
Chapter 9

**The Automation of
Federal Government Offices**

Contents

	<i>Page</i>
Federal Procurement and Acquisition of Office Automation	234
The Three Phases of Federal Office Automation	234
Laws and Policies	235
The Federal Inventory of Office Automation	238
Acquisition Strategies and Problems	239
The Dilemma of Procurement Policy	241
What Will Office Automation Mean for Federal Office Productivity?	242
Evaluations of productivity	242
Incentives	243
Implications for the Federal Work Force	244
Size of the Work Force	244
Changes in the Mix of Federal Jobs	246
Shifts Among Occupational Categories and Grade Levels	246
Unanswered Questions.	250
Part-Time and Temporary Workers	251
Women in the Federal Work Force	252
Quality of Worklife.	252
Labor Management Relations and Federal Unions	254
International Comparisons	255
Effects of Office Automation on Public Services	256
A Case Study of Expanding Responsibilities	256
Changes in the Nature of Delivered Services	258
Effects on Governance	258

Figures

<i>Figure No.</i>	<i>Page</i>
9-1. Paid Civilian Employment of the Federal Government, 1881-1983	245
9-2. Changes in the Distribution of Federal Employees by Occupation, 1975 and 1983	247
9-3. Change in Distribution of Federal Employees by Grade Levels, 1974-80	248
9-4. Distribution of Federal Employment by Grade Level 1975 and 1983	249
9-5. Full-Time White-Collar Employment in the Federal Work Force by Grade Level and Sex, 1974-75 and 1983	253

The Automation of Federal Government Offices

Automation of Federal Government offices is generally keeping pace with automation in the private sector. The effects are likely to be at least as significant in government offices as in corporate offices. But the forces that drive change are not the same, and the consequences will not necessarily be the same. Government is not business, although it is often argued that it should be business-like in its approach to delivering services.

Federal office automation is preceding on the reasonable assumption of significant benefits. Large investments of public resources are involved, and most Federal employees will be affected. Thus, a close look at the potential consequences of Federal office automation is merited,

The Federal Government is in effect the Nation's largest office. It occupies 2.6 billion square feet of office space; it has 332 accounting systems and over 100 payroll systems; and it employs about 1.7 million white-collar workers.¹

Opinions vary widely as to how well and how rapidly the Federal office is being automated. One trade journal concluded that "government is pioneering some leading-edge office automation programs and in many respects is ahead of the private sector because the Reagan Administration is emphasizing automa-

It is in fact surprisingly difficult to ascertain how many white-collar Federal employees there are, or indeed how many Federal workers there are in all, at any one time. The Office of Personnel Management, the Bureau of Labor Statistics, and the Bureau of the Census all publish figures, but they are never the same figures. The total given varies widely depending on the time of year or month; or whether it is a monthly average or an estimate or a survey; or whether and how the count treats temporary workers, part-time workers, intermittent workers, postal workers, census takers, CIA and NSA workers, congressional employees, judicial-system employees, student interns, fellows, etc.; and on how many of the approximately 106 pay plans OMB chooses to count. All of these are traps for the unwary analyst.

tion in the effort to increase efficiency. Some experts say with equal confidence that government offices are behind the state-of-the-art. Comparisons based on many case studies however indicate that while some large corporations are far ahead of Federal agencies in using information technologies, the government is at least keeping up with the private sector as a whole. Among major institutional sectors it has been the largest user of computer-based information systems.³

Some agencies are behind their closest private sector counterparts. For example, the Federal Reserve Board does not compare with leading financial institutions in terms of either advanced applications or the proportion of critical work that is automated. On the other hand, some agencies are at the frontier in specific office automation applications; International Revenue Service (IRS) is one example. Most agencies are in the mainstream in terms of penetration and in terms of advanced applications of hardware and software.'

Federal agencies were among the first institutions to adopt large computers. In the last few years, they have been adding small computers and word processors to augment their large-scale data processing. For the next few years, a major trend will be the linking of microprocessors, mainframe computers, and other devices into integrated office systems; and the networking arrangements that will connect office to office, headquarters to field

¹*Office Administration and Automation*, September 1984, p. 56.

²John Leslie King and Kenneth L. Kraemer, "Information Systems and Intergovernmental Relations," *Public Sector Performance*, Trudi C. Miller (ed.) (Baltimore: The Johns Hopkins University Press, 1984), p. 103.

³This judgment is based on materials supplied by Federal agencies and comparisons drawn from the literature and from OTA contractor case studies; and specifically, on the conclusions of an OTA contracted report by The Educational Fund for Individual Rights.

offices, and Federal agencies to external systems and databases.

This section looks briefly at the effects of office automation that can be detected now, and the effects to be expected over the next 15 years. After a discussion of Federal procurement and acquisition policies with regard to office automation, the rest of the chapter looks in succession at the following questions:

- Are there major problems in Federal acquisition of information technology?
- Will automation make Federal offices more efficient, or more productive?
- If so, can that benefit be translated into lower labor costs, and lower Federal budgets?
- What are the potential effects on the size

and structure of the civil service, and what are the implications for recruitment, classification, and retention of Federal workers and for budgetary and personnel policies?

- What are the implications for career expectations and opportunities of Federal white-collar employees?
- How will automation affect the quality of their working environment?
- Will automation affect the relationship of government and citizens—will it change the availability or quality of government services?
- Could it affect the exercise of authority, accountability, responsibility, and the quality of decisionmaking?

FEDERAL PROCUREMENT AND ACQUISITION OF OFFICE AUTOMATION

It is the declared policy of the present Administration that information is an economic resource and should be managed efficiently. The emphasis has been on reducing the cost of information-handling rather than on increasing information services.

Federal agencies have had wide latitude in making decisions about office automation. The policy has been to keep governmentwide requirements and restrictions to a minimum. Critics charge that this has led to uncontrolled proliferation of small computers, and that the lack of compatibility among them is preventing the realization of expected benefits of automation. On the other hand, overly detailed and rigid specifications in procurement of major information systems, including local area networks, is said to preclude vendors from finding innovative ways to meet government needs, and to result in purchase of equipment that is already far behind the state-of-the-art when it is installed.

The Three Phases of Federal Office Automation

The adoption of mainframe computers in the late 1950s⁵ led almost immediately to development of large centralized-computer centers. The Office of Management and Budget (OMB) and the General Services Administration (GSA) were soon given governmentwide authority over automatic data processing (ADP) policy and standards. During the 1960s and 1970s many of the major activities of government became dependent on computers for management functions such as planning, program control, financial and payroll operations, procurement control, auditing and inspection, and other government functions. The acquisition process was framed around centralized ADP

⁵The first general data processing computer, UNIVAC I, was acquired by the Bureau of the Census, in 1951.

and the communication functions that were developing in parallel.’

In the 1980s however the dominant theme in Federal office automation has become the spread of end-user computing. It is difficult to distinguish the effects of these two phases of computerization since decentralized computing does not replace, but is superimposed on, centralized computing. Now personal computers and word processors are often networked and part of an integrated system. Federal procurement policy, and accounting and inventory practices also blur distinctions between these two kinds of office automation.

Most Federal agencies now have word processing, spread-sheet packages, automated document transmission, and calendaring. The other most frequently used functions are electronic filing and computer graphics. Many agency headquarters communicate by computer with their field offices nationwide.’

Personal computers are being used more and more by managers and professionals as well as by support staff. The National Academy of Public Administration, in a 1983 report, assumed that this reduces the load factors and utilization rates of mainframe computers, and said that this cast “serious doubt on the future role of many of the large central computer service centers that have been built up. . . over the last 10 to 15 years.”⁸ But experts generally do not believe that ADP centers will be superseded by distributed processing. Rather, as small and large computers are linked, the ADP center will be the locus and guardian of the agency data to which all managers and professionals will increasingly have access and make contributions.

⁸ International Data Corp., Procurement Information Management Service, “Federal Acquisition Strategies for Office Automation,” research paper for Continuous Information Services Clients, March 1983.

⁹ According to an office automation survey compiled by the Information Management Assistance division of the Office of Information Resources Management, General Services Administration, November 1984. Thirty-one departments and agencies responded to the survey.

¹⁰ National Academy of Public Administration, *Revitalizing Federal Management: Managers and Their Overburdened Systems*, November 1983.

Some large Federal computers are, however, already obsolete or will soon become so.⁹ “Obsolete,” in this case, does not mean that they are no longer functioning, but merely that more cost-effective technology is available. The old systems require repeated patching and modification, maintenance costs are high, and spare parts sometimes not available. Older computers sometimes have limited on-line processing capacity because they were designed for 24-hour operation and not for the peaks caused by many end-users.

When these computers are replaced, databases often have to be converted, and new software packages developed or adopted. This is expensive. The incompatibility of equipment from many vendors is also causing problems.

Laws and Policies

The Paperwork Reduction Act of 1980, Public Law 96-511, was a milestone in government information management.¹⁰ In addition to reducing the paperwork burden imposed on business by government, the act was aimed at improving efficiency and effectiveness in the use of information. It promulgated the concept of information resources management (IRM), meaning the integrated management of all basic information-handling activities and functions. The sections of the act dealing with information-resources management cover everything from conventional libraries to centralized ADP systems, and have a direct effect on office automation.

The act required each agency to appoint an information-resources manager.¹¹ It charged

¹⁰ The Grace Commission criticized the government for allowing its data processing systems, which in the early 1970s were state-of-the-art, to fall behind; according to the Commission about 60 percent of the government’s then 17,200 computers were in need of replacement or significant upgrading. However, in a recent review of 100 “major systems, GSA concluded that only 5 percent are “totally supported by obsolete ADPE systems,” and that obsolescence “is not as extensive as has been claimed.” See *Assessing ADPE Obsolescence in Major Federal Systems*, U.S. General Services Administration, February 1985.

