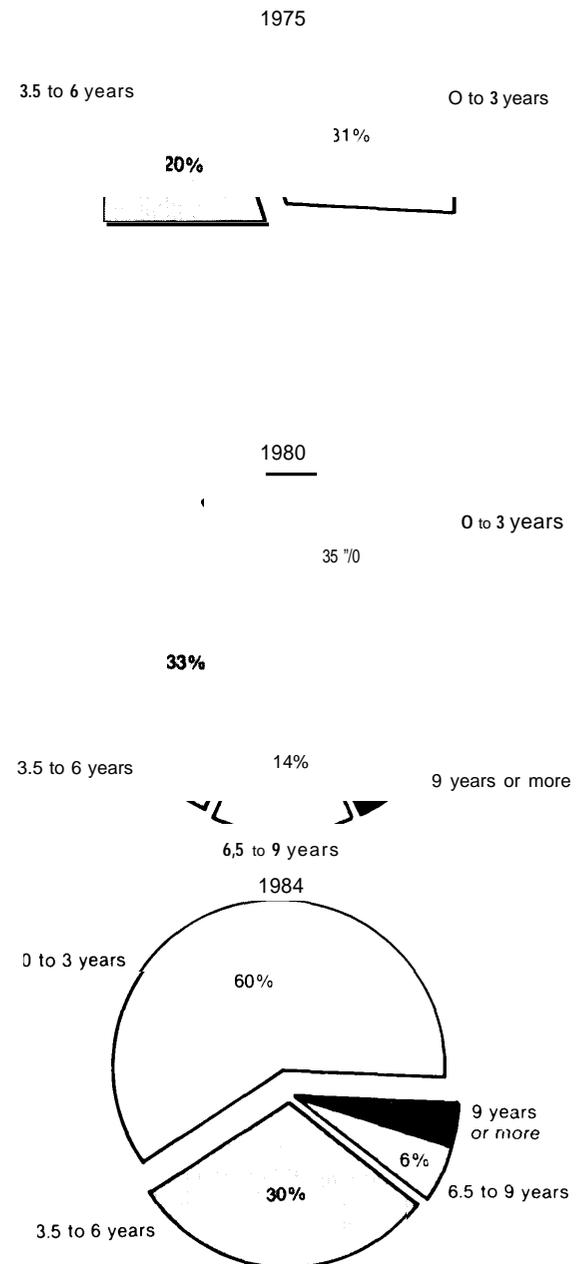
Several other indicators suggest that the obsolescence problem has indeed been improving over the past 5 years:

- Federal agencies have dramatically increased both their overall expenditures for information technology and their capital investment levels. According to OMB

<sup>65</sup>OMB, GSA, and Commerce/NBS, *A Five-Year Plan for Meeting the Automatic Data Processing and Telecommunications Needs of the Federal Government*, April 1984, vol. 1, p.3.

<sup>66</sup>GSA acknowledged this in its 1985 report, op. cit.

Figure 2-8.—Average Age of Mainframe Computers



NOTE: 134 agency components responded to this question

SOURCE: OTA Federal Agency Data Request

documents, agencies had capital investments for information technology in 1982 of \$1.01 billion, 11.2 percent of the \$9.1 billion total information technology obligations; obligations soared to \$2.86 billion, 19.6 percent of the \$14.6 billion total in fiscal year 1985; and eased back down to \$2.17 billion, 14.3 percent of the total \$15.2 billion in fiscal year 1986.<sup>67</sup>

- In addition to capital investment, agencies also seem to be increasing the proportion of their information technology expenditures that is for commercial services. In 1983 to 1985, the proportion was 44 to 45 percent, but in 1986 the proportion is expected to increase to 50 percent. According to GSA and industry analysts, one can safely assume that commercial vendors of ADP services use relatively up-to-date equipment.<sup>68</sup>
- Similarly, an International Data Corp. forecast expects Federal spending for ADP equipment and supplies (both rental and purchase) to grow from \$2.3 billion in 1983 to \$4.0 billion in 1988. Particularly high growth is expected in purchases of ADP systems, from \$607 million in 1983 to \$1.51 billion in 1988.<sup>69</sup> As noted earlier, Gramm-Rudman-Hollings deficit cutting measures are sure to affect planned spending, although the magnitude of these effects is unknown.
- Finally, experts consulted by OTA, both government officials and vendor representatives, generally agree that much modernization has taken place in the last few years, and a great deal more is planned.<sup>70</sup>

<sup>67</sup>OMB, GSA, and Commerce/NBS, op. cit., April 1983; April 1984; June 1985.