¹¹ The act built on the recommendations of the Commission on Federal Paperwork (1975-77).

¹² The act specified that these officials should be at the level of Assistant Secretary. Since the number of these positions

(continued)

OMB, assisted by GSA, with reviewing information resources management in each agency at least every 3 years. OMB has largely delegated this responsibility to GSA. ² In practice, each agency conducts its own review, for which GSA provides a voluminous handbook or set of guidelines. The agency reviews are then reviewed by GSA.

OMB has stated two basic tenets that govern its approach to information-resources management: ³

- Information is an economic resource and should be managed in the same way that other economic resources are managed.
- Information-resources management should entail the management of the total information life cycle from collection to dissemination.

OMB provides guidance on all matters of budget allocation and procurement in Federal agencies, but this guidance is not specific enough to materially affect the acquisition of office automation equipment. ⁴ GSA does provide guidance to agencies on this subject, although agencies still make their own basic decisions.

Twenty years ago, in 1965, the Brooks Act (Public Law 89-306) gave GSA sole authority to procure ADP systems. ⁵ Although this au-

in each agency is limited by law, the responsibility was generally given to the Assistant Secretary for Administration or the equivalent. These are now referred to as Senior Designated Officials or SDO'S, and there is typically an Office of Information Resources Management under them, with a director who acts as the IRM and represents the agency on the Interagency Committee on Information Resources Management. There is an Office of Information and Regulatory Affairs in OMB that coordinates OMB responsibilities for implementation of the Paperwork Reduction Act.

²Letter of delegation of June 13, 1983, and Temporary Regulation 10.

³Executive Office of the President, Office of Management and Budget, *Improving Government Information Resources Management*, March 1982, p. I, hereafter cited as *EOP/OMB 1*.

⁴OMB guidance on procurement (which comes from the "M" or management side of OMB, and specifically from the Office of Federal Procurement Policy or OFPP) is of course to be distinguished from OMB review of agency budget requests on the "B side of OMB, which certainly does affect the level of office automation procurements.

⁵"DOD computers and related devices were exempted if the equipment was "a mission critical computer resource." DOD has argued that if any office automation system is tied into

thority is premised on large-systems procurement it remains the basic authority for purchase of office automation equipment. If office equipment contains data processing components it must be bought under GSA standards and rules governing competitiveness in procurement. Procurements of microcomputers and word processors, ¹⁶ when under \$300,000, are handled under a GSA schedule (Schedule C), which means that there are simplified procedures for competitive bids from already authorized vendors. When the total value of a procurement exceeds certain thresholds (for ADP equipment in general it is now \$2.5 million) GSA usually issues to the agency a Delegation of Procurement Authority, based on information provided by the agency about the justification for the procurement. The agency then draws up specifications and goes through its own competitive bidding procedure. (GSA can withdraw this delegation or change the thresholds.) GSA acquisitions do not account for all, or even for the preponderance of, Federal-agency microcomputer acquisitions.

The Competition in Contracting Act¹⁷ that took effect April 1, 1985, created simpler procedures for using GSA's ADP Schedule in microcomputer purchases under \$300,000. GSA has an approved list of 45 microcomputers, available from 36 suppliers at special Federal rates. In addition, a GSA Computer Store carries 15 brands (not necessarily on the list); this is designed to encourage the selection by end users rather than leaving the choice to an agency's central-purchasing agent. GSA has published several attractive booklets of

a mission-critical computer resource system then it is also exempt from GSA procurement regulations. Statement of Undersecretary of Defense DeLauer on Mar. 4, 1983, according to International Data Corp., op. cit., p. 22. The question of whether this applies to word processors has been under review several times and the outcome is not clear.

¹⁶Word processors were not included under ADP equipment until late 1983 (SPMR Temporary Reg. F500, Oct. 25, 1983).

¹⁷Part of the Deficit Reduction Act of 1984. The CIC Act, aimed at increasing competitiveness in procurement, makes it more difficult to buy from a preselected sole source, but defines as competitive, awards that are made under a GSA Multi-Award Schedule Program such as the ADP program. An agency may also exclude a specific vendor in the interest of maintaining alternative sources.

advice to help agencies in buying and managing microcomputers.¹⁸

GSA also has responsibility for most of the many common-user telecommunication facilities used by Federal civil agencies. If an agency wants to make a major change in common-user services (e.g., Wide Area Telephone Service, or WATS, lines) to implement office automation communications, GSA must approve.]

The GSA authority under the Paperwork Reduction Act (and by delegation from OMB) was until recently exercised through two different services. The Automated Data and Telecommunications Service, which dealt with ADP equipment, and part of the National Archives and Record Service, which dealt with records management, micrographic, and word processing equipment, have been merged to create the Office of Information Resources Management.²⁰

In April 1984, a number of policies and regulations related to information resources and technologies were consolidated in a Federal Information Resources Management Regulation (CFR Pt. 41, ch. 201). Amendments to the Paperwork Reduction Act have been introduced in Congress aimed at strengthening some aspects of the law.²¹

Other agencies have roles in office automation procurement. The Institute for Computer Science and Technology in the National Bureau of Standards develops standards for ADP and communications equipment, develops technical guidelines, and prepares a yearly forecast of developments in computer technology, including office automation.²² The General

“office of Information Resources Management, U.S. General Services Administration, *Managing End User Computing in the Federal Government*, June 1983, and *End User Guide to Buying Small Computers*, August 1984.

“DOD manages its own procurements of communications technology.

“Another part of GSA’s National Archives and Records Service became the independent National Archives and Records Administration.

—S. 2433 (amendments of 1984); H.R. 2718 (amendments of 1983); hearings were held in the House in April 1983 and in the Senate in April 1984.

—Recent budget cuts have abolished the planning office of ICST, leaving in doubt the question of whether these forecasts will be done in the future.

Accounting Office (GAO) has general auditing power over all government expenditures and has repeatedly evaluated office automation acquisition programs.

The President’s Private Sector Survey on Cost Control (the Grace Commission), which was highly critical of government management procedures, asked, “Can improvement of information systems create cost savings and efficiencies and facilitate managerial decision-making throughout the Federal Government?”²³ The report concluded that it could, and that this offered the “opportunity for savings and revenue of \$15.2 billion over 3 years, an estimate that included both office-microelectronic equipment and large systems. The survey team said that the acquisition process was inadequate, characterized by excessive procedural steps, a confusing array of policies and directives, lack of qualified personnel, and deficient training and supervision. The survey team recommended stronger, centralized, government-wide policies for information-technology acquisition and management, but not necessarily less discretion for the agencies, although it is not clear how both objectives can be preserved.

The Administration has stressed the importance of planning, and OMB, GSA, and the National Bureau of Standards together prepare a 5-year plan, updated every 2 years, together with guidelines to assist agencies in planning. A new OMB circular, 85-12, will provide agencies with further guidelines to be used in planning. Agency managers, however, often express a feeling of futility in doing long-range planning for information systems because their budgetary constraints are constantly changing. Nevertheless, the desire to link personal computers and word processors to mainframes and minicomputers, and to other devices, is pushing Federal agencies toward planning and coordination of equipment acquisition, probably more effectively than could be done by instituting government-wide requirements.

²³The Executive Committee to carry out the survey was established by Executive Order 12369, June 30, 1982. See: President’s Private Sector Survey on Cost Control, *Management Office Selected Issues*, vol. VII 1, “Information Gap in the Federal Government, winter 1983.

The Federal Inventory of Office Automation

Expenditures for information technology for Federal agencies grew from about \$10.4 billion in 1983 to \$13.9 billion in fiscal year 1985, increasing 19 percent in the first year and 13 percent in the second.²⁴ This is a much larger growth than that for Federal expenditures as a whole. About a third of these expenditures are for defense-related agencies.

The government has been spending about 1.4 percent of its budget on information technology; this is perhaps somewhat less than the rate of spending by private corporations in the services and manufacturing sectors,²⁵ in spite of the greater intensity of white-collar work in government (about 80 percent of the Federal work force are white-collar workers, compared to about 55 percent of the total civilian work force). The average length of time in service for Federal computers in 1982 was just under 7 years, and decreasing as old systems are replaced.

The purchase of equipment (capital investment) accounts for only about 19 percent of these expenditures, compared to 36 percent for commercial information services (ADP, etc.). The rest is for equipment leasing or rental and for personnel costs. Federal policy has generally been to encourage purchasing rather than leasing; it is more cost effective, and the proportion of systems that are leased has declined from 36 percent in 1970 to 12 percent at present.²⁶ But some procurement specialists question this strategy since leasing would make state-of-the-art technology more readily available.

In recent years, the largest absolute increases in expenditures for information technologies have been in the Department of Defense (DOD), the Department of Energy, and the Department of Health and Human Resources. But a number of small agencies that had lagged behind have had bigger percentage increases in order to catch up with the pace; for example, the Office of the U.S. Trade Representative (USTR), the Department of Justice, and the Securities and Exchange Commission.

DOD is by far the largest user of office automation among Federal agencies with about 67 percent of the stock. DOD however also has the largest share of all Federal white-collar workers (about 40 percent of them). One measure of the extent to which an agency has automated is the comparison between its share of total Federal office automation, and its share of the Federal white-collar work force. The ratio of DOD's share of automation to its share of the white-collar work force is a modest 1.68 compared to 8.24 for the Department of State, 3.41 for the Environmental Protection Agency, and 3.34 for the National Aeronautics and Space Administration.²⁷

In 1982, the Federal Government had in its computer inventory about 13,667 major systems with over 20,000 central processing units. This inventory is not complete nor accurate." Moreover, GSA will no longer attempt to list systems costing less than \$50,000, and has recently discontinued its tracking of communications use and costs. It is therefore impossible to say how much office automation equipment the government owns. In early 1983, the General Service Administration said that "there are estimates" of 82,000 word proces-

 "Office of Management and Budget, General Services Administration, and Department of Commerce, *A Five-Year Plan for Meeting the Automatic Data Processing and Telecommunications Needs of the Federal Government*, vol. 1, April 1984. Hereafter cited as *Five Year Plan, 1984*.

"Thomas G. Cody, "How Senior Execs View Info Technology," *Government Computer News*, July 1984, p. 64.

"In 1960, over 80 percent of computer systems used in the Federal Government were leased; by 1970 this had dropped to 36 percent, from 1977 to 1983 it was about 9 percent, and since then it is rising again, to 12 percent in 1984. *Five-Year Plan, 1984*, pp. 1-3.

²⁴International Data Corp., op. cit. These percentages are for 1982-83; more recent figures are not available.

²⁵GSA, *Automatic Data Processing Inventory, April 1984*. GSA guidelines require agencies to report all systems with a CPU but agencies nevertheless differ on their interpretations of the guidelines-e. g., some do not include word processing systems and some do. An on-line version of the inventory is being developed, but it will not include systems costing less than \$50,000. GAO concluded in March 1985 that "GSA's data base of the government's inventory of computer equipment has been inaccurate for some time." (U.S. General Accounting Office, *Effective Management of Computer Leasing Needed to Reduce Government Costs*, IMTEC-85-3, Mar. 21, 1985, p. 11 1).

sors in government offices,²⁹ but these estimates were based only on old rules-of-thumb about government's share of computer purchases. Most agencies are not sure how many personal computers or small word processors they have. Accounting and inventory categories differ across agencies in how they categorize leasing arrangements, paced payments, etc.³⁰ Agency IRM officials nevertheless complain about surveys or audits aimed at clarifying these questions; audits are seen as a heavy burden that detracts from more productive work.

Much of the office automation equipment now being bought is low cost; decisions about personal computers are in this sense not much different from decisions about desks and typewriters. Over-elaborate regulations and controls could be needlessly costly. Organizations need the freedom to experiment in order to identify the most useful technology for them. However, monitoring and inventory could be done without affecting the range of choice.

Current procedures for inventory of office automation equipment make it difficult to assess the status, level of capital investment, and rate of investment. Projections of future office automation, future costs, and future benefits are therefore unreliable, and effects hard to measure. This is a problem for agency planners and decisionmakers trying to assess the cost-effectiveness of automation.

²⁹U.S. General Services Administration, Office of Information Resources Management, *Managing End User Computing in the Federal Government*, June 1983, p. 3.

³⁰U.S. Office of Management and Budget, U.S. General Services Administration, and U.S. Department of Commerce, *A Five Year Plan: Meeting Automatic Data Processing and Telecommunications Needs of the Federal Government*, April 1983, pp. 12 1-146; National Bureau of Standards, *Future Information Processing Technology-1 983*. Special Publication 500-103, pp. 177-179; International Data Corp., "Federal Acquisition Strategies for Office Automation," research paper for Continuous Information Services Clients," by the Procurement Information Management Service, March 1983, p. 32; and Dr. Richard Werling, "Applications of Information Technology in Government," July 1984, contractor report for the CIT Government Information Systems Assessment, OTA.

Acquisition Strategies and Problems

Within OMB and GSA guidelines each agency makes its own decision about office automation acquisition. OMB Circular A-109 requires every agency to have an acquisition strategy; some of these strategies have been widely criticized.³¹ A series of GAO reports has faulted agencies for:³²

- not complying with guidelines and regulations,
- not studying alternative methods of acquisition,
- leasing rather than purchasing,
- using vendor-specific programming language,
- not adequately analyzing agency mission and needs,
- failing to have a long-range plan,
- not consolidating individual small-volume orders,
- purchasing equipment in excess of need or likely use,
- failing to properly inventory equipment,
- lack of accountability in controlling equipment,
- failing to issue or enforce departmentwide policies,
- not separating short-term objectives from long-range plans,
- failure to use word processing to reduce the cost and size of the work force,
- faulty cost/benefit analysis,
- not realizing maximum productivity gains,
- underestimation of operating and maintenance costs, and
- use of untested technology.

³¹For example, a National Academy of Public Administration panel (op. cit.) concluded that only a few agency leaders "are really aware of how swiftly change is being forced on their organizations as a result of rapid office automation." As a result, the panel said, acquisitions are often haphazard and poorly planned and fail to meet their objectives.

³²See U.S. General Accounting Office reports CED-81-15, Oct. 23, 1980; AFMD-81-55, Apr. 21, 1981; HRD-81-74, Apr. 21, 1981; HRD-81-106, June 30, 1981; CED-82-113, Sept. 30, 1982; GGD-83-103, Sept. 1, 1983; IMTEC-84-11, May 25, 1984; and AFMD-82-54, Sept. 21, 1982.

Noncompatibility

Some of the most difficult decisions about acquisitions strategies involve the value of compatibility of small systems and devices. Some Federal executives insist that it is most important to get office equipment that is useful now; diversity will help the agencies determine what kinds of automation are most successful. Noncompatibility is a minor problem, they say; by the time it becomes cost-effective to tie systems together, it will be time to buy new up-to-date equipment. The experience and learning gained meanwhile will carry over.

This seems to be a minority position. The tying together is already going on, and for most agencies noncompatibility is certainly a problem. However, this problem may be an unavoidable cost of competitive procurement. Moreover, cumbersome attempts at coordination and control during the first few years of personal computers would almost certainly have greatly delayed the automation of Federal offices and put the government far behind the private sector in the pace of adoption.

Because the government is a major market for office automation, it is often urged to force the development of industry-wide standards, or to develop its own standards. Many experts think however that since the development of voluntary standards is proceeding, it would be preferable in the long run for government not to force this issue by intervening more strongly. There appears at present to be little pressure for such intervention.

Inappropriate Choices

Many day-to-day problems come about because of the selection of equipment by managers who do not understand the mechanics or flow of work in their own offices. The support staff is often not consulted, although they could bring to the decisionmaking valuable information that is otherwise not available. Formal description of work procedures often bears only nominal relationship to the real process of moving a form, a letter, or a report out the door. How smoothly the movement proceeds is affected by a myriad of details from how

the office furniture is arranged, to what else has to be done at the same time. Hardware, software, or auxiliary furniture can improve this workflow or it can disrupt it, depending on characteristics that may appear unimportant or irrelevant to those who are not actually doing the work.

The Complexity of Options

The procurement of networking technologies involves much higher costs and longer-lived systems than the choice between stand alone devices. Mistakes are more serious. Even in procuring simple systems, the procurement options are becoming complex. To get a telephone system for a new office, the Federal executive must now choose between buying and leasing. If the budget only has operating funds, not capital investment funds, lease financing is necessary.³³

Privatization

An agency's evaluation of its needs for computers and related equipment has also been complicated by confusion over Administration policy about contracting with private organizations for information-related services. OMB Circular A-76 requires the contracting out of services that can be performed more cheaply by the private sector. Many agencies have contracted for data entry or word processing to relieve the load on old systems and avoid the need for new systems. Some have become dependent on outside sources for training and support of office automation instead of developing the capabilities that they will need in the future.

Recent studies of productivity factors resulted in revision of A-76 to emphasize 14 major categories of services in contracting out. These include ADP, data entry and keypunch, audiovisual, and mail and file services. Agencies are now required to consider three options—internal performance, use of another government agency, and outside contractors. They

³³Patrick J. Keogh, Chief of the Economic Analysis Branch of GSA, "Deregulation is Challenge to Procurement Officials," *Government Computer News*, November 1984.

are **still encouraged** to contract out as many services as possible, if those services would require more than 10 Federal employees.³⁴

OMB recently reported that **cost comparisons are now going against privatization** in about half of the activities reviewed, a much higher percent than in the past. This has been advanced as an indicator that government is becoming more efficient in carrying out its activities.

The Dilemma of Procurement Policy

In their own audits and reviews, agencies frequently identify problems such as those GAO listed above. For example, the Inspector General of a major agency³⁶ in a 1985 post-installation review of major systems listed a number of failures: no clarification over who has control over the project, no determination of total-user requirements, poor planning and design, lack of coordination between two user groups, and acquisitions occurring at field level, resulting in incompatibility. Mistakes of this kind can and should be avoided as better procedures are developed.

But at the same time, for larger systems, **agency procurement procedures may be too elaborate and too rigid.**³⁷ For advanced Systems, including the computer networks that are becoming a high priority goal in most agencies, the procurement procedures often result in specifications that are precise, elaborate, and rigid. This creates major problems. The agency contracts officer finds himself caught in a tension between the agency or program officer's need to solve old problems or achieve new goals with advanced technology on the one hand, and on the other hand, customary

professional procedures and the increasingly demanding safeguards and checks imposed by Congress to ensure fair competition.

To guard against violations of established safeguards, the contracts officer tends to insist on elaborate specifications before requesting bids. As a result, the development of the technology may outrun the procurement cycle, and equipment may be behind the state-of-the-art by the time it is installed. Vendors have no opportunity to propose alternative specifications that could provide more innovative ways of meeting agency needs.