<sup>68</sup>Ibid.; and GSA, *Assessing ADPE Obsolescence*, op. cit.

<sup>69</sup>International Data Corp., "Federal Market Spending Analysis: 1983-1988," June 1984.

<sup>70</sup>This was the sentiment, for example, at OTA's work session on information technology management, procurement, and planning, June 26, 1985. For some of the major planned modernizations, see OMB, GSA, and Commerce/NBS, op. cit., 1985, which describes the system plans for the Patent and Trademark Office Automation Plan, Internal Revenue Service Tax System

However, examples of antiquated Federal computers remain.

### Length of the Procurement Process

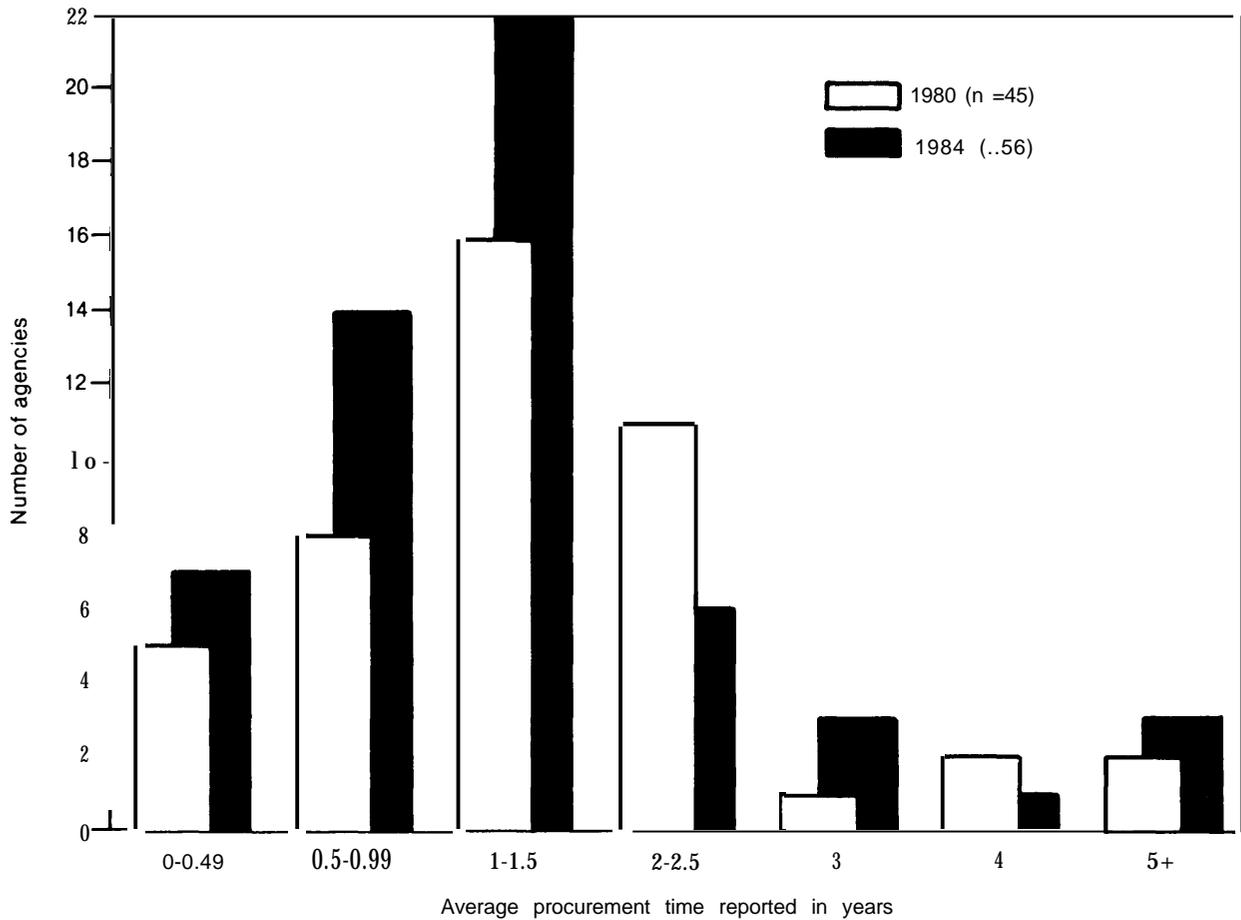
Essentially, as noted earlier in this chapter, the procurement process is in flux. There are few reliable indicators of the health and effectiveness of the process, and the indicators that do exist are mixed.