Overspecification is particularly likely to occur with information technologies because contracting officers usually are not experts in the technology and are unable to rely on their own professional judgment about how detailed specifications must be. Contracting officers are themselves at severe risk if there are too many challenges to their actions on grounds of inadequate competition and this makes them even more cautious.³⁸

An additional complication with competitiveness in regard to information-technology procurement is the desire for compatibility with existing equipment. If the procurement is decided on the grounds of compatibility, it may be faulted for noncompetitiveness; if greater competition results in procurements that require additional high expenditures to compensate for noncompatibility, the decision may also be faulted.

Overspecification, according to industry experts, can result in procurement specifications that reflect obsolete approaches to technical problems, or specifications that no vendor can exactly meet, although several vendors may have alternative approaches that would solve the technical problem, perhaps at less cost than is entailed in meeting the government specifications.

Federal contracts officers have a warrant, giving them sign-off authority on contracts up to a specific dollar limit. If there are serious challenges to their decisions about competitive contracts they may not only get a poor performance evaluation, but can lose their warrant, or have their sign-off authority reduced, which would seriously damage their future career outlook.

³⁴Eric Fredell, "OMB Restricts Contracting Out in A-76 Revision," *Government Computer News*, November 1984.

³⁵Myron Struck, "Workers Break Even in Cost Studies," *The Washington Post*, Apr. 11, 1985, A19.

³⁶This was typical of audits and reviews shown to OTA by agencies; there is no intent here to single out a specific agency for criticism or otherwise, and the agency is therefore not identified.

³⁷Based on discussions at workshops for Federal agency office automation specialists held by OTA in October 1984 and July 1985, and on many other written and spoken communications from Federal officials.

In some cases, attempts to make procurements more competitive and to increase accountability result in procedures that seriously obstruct the accomplishment of agency responsibilities.

In spite of these problems, OTA concludes that office automation, under Administration

policies that give agency managers wide discretion in formulating acquisition policies, has kept pace with private sector office automation, and that the opportunity for increased productivity will not be unduly limited by procurement-related problems.

WHAT WILL OFFICE AUTOMATION MEAN FOR FEDERAL OFFICE PRODUCTIVITY?

Nearly all observers agree that Federal office automation is increasing agency productivity. But because there is no agreement on the definition of productivity, this benefit is hard to measure and document.

Based on past experience and analogy with the private sector, the gain in productivity is probably far below that which is eventually possible. A mixture of old and new technology is rarely completely effective. Workers using the new technology must cope with existing paper-based data, through procedures built up around older work activities, coordinating with other offices that have not been automated, in a bureaucratic structure organized to fit the earlier patterns of workflow and task sequencing, and in a workplace environment that was not planned with the new technology in mind.

Moreover, the training that is given to workers using the new technology is clearly inadequate. Most of them are learning on their own, and from each other. This takes time to accomplish, and also cuts into the time that is spent in direct production of output, both for learners and teachers. Managers, too, are still struggling to learn new techniques for managing the automated office. (Federal training is also discussed in chapter 3.)

Evaluations of Productivity

The General Accounting Office estimated the cost of the government work force as \$81 billion in 1980 and on that basis calculated a potential savings of \$12 billion, or 15 per-

cent, through the use of office automation.³⁹ It is not clear how this estimate was calculated, but the 15 percent estimate recurs frequently in agency projections of increased productivity.

The first round of agency reviews of their information-resources management, as required by the Paperwork Reduction Act, began in 1982. These reviews varied in scope and objective; some were designed to assess system performance, some evaluated the effectiveness of systems in direct support of specific program areas, and some concentrated on the effects on administrative responsibilities and budgets.⁴⁰

The reviews were intended to address progress in reduction of the paperwork burden, improved delivery of services, elimination of activities that duplicate private sector sources, budget savings, improved productivity, improved technology, and improved management controls. But few cited specific productivity gains that could be quantified. These status reports illustrated why it is difficult if not impossible to specify, either in advance or in retrospect, the direct productivity benefits of office automation. First, information resources management goes beyond office automation

³⁹As quoted by the U.S. General Services Administration, Office of Information Resources Management, *Managing End User Computing in the Federal Government*.

⁴⁰OMB then targeted and monitored 66 of the reviews, being conducted by 26 agencies. Executive Office of the President, Office of Management and Budget, *Improving Government Information Resources Management: A Status Report*, March 1983. Hereafter cited as *EOP/OMB 2*. See also *EOP/OMB 1*, cited previously.

and some of the gains come from reorganization or increased management attention. Secondly, in most cases, automation is not a one-time, self-contained event and comparison of clear-cut before and after measurements are not possible.

Many agencies have provided OTA with system plans and evaluation reports in which they made estimates or projections of productivity gains from office automation. For example, a natural resource agency recounts cutting staff in one field office from 370 to 120 when much of the work was automated by a new computer system. There are also many estimates of future savings. A science-oriented agency estimates that 10 percent of the work hours of administrative personnel and 3 percent of those of its scientists will be saved. Another agency expects time savings of 10 percent for administrative personnel and 20 percent for professionals, and the elimination of some technical positions. These estimates are persuasive in context, but they use so many different ways of estimating or aggregating that they cannot be evaluated or compared.

Although not called out as a criteria for evaluation in the status reports, there appear to be many cases where information technology has resulted, or can result, in services to the public that would not be possible without it.⁴² But in the interest of reducing the Federal deficit, there has been more emphasis on attempts to reduce or constrain the growth of government services than on expanding them.

OMB, while specifying productivity as an evaluation criteria, has not defined it nor provided a metric for it. OMB says only that with the technology "the Federal Government should be able to utilize available resources in a more efficient and effective manner."⁴³

⁴² "Fifteen percent of the 20 percent of their time that the scientists spend on administrative duties.

⁴³ For example, the automation of the Occupational Safety and Health Administration's technical Data Center allows OS11A to respond yearly to several thousand inquiries by government agencies, workers and their unions, employers, public interest groups, and the general public.

⁴⁴ *EOPOMB 1*, p. 12.

Productivity could mean more or better work performed or services delivered; it could mean doing the same work at less cost.

The Merlin Experiment

One example of productivity assessment is an Office of Personnel Management (OPM) evaluation of the General Service Administration's Merlin System, installed in GSA's Western Region in July 1983.⁴⁴ Merlin is composed of 84 personal computer workstations linked by a local area network and used by managerial, technical, and senior clerical employees. The OPM study was based on systematic measurement and evaluation of work before and after the installation. In 39 of the 47 categories of tasks studied, output increased "remarkably": OPM rated this "a strong overall improvement. The volume of output per employee hour went up in 14 of 19 categories. Cost per unit of output was reduced in 79 percent of the categories. In some categories it was possible to compare the same kinds of output with and without use of Merlin, in the same time period; 10 of the 17 categories showed improved unit time with Merlin. OPM also found a reduction in contract preparation time, improved time and project management, and a "marked reduction" in time spent in meetings, due to the system's communications capabilities. OPM's figures appear to indicate about a 1-percent cost saving for the organization as a whole (across about 4.4 person years spent in all tasks done by the organization).⁴⁵ No information is given about the cost of Merlin or its anticipated lifetime.

Incentives

In the private sector, increasing the output and/or the quality of the product should increase the organization's market share and ultimately its profits. This incentive does not

⁴⁴ U.S. General Services Administration, Office of Information Resources Management, *Merlin Improvements*. January 1985.

⁴⁵ App. D of the cited report gives "total time and total cost" for sample 1 (pre-Merlin) as 9,200.6 hours and \$132,160.10 or \$ 14.36 per hour; for sample 2 (post-Merlin) as 9,763.0 hours and \$138,731.30 or \$14.21 per hour.

operate in government. On the contrary, a government organization that performs its work at less cost typically finds its budget reduced for the following year, usually with no reward for the managers who achieved the cost reduction. Instead, if they have fewer employees they may lose status and find their chances of a higher grade level significantly prejudiced.⁴⁶ The always present possibility of across-the-board budget cuts encourages Federal executives to keep staff levels above the minimum that is necessary so that cuts can be absorbed

⁴⁶For example, a 1980 U.S. General Accounting Office report concluded that productivity rates achieved by Federal payment centers varied by 600 percent, and added that the GAO auditors were told by payment center managers that there were strong disincentives against raising productivity, of the kind described here. GAO, *Improving the Productivity of Federal Payment Centers Could Save Millions*, FGMSD-80-13, Feb. 12, 1980.

without damaging their ability to get the work done.

New York City undertook to automate its municipal offices under a strong drive to reduce costs and increase government revenues,⁴⁷ and high level officials say that progress is being made toward these goals. The same pressures are operating within the Federal agencies, and there is every reason to anticipate that the results will be much the same. Productivity as measured by output and by labor costs is likely to increase; whether this is accompanied by improvement in the quality of government services is much more uncertain.

⁴⁷According to a case study of municipal office automation done for OTA; see app. B for a summary.

IMPLICATIONS FOR THE FEDERAL WORK FORCE

If office automation does increase productivity in Federal offices, it could allow Federal white-collar employment to be reduced (or it could allow government services to be expanded without a proportionate increase in employment). Automation may also:

- change the nature of the work and the skill requirements of some jobs,
- effect the number of people needed in some job categories,
- create new jobs and occupations, and make other jobs obsolete.

Such effects would change the relative number of people needed in the major categories of Federal jobs—professional, administrative, technical, and clerical; and also affect the distribution of people at each grade level and salary level.⁴⁸ Such changes in the structure of the Federal work force, as well as the size of the work force, will strongly affect total labor costs and thus the cost of government.

⁴⁸In the Federal civil service, employees hold a grade level in one or the other of approximately 100 pay plans used by the executive branch. About two-thirds of them are covered by the largest pay plan, the General Schedule (GS). This has grade levels from 1 (the lowest) to 18. The employee's grade level determines the range of salaries that he or she can obtain.

These potential changes should be considered in work force projections, in planning, and in developing policies about personnel recruitment, rewarding and promoting, retention, and retirement. There is no indication that OPM, OMB, or other central agencies of government are studying the implications of such changes.

Since Federal offices have been using computers for about 20 years and have been rapidly automating over the last 5 to 10 years, indicators of such change should already be apparent with careful statistical analysis. This analysis has not been done on a systematic basis. However, OTA concludes that there are at least some general indicators that such changes are underway.

Size of the Work Force

If office automation is affecting Federal employment levels, then historical growth rates should be slowing or reversing. Growth of the Federal work force has in fact slowed, stabilized, and then been reversed over the past 15 years. It is not necessary to argue that office automation has been the cause of this decline. The volume of government employment

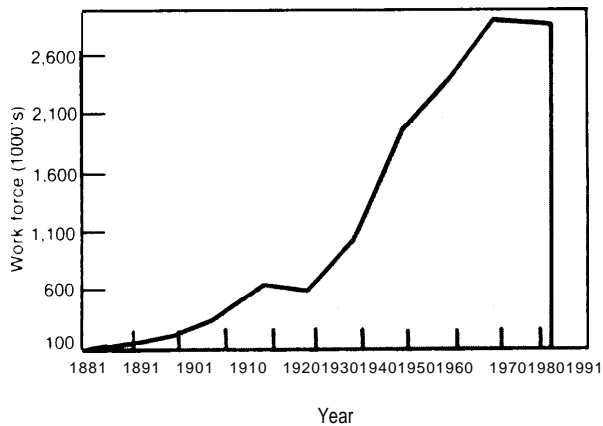
depends strongly on the political philosophy of the Administration in power and of Congress about the scope of Federal Government responsibility and the services that government should provide. It is also strongly affected by population growth and economic expansion. However, given a political imperative to reduce the cost of government and hence to shrink Federal employment, it can be argued that office automation has at least allowed and facilitated a reduction of the work force.

Federal employment has grown every decade of our history except the 1920s. (See figure 9-1.) It has not, however, kept pace with growth in population or in the economy.” Federal employment grew by 73 percent during the 1930s and the New Deal, 88 percent during the 1940s and world war, 23 percent in the 1950s, and 24 percent in the 1960s.⁵⁰ The

“Federal employment has steadily decreased relative to the size of the economy and the national population, from 3.7 percent of U.S. civilian employment in 1960, to 2.9 percent in 1982, and from 13.1 (executive branch) Federal workers per 1,000 population in 1960, to 12.2 in 1982. The Federal proportion of total public sector employees has declined from 33 percent in 1950 to under 18 percent in 1980 (U.S. Department of Commerce, *Statistical Abstracts*).

⁵⁰Bureau of the Census, *Historical Statistics of the United States*, Part II, Series 308-317.

Figure 9.1.—Paid Civilian Employment of the Federal Government, 1881-1983



SOURCES Data from 1881-1960 based on U S Department of Commerce Bureau of Census *Historical Abstracts of the U S Colonial Times to 1970, Part II, Series y 308-317* Washington DC 1975 Data from 1970-1983 based on U S Department of Commerce Bureau of Census *Statistical Abstracts of the United States*, N 523, Washington DC 1985

growth in the 1960s was perhaps in part related to the Vietnam War, but it was characterized by increases in the number of postal workers and the number of general administrative, clerical, and office service workers in nondefense agencies.⁵¹ Thus, it was probably related to the trend toward an information-intensive economy and to political initiatives such as the War on Poverty.

But from 1970 to 1980, Federal employment growth slowed; it grew only 2 percent in that decade.” During this period the Federal work force was—like the country’s general labor force—becoming more thoroughly white-collar. The ratio of white-collar to blue-collar Federal workers changed from 2.9: 1 in 1960, to 4:1 in 1980. Yet at the same time the growth of the Federal white-collar work force has also slowed; it grew more than 13 percent from 1960-65 and again from 1965-70, but only 7 percent from 1970-75 and 3 percent from 1975-80. This change was at least coincident with the speeding up of office automation, which began about 1974.

Every 2 years from 1960-74, the number of General Schedule and Merit Pay employees (about two-thirds of all Federal white-collar employment)⁵³ grew about 3 percent; from 1974-84, the average growth rate each 2 years was only 0.3 percent. This may also be an indicator that office automation was having an effect.

Such indicators do not of course establish a cause-and-effect relationship. Nevertheless, the cumulative evidence that automation of white-collar work can at least allow employ-

“Department of Defense employment increased 15 percent from 1960-70, but it was 43 percent of total Federal civilian employment in 1960 and only 41 percent in 1970. (Stat. Abstr. 1984, table 535.) But General Administrative Clerical, and Office Services increased 20 percent and postal workers increased by 26 percent.

⁵³Stat. Abstr. 1984, table 535, p. 333.

There are over 100 pay codes or schedules for Federal executive branch employees, although some cover only a handful of workers. A few, such as those used only for Foreign Service employees, the Tennessee Valley Authority, or the Veterans Administration, cover thousands of employees. However, the GS/GM pay codes cover about 67 percent of all white-collar workers, and a higher percentage of those who are administrative or clerical.

ment growth to be constrained or reversed while the amount of information-handling increases, is persuasive.

Changes in the Mix of Federal Jobs

There are now 8 percent fewer people in the jobs grouped under "General Administrative, Clerical, and Office Services" than there were in 1975.⁵⁴ A closer examination of this group, which contains about one-quarter of all Federal workers, also suggests that office automation is bringing about basic changes in Federal office work and in Federal jobs.

For example, four job titles within this grouping have disappeared since 1975⁵⁵—cold-type composing machine operation, dictating machine transcription, electric bookkeeping machine operation, and calculating machine operation. Together they accounted for 8,500 jobs in 1975, although even then they were on the way to becoming obsolete jobs. In 1975, there were already 42,500 computer operators, specialists, and aides; that number has grown by 9,000.⁵⁶

Some job titles have changed as the technology associated with them changed—for example, card punch operations has become data transcription. The number of people who presumably spend much of their time typing (now known as keyboarding) may have grown despite the spread of word processing. In 1975, there were over 7,146 dictating machine transcribers (a classification that does not now exist), 72,895 clerk-typists, and 62,373 secretaries. By 1983, there were 11,780 fewer clerk-typists but 29,100 more secretaries, a 7-percent

overall increase. Secretaries, who have more diverse duties and make higher salaries than clerk-typists, now make up 60 percent of this group of workers, as compared to 44 percent in 1975.

Shifts Among Occupational Categories and Grade Levels

These changes in and among job classifications imply that there will also be changes in the shape of the Federal work force—the distribution among major occupational categories (professional, administrative, technical, and clerical) and across grade levels and salary levels. Such changes have occurred in the last decade, although undoubtedly many forces are operating to affect this trend. The distribution in terms of the major occupational categories is squaring up. The proportion of clerical workers is declining, and the proportions of technical, administrative, and professional workers have been growing (although the share made up by professionals is now beginning to shrink slightly). (See figure 9-2.)

Clerical Workers

In October 1983, about 25 percent of General Schedule (GS) employees were clerical workers. In 1975, more than 31 percent were clerical workers. The figures for both years exclude postal workers (who were removed from OPM'S occupational survey between 1979 and 1981); with them included, more than 45 percent of white-collar employees were in the clerical grouping in 1975. Ninety percent of Federal clerical workers in 1983 were in grade levels 3 through 6, with another 3 percent in grades 1 and 2.⁵⁷

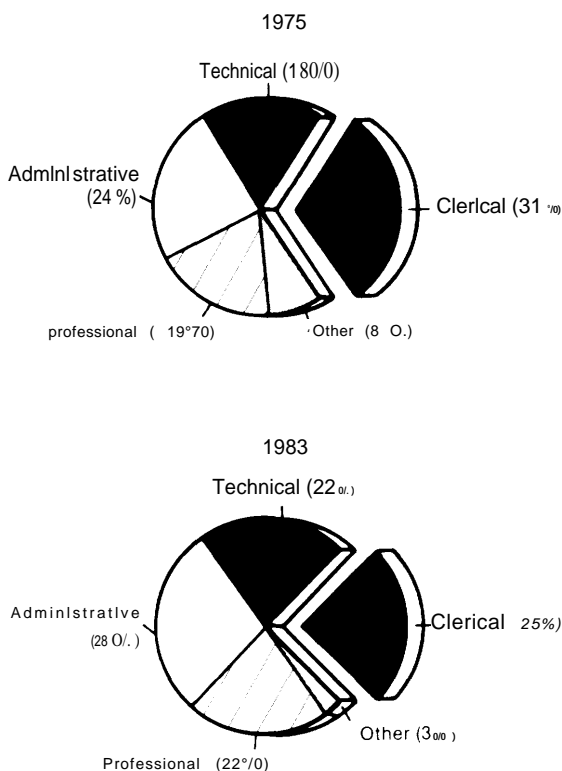
As a reference point, there were over 305,000 Federal clerical workers in grades 1-6 in October 1984. At the high end of the scale are secretaries and claims, payroll, legal, and travel clerks and statistical assistants; average grades for these job classifications are between 5 and 6 (roughly \$16,000 to \$17,000 in 1983) and there are about 110,000 people in such jobs. At the low end of the clerical scale are messengers, clerk-typists, mail and file clerks, and computer clerks, with average grades of 2-4 (\$12,000 to \$14,000). The breakdown of workers in each category by grade level is based on an OMB computer printout as of Mar. 31, 1983, while the total numbers for each category are for October 1983. This should not, however, cause any major misstatements.