While the results of OTA's Federal Agency Data Request can only be considered suggestive in this area,<sup>71</sup> they show a fairly consistent pattern. As shown in figure 2-9, the plot of average procurement times peaks at 1 to 1.5 years for both 1980 and 1984, with a substantial number of procurements in the 0.5 to 1 and 2 to 2.5 year slots. Very few procurements were reported to have taken longer than 2.5 years. The most prevalent factors cited for increases in the length of the procurement process were the time it takes to get a delegation of procurement authority from GSA, as well as the changing regulations (especially the Competition in Contracting Act and GSA rules) and the various levels of review and oversight (including preparation of voluminous justification documents) that are required for a large procurement. On the other hand, a few agencies reported that increasing thresholds for delegation of procurement authority from GSA in fact decreased their procurement time.

Redesign, Federal Aviation Administration Advanced Automation Plan, Department of Defense Tri-Service Medical Information System Composite Health Care System, Census Bureau Decennial Census Program, Social Security Administration Systems Modernization Plan, Department of Agriculture Farm Agency System, and Department of Energy Laboratory System.

<sup>71</sup>Of 134 responses total, 80 agency components responded to OTA's request for average procurement times of mainframe computers in 1975, 1980, and 1984. The brevity of the question clearly had some flaws; for example, an average procurement time may not give a good indication of exceptionally long or short procurements; the point at which procurement time begins or ends was not specified; and the data request did not examine software procurement, which clearly deserves study.

Figure 2-9.—Average Procurement Time for Mainframe Computers



SOURCE OTA Federal Agency Data Request

## APPENDIX 2A.—EXCERPTS FROM MAJOR STUDIES AND POLICY ACTIONS IN INFORMATION TECHNOLOGY MANAGEMENT

The widespread use of electronic systems for handling large volumes of data has developed only in the last few years. . . .We have noted that the general trend has been to use electronic computers in segments of agency operations rather than in systems in which management procedures and controls over related functional areas are fully integrated. . . .The principal recommendation in our report is concerned with the need to establish an effective and coordinated program of joint effort by the interested agencies of the government.

—Joseph Campbell, (Comptroller General, GAO, letter report to Rep. Sam Rayburn, June 27, 1958)

The findings on the impact of ADP previously reported herein indicate that dynamic leadership of the ADP program of the Federal Government is a vital necessity. Passive, partial, or informal types of leadership have had their place, but have now outworn their usefulness.

—“Report of Findings and Recommendations Resulting From the Automatic Data Processing (ADP) Responsibilities Study, September 1958-June 1959,” Bureau of the Budget, p. 20

After 6 years, the type of leadership the Bureau of the Budget (BOB) recommended in this early automatic data processing (ADP) management study has yet to be realized. This legislation would

establish the authority and provide the operational machinery needed for the effective and efficient management of this costly equipment.