⁵⁴U.S. Office of Personnel Management, *Federal Civilian Work force Statistics: Occupations of Federal White-Collar and Blue-Collar Workers*, MW 56-18, Oct. 31, 1983, table E, and U.S. Civil Service Commission, *Federal Civilian Manpower Statistics: Occupations of Federal White-collar Workers*, SM 56-11, table F-1. Postal workers have been removed from the 1975 data to make it comparable to 1983 data.

⁵⁵The only entirely new job title is equal opportunity specialist, although as noted the title of some job classifications (as identified by code number) has changed.

⁵⁶The extent to which people displaced from eliminated jobs move into newly created jobs cannot be answered from this data. However, it appears from OPM print-outs that most of the over 7,000 dictating machine transcribers were women; most of those in computer specialties are men.

Figure 9-2.—Changes in the Distribution of Federal Employees by Occupation, 1975 and 1983



SOURCES 1975: U.S. Civil Service Commission, *Federal Civilian Manpower Statistics Occupations of Federal White-Collar Workers*, Oct. 31, 1974 and 1975, SM 56-11, Washington, DC, 1975, and 1983: U.S. Office of Personnel Management, *Federal Civilian Workforce Statistics Occupations of Federal White-Collar and Blue-Collar Workers*, Oct. 31, 1983, MW 56-18, Washington, DC, 1983.

In internal Federal agency documents and in anecdotes told by Federal office automation managers, it is frequently said that government clerical workers, once trained in the use of office automation, are often hired away by private sector industries that offer higher wages. This is alleged to be true especially in field offices in some sections of the country. This disparity is largely at lower salary levels; 34 percent of Federal data processing workers made under \$23,400 in 1983, compared to 22 percent of those in the private sector, according to figures derived by the Congressional Budget Office. However, 35 percent of Federal data processing specialists earned \$35,400 or more, compared to 33 percent of those in the private sectors¹

¹U.S. Congressional Budget Office, *Reducing Grades of the General Schedule Work Force*, September 1984, p. 43.

Technical Workers

About 22 percent of GS employees in 1983 (nearly 332,000) were technical workers or paraprofessionals with such diverse titles as economics assistant, communications specialist, tax technician, and equal opportunity assistant—120 titles in all. In 1975, only 18 percent of the Federal workers had technical ratings. This trend probably reflects the development of an information society in which scientific and technical information is a major factor in all economic activity.²

Administrative Workers

Another 28 percent of GS workers in 1983 (432,000), were classified as administrative, compared to 24 percent in 1975. Nearly 11 percent of all Federal white-collar workers are supervisors; just over 2 percent are called managers, or top-level executives. (The latter are usually in the professional rather than the administrative category.)³ About 90 percent of administrative workers in 1983 were low and middle-level managers in grades 9 through 15, with nearly another 10 percent just below in grades 5 through 8.⁴ Program managers, health systems administrators, and computer-systems administrators, for example, have average grade levels of 13 or over. Passport and visa examiners and social insurance claims examiners are at the lower end of the range and have grade levels under 9. Again, it is the administrative classifications with lowest grade levels that appear most likely to be reduced in numbers as some of their tasks are automated, if the experience of their closest counterparts in the private sector, insurance raters, and underwriters, can be generalized.

²U.S. Civil Service Commission, *Federal Civilian Manpower Statistics: Occupations of Federal White-Collar Workers*, Oct. 31, 1974 and 1975, SM 56-11, pp. viii and x. The 1975 figures have again been revised to exclude postal workers. See table B of the CSC publication.

³The grade levels for technical jobs vary widely (the 90 percent range is from GS 4-11) but the average grade is 7.14 (average salary \$21,000 in 1983).

⁴U.S. Office of Personnel Management, *Federal Civilian Work Force Statistics: Occupations of Federal White-Collar and Blue-Collar Workers*, Oct. 31, 1983, MW 56-18, p. 8.

⁵The average grade for administrators is 10.9 (average salary \$32,000 in 1983).

Professionals

Just over 22 percent of Federal workers were professionals in 1983, as compared to 19 percent in 1975. Again, this increased proportion is probably related to changes in American society and economy as well as to office automation. In 1983, 94 percent of professionals were in grade levels 9-15. Their average grade level was 11.7 with an average salary of \$36,000. (In 1983-84, however, the proportion of professionals in the Federal work force was reduced slightly from that in 1980.)⁶³

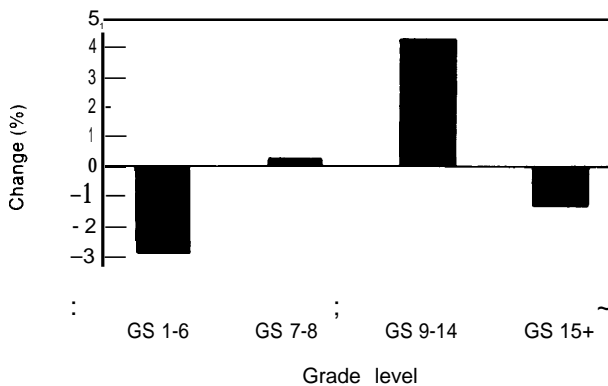
Changes In and Among Grade Levels

These changes have squared up the Federal structure, viewed in terms of occupational categories, so that their proportions, which in 1974 ranged from 18 to 31 percent, are now more nearly equal, from 22 to 28 percent, with administrative rather than clerical occupations as the largest group. Paralleling these shifts, the number of workers at each grade level has also changed. (See figure 9-3.) In 1974, 41.9 percent⁶⁴ of Federal workers were in the lower grades 1-6, where clerical workers are concen-

“About 3 percent of Federal workers are usually classified as “other or unspecified,” usually because their jobs are being reclassified during the counting period.

“The figure for both years excludes postal workers; if they are included for 1974, the percentage becomes 41.6 percent.

Figure 9-3.—Change in Distribution of Federal Employees by Grade Levels, 1974-80



SOURCES: U.S. Civil Service Commission, *Federal Civilian Manpower Statistics: Occupations of Federal White-Collar Workers*, Oct. 31, 1974 and 1975, SM 56-11, Washington, DC, 1975; and U.S. Office of Personnel Management, *Federal Civilian Workforce Statistics: Occupations of Federal White-Collar and Blue-Collar Workers*, Oct 31, 1983, MW 56-18, Washington, DC, 1983

trated. By 1980, it was 38.6 percent. The percentage of workers in grades 7 and 8 remained much the same (11.4 percent in 1974, 11.5 percent in 1983). But the proportion in grades 9 through 14, where most of the professionals and supervisory administrative workers are concentrated, has grown from 45.1 to 49.4 percent.⁶⁵ (Congressional Budget Office (CBO), taking slightly different parameters, says that the percentage of people in middle-management grade levels 9 through 15 has grown from 33 to 37 percent since 1974.)⁶⁶

The establishment of the Senior Executive Service (SES) was intended to increase the retention of senior Federal executives by providing them with the opportunity for higher rewards (bonus pay) in return for some sacrifice in job security. It is generally agreed that it has not worked well; many SES people believe that they have been made more visible and therefore the particular target of reductions in force (RIFs) and salary caps or freezes, and most of the few bonuses have gone to a relative few of the highest ranking people.⁶⁷

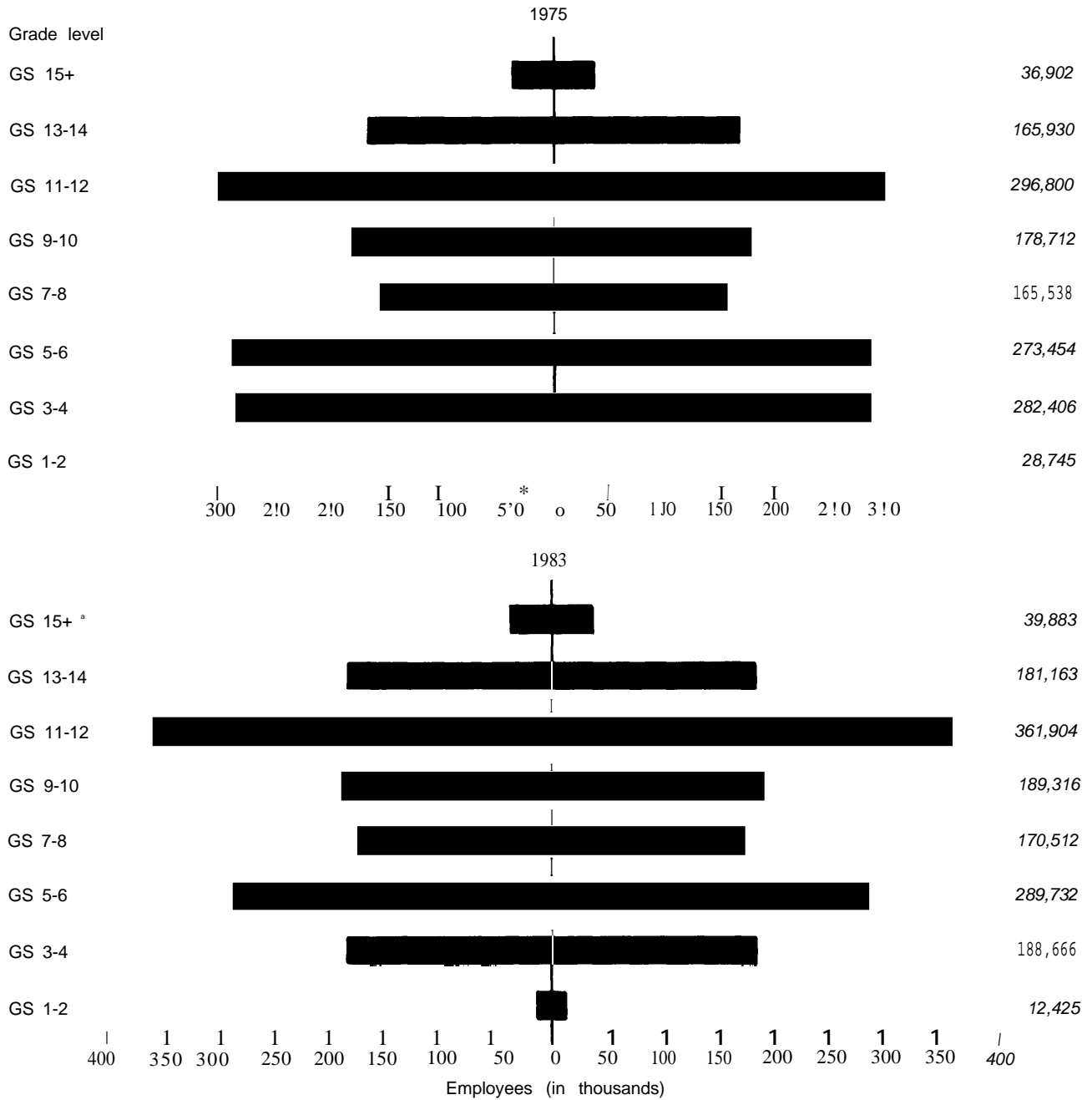
People tend to think of bureaucracies as shaped like a pyramid. The Federal work force is shaped more like a very flattened figure 8 or hour-glass. There are relatively few people in the lowest grades, a large bulge at grades 5 and 6, a narrow waist representing grades 7 through 10, another large bulge at grades 11 and 12, and a rapid drop-off in numbers in grades 13 through 15. The number of positions at grades 16 through 18 and in the Senior Executive Service (equivalent to grades 16 through 18) is limited by law and is less than 0.5 percent of all Federal jobs. (See figure 9-4.) The figure eight is getting squashed down, the bulges growing wider, and the top and bottom flattened.

⁶⁵Figures supplied by OPM in advance of the 1984 analysis of Federal civilian work force statistics now in progress, and compared to OPM occupational statistics for 1974 and 1980, see previous cites.

⁶⁶U.S. Congressional Budget Office, op. cit., p. x.

⁶⁷Sar Levitan and Alexandra B. Noden, *Working for the Sovereign: Employee Relations in the Federal Government* (Baltimore: The Johns Hopkins University Press, 1983), pp. 94ff.

Figure 9-4.— Distribution of Federal Employment by Grade Level, 1975 and 1983



^aThe grades 16-18 excluded senior executive service employees

SOURCES^b 1975: U S Civil Service Commission, *Federal Civilian Manpower Statistics, Occupations of Federal White-Collar Workers*, Oct 31, 1974 and 1975, SM 56-11, Washington, DC, 1975, p 34 1983: U S. Office of Personnel Management, *Federal Civilian Workforce Statistics Occupations of Federal White-Collar and Blue-Collar Workers*, Oct 31, 1983, MW 56-18, Washington, DC, 1983

Unanswered Questions

The Question of "Overgrading"

The average grade level for the civilian work force, not surprisingly in view of changes described above, increased from 8.03 to 8.51 between 1974 and 1983. As a result, salaries increased 4 percent (in equal dollars) and about 1.3 billion was added to payroll costs.⁶⁸ The President's Private Sector Survey on Cost Control, and others, have charged that the Civil Service is "overgraded, meaning that grades are too high in comparison with earlier levels and with the private sector."⁶⁹

The Congressional Budget Office (CBO) concluded that the growth in the proportion of nonclerical jobs accounted for about two-thirds of the half-grade increase. They attributed most of the additional increase to promotions granted by some managers to compensate for repeated caps.⁷⁰ An earlier OPM analysis (1980) said that 60 percent of the half-grade rise was due to "changes in the occupational mix of the workforce, citing the disproportional decrease in the clerical work force."⁷¹

Neither the Private Sector Survey report, OPM, nor the Congressional Budget Office explicitly addressed the effect of the increasing professionalization of government work nor of the penetration of information technologies in the office. CBO did acknowledge "the changing character of governmental work" in identifying the factor of growth in nonclerical jobs,⁷² but did not explicitly raise the question of how the declining proportion of clerical jobs might be related to office automation,

⁶⁸U.S. Congressional Budget Office, *op. cit.*

⁶⁹The Administration has proposed reducing the number of positions graded GS 11-15 by shifting 8 percent (about 40,000 jobs) to lower grades; this would be done over a period of 4 years, as vacancies occur. This would save \$3.9 billion over a 5-year period. See U.S. Congressional Budget Office, *op. cit.*, p. xi.

⁷⁰R. Mark Musell, "Reducing Grades of the General Schedule Work Force," LRS84-12344 (Washington, DC: U.S. Congressional Budget Office, 1984).

⁷¹"Average Grade Trend 1974 -1980," prepared by James Hall, Program Management Information Section, Work Force Information Division, U.S. Office of Personnel Management (manuscript, unpublished).

⁷²*Ibid.*, p. x.

nor did it point out that the Federal work force is far more thoroughly white collar than the private sector work force. CBO also pointed out that while the government has more middle- and top-ranked workers than the private sector, it also pays them much less; "Federal and private sector salary distributions were almost identical" in proportion going to people at those levels.

CBO noted that only 43 percent of Federal jobs were, at that time, below grade 11 compared with 61 percent in equivalent levels in the private sector. Again, it did not specifically note the greater proportion of white-collar work in the public sector.

Neither CBO, nor OPM in its own analysis, have given attention to the implications of office automation for future work force size, grade distribution, and payroll costs. Neither has systematically analyzed the forces behind the changing character of governmental work, nor acknowledged that these forces are likely to grow stronger in the future. There appears, in fact, to have been no major executive branch study of the possible effects of office automation on the Federal work force or labor costs. Considering the current emphasis on cutting the costs of government, the high priority given to increased productivity, and the strong trend toward procuring information technology to accomplish these goals, this is surprising.

Whether the potential increase in productivity because of office automation, and the consequential possibility of shrinking the size of the work force, will more than compensate for the need for more highly paid technical and professional workers is a question that should be studied thoroughly. To both reduce the clerical work force and artificially hold down average grade level and salary could mean that the government cannot attract and hold the people it needs for excellence.

The lack of systematic analysis and planning for changing work force needs makes some Federal workers anxious about their jobs. In discussions and workshops with Federal clerical employees concern is often expressed about what it may mean for job security and

the opportunity for promotion. Some of this concern may be unrealistic and exaggerated; it could be alleviated if officials could talk with their workers about current effects and the implications for the future. They cannot honestly do that at present because little or no information is available about the effect that office automation is now having on Federal employment.

How Jobs Are Classified

As discussed in chapter 4, office automation changes the nature of work and the skills requirements for many jobs. In both the private sector and the public sector, this leads to an expectation that job descriptions and personnel classification schemes will be revised.

OPM uses a point/factor rating system in assigning grade levels.⁷³ Brief definitions of the factors do not mention any consideration of equipment that is used in the work. The first and most heavily weighted factor is "knowledge required," defined as "the nature and extent of the information or facts that the worker must understand to do acceptable work." It is not clear whether more knowledge is required to operate a word processor than to operate a typewriter, or whether using a spread-sheet program takes more or less special knowledge than using a bookkeeping ledger. In some cases automation requires less knowledge about the process being carried out, in other cases it requires additional abstract thinking or ability at problem solving. It appears that Factor No. 1 could be interpreted so as to accommodate necessary technological skills, and thus jobs could be reevaluated and their grade level moved up or down, if their nature changes because of automation.

.. . . —

The factors are:

1. knowledge required by position (1,850 points, 41 percent of maximum total),
2. supervisory control (650 points),
3. guidelines (and judgment needed to apply them) (650 points),
4. complexity of work (450 points),
5. scope and effect of work product (450 points),
6. personal contacts with nonsupervisors (220 points),
7. physical demands (50 points), and
8. work environment (.50 points).

The point range for grades 1-6 is 190 to 1,350 points; for grade 9—1,855-2,100; for grade 15—4,055 and up. The maximum total is 4,480 points.

Unless this is explicitly recognized, however, it is likely that there will be challenges to the factor evaluation system, especially if workers believe that they are mastering new skills not recognized and explicitly valued in their old job descriptions. Catherine Waelder, General Counsel of the National Federation of Federal Employees, has already said that "the factor system is new but its standards and values are old." She points out that if not continuously revised, the system will "fail to account for the ability needed to use developing technological resources essential in many professions. . . ."⁷⁴

Part-Time and Temporary Workers

Government use of part-time and temporary workers is determined by many factors; it may or may not increase because of office automation. The Federal Employees Part-Time Career Act of 1978 was passed after several years of effort by members of the Senate and House of Representatives who were responding to urging of female constituents wanting to protect career opportunities in government while reserving time for at-home child care. Unions objected on the grounds that it would take jobs needed by over three million women actively seeking full-time employment who could not afford to support their families on part-time employment.⁷⁵

The act required agencies to do feasibility studies, establish annual goals and timetables, and review and monitor part-time work opportunities. Part-time Federal employment did increase by almost 14,000 from 1979 to 1981, to a high of 57,184; but in 1981 in the strong effort to reduce Federal employment, part-time workers were laid off at a higher rate than full-time employees, and by 1984, the number of part-time workers had declined by roughly 2,000. In a 1982 review of the Part-Time Career Act, GAO found that most agencies were not conforming to its requirements.⁷⁶

⁷³Statement in *Hearing on H. R. 4599, Federal Pay Equity Act of 1984*, op. cit., p. 248.