*-Senate Report (Government Operations Committed No. 938, Oct. 22, 1965, To accompany H.R. 4845 ("The Brooks Act"), p. 1*

In the case of paperwork, the compartmentalization of policy and operating authorities and functions has resulted in the failure to consider systematically less paperwork-intensive alternatives, the costs involved to everyone when new programs are designed and implemented are not fully taken into account, and citizens are extremely dissatisfied with the manner in which they are served by and interact with their Government.

Therefore the commission concludes that central policy and operating functions and authorities for Government's automatic data processing, statistical, public-use reporting, interagency reporting, forms, microform, word processing, telecommunications and related paperwork, information and communications programs should be brought together in a central management authority. Correspondingly, at the agency level, operating functions and authorities should be consolidated under the direction and control of an appropriate central management authority in each executive department and agency.

*-Information Resources Management, Report of the Commission on Federal Paperwork (Washington, DC: GPO, 1977), p. 65*

1) The Federal Government needs to take actions that will establish the importance of information technology, provide tools for its management, and set national and federal goals for its productive use.

2) The Federal Government needs to improve and expand its use of modern information technology to increase and enhance the level and quality of governmental service delivery while reducing costs.

3) The Office of Management and Budget needs to establish a policy requiring that costs of data processing be charged back to the using agency and program in program-related terms.

4) The Federal Government needs to set as an objective the removal from service of all information technology components which have outlived their cost-effective life.

5) The Federal Government needs to significantly alter its process for acquiring information technology resources. Increased emphasis should be placed upon the planning, needs definition, and justification phases of acquisition.

6) The Federal Government needs to upgrade the training and career development required for func-

tional managers, reclassify personnel skilled in the management or use of information technology, and establish appropriate career paths for such persons.

7) The program and mission agencies need to be strengthened to meet the general requirements for managerial and technical expertise in information technology. The agencies must have prompt access to resources which can help them solve their problems.

8) The Federal Government needs to institute a research and development program in information technology to meet the needs of the non-defense sector.

9) The Federal Government needs to revitalize its efforts to establish and maintain a standards program for information technology in order to support the economic purchase of equipment and the economic and effective operation of computer resources.

*-Information Technology and Governmental Reorganization: Summary of the Federal Data Processing Reorganization Project, OMB, April 1979, pp. 6-18*

The Paperwork Reduction Act creates a single control point for the management of Federal information resources. It ends the fragmented responsibility for controlling Federal paperwork burdens which exists today and establishes visible and accountable officials for information management within the Office of Management and Budget and each agency.

*-Senate Report (Governmental Affairs Committee) No. 96-930, to accompany the Paperwork Reduction Act of 1980, Sept. 8, 1980, p. 5*

The ADP Task Force found that the Federal Government is not effectively managing its information technology resources and, therefore, missing out on substantial potential cost savings. The Government has failed to develop a coherent system for ADP planning and management. As a result, it has not capitalized on the substantial opportunities for cost savings and effectiveness improvement.

*-President Private Sector Survey on Cost Control ("The Grace Commission"), Report on Automated Data Processing/Office Automation, spring-fall 1983, p. iii*

Despite substantial improvements, Federal agencies have not realized the efficiency improvements and economic returns that information technology has made possible . . . the little planning that has taken place has not been as concerned with savings and efficiency improvements as it should have been.

To recapture the Government's position as a leader in the efficient and productive use of infor-

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mation technology, the Administration has adopted a three-point strategy: (1) develop and issue effective and up-to-date Government-wide policies, procedures and guidelines; (2) ensure implementation of those policies through earlier policy-level, OMB involvement in the planning and decision-making processes of selected agencies with significant investments in information technology; and (3) develop results-oriented measures of performance to ensure maximum return on the Government's investment in information technology. . . .

- Agencies will be required to document at least

a 10 percent return on their information technology investments;

Ž Agencies will be required to implement standards that foster open systems of communication and permit the exchange of information among systems;

- Greater reliance will be placed on the acquisition of commercially available software to reduce the Government's dependence upon locally developed, customized software.

*—Office of Management and Budget, Management of the United States Government Fiscal Year 1986*