⁷⁴William G. Whittaker, *Federal Legislative Interest in Alternative Patterns of Work: An Overview*, U.S. Congress, Library of Congress, Congressional Research Service, Mar. 31, 1980.

⁷⁵U.S. General Accounting Office, *Part-Time Employment in the Federal Government*, July 12, 1982.

OPM is now again encouraging part-time and temporary employment on the grounds that it is cost-effective.⁷⁷ If office automation allows the work force to be reduced and kept lean, part-time and temporary workers are likely to be used to augment permanent staff when there is a short-term increase in the workload; thus temporary and part-time Federal employment is likely to increase as along-term trend. Since the objective of part-time work is from an employer's perspective to allow rapid, flexible adaptation to changes in workload, the number of part-time workers will fluctuate widely.⁷⁸

Women in the Federal Work Force

Several bills now before Congress deal with questions of pay equity and comparable worth in the Federal civil service. Comparisons of job content and skill requirements will be made more complex as office automation changes the nature of the work. While many clerical jobs have traditionally been considered women's work, "the degree of gender dominance differs significantly by grade level. (See figure 9-5.) In the occupational category of General Administrative, Clerical, and Office Services, women predominate at grade levels 1 through 9, and men at grade levels 10 through 15. In grades 2 through 6 the percentage of workers who are female varies from 78 to 90 percent.⁷⁹ In grades 7 through 9, the proportion of women ranges from 71 down to 61 percent, and at levels 10 through 15 the proportion decreases with each level, from 41 to 10.3 percent. Thus, while office services jobs are thought of as a group as "women's jobs," their grade level distribution is not much different from their distribution in the Federal work force as a whole for women. About 62 percent of female Federal employees are in grades 1 through 6, as compared to 20 percent of male employees. Only 10 percent of female Federal

⁷⁷Since January 1985 agencies have been allowed to keep temporary workers for up to 4 years; the previous limitation was 1 year.

⁷⁸See ch. 2 for a general discussion of part-time and temporary work as related to office automation.

⁷⁹Grade 1, which is held by fewer than 150 workers (many of them messengers) is only 66 percent female.

workers are in grades 14 and 15. As a result of their concentration in lower level jobs, women (who hold 46 percent of Federal General Schedule jobs) have an average salary that is 62 percent of men's average.⁸⁰

It is estimated that three-quarters of the lowest ranking Federal jobs (by grade level) are predominantly women's jobs.⁸¹ Since office automation is most likely to bring about reductions in lower level Federal jobs, women workers are those most likely to be made redundant. This could lead to a statistical improvement in the position of women in the Federal work force, as a group, since their average grade level should rise as a result. This statistical "improvement should not obscure the fact that the job losses will be disproportionately suffered by women.

Quality of Worklife

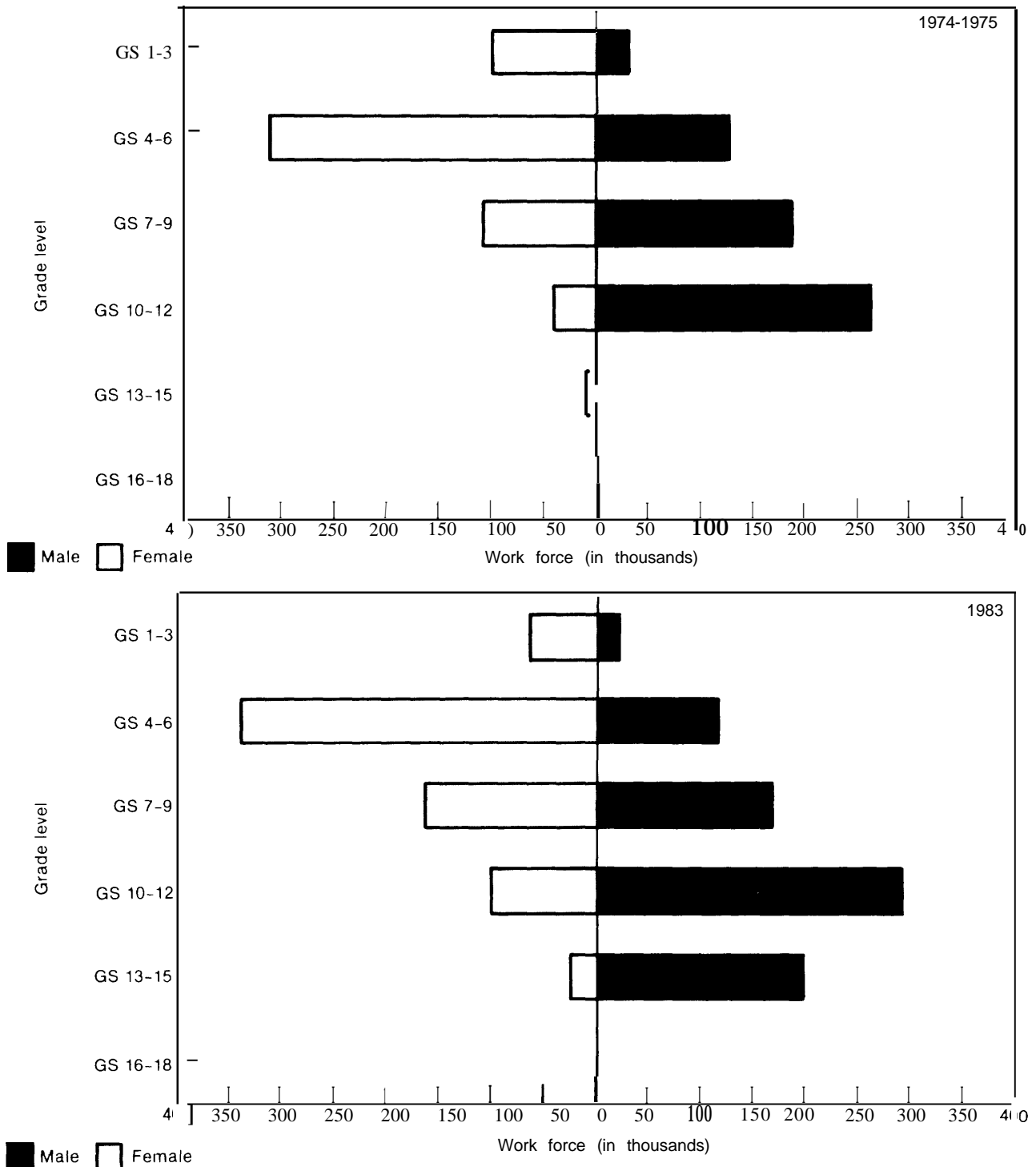
Again, the case study of office automation in New York City⁸² offers some possible indicators of present and future effects on a civil service work force. In automated municipal departments, new tasks were learned that cut across traditional occupational definitions, but there was little or no evidence of job upgrading in clerical and technical (paraprofessional) positions. Neither old or new job ladders provide a ready path for these workers to move up in the hierarchy of jobs, and some rungs of the job ladder have been removed by automation of intermediate tasks and responsibilities. In some jobs, abstract and conceptual knowledge is becoming more important than traditional skills, but this change has not been accompanied by an increase in pay scales. This

⁸⁰"In the 'Federal Wages Schedule (blue-collar workers) women are only 9 percent of the total, and their average wages are 79 percent of men's average. Among all FWS and GS workers (83 percent of all Federal workers) women are 38 percent of all employees and their average salary/wages are 68 percent of men's average. U.S. General Accounting Office, *Options for Conducting a Pay Equity Study of Federal Pay and Classification Systems*, GAO/GGD-85-37, Mar. 1, 1985.

⁸¹Statement of the Honorable Michael I. Barnes of Maryland, *Hearings on H.R. 4599, Federal Pay Equity Act of 1984*, before the Subcommittee on Compensation and Employee Benefits of the House Committee on the Post Office and Civil Service, 98th Cong., 2d sess., pt. 1, Apr. 3-4, 1984.

⁸²Greenbaum, Pullman, and Syzmanski, op. cit., ch.1.

Figure 9-5.—Full-Time White-Collar Employment in the Federal Work Force by Grade Level and Sex, 1974-75 and 1983



SOURCES 1974-75: U S Civil Service Commission, *Federal Civilian Manpower Statistics Occupations of Federal White-Collar Workers*, Oct 31, 1974 and 1975, SM 56-11, Washington, DC, 1975 1983: U S Office of Personnel Management, *Federal Civilian Work force Statistics Occupations of Federal White-Collar and Blue-Collar Workers*, Oct 31, 1983, MW 56-18, Washington, DC, 1983

is becoming a union issue and apolitical issue in the city.

The observations made on quality of work-life and the automated office environment in chapter 5 generally apply to the Federal office as well as to the private sector. Physical conditions are probably not as good in public sector offices as in many private sector offices. Turnover of facilities and office furniture is probably slower so that new technology is even more likely to be inserted into old settings. Furniture, lighting, and space layout is often inappropriate for microelectronic equipment now in use.

One issue likely to be controversial is the use of computer monitoring and pacing of work.⁸³ Federal labor law holds that applying work measurements and using these to evaluate employees are management prerogatives and need not be negotiated with unions representing Federal employees.⁸⁴ However, agency management can if they so choose bring the unions into discussion of work standards and measurement. Unions have attempted to raise the monitoring issue at some agencies but these attempts have been rebuffed as "non-negotiable" under the management rights clause. Arbitration rulings have upheld agency management when work monitoring was challenged, for example, in the Social Security Administration.

⁸³See ch. 5, for a general discussion of computer monitoring of work.

⁸⁴Civil Service Reform Act of 1978, Code of Federal Regulations, title V, sec. 7106 (a) (A) and (a) (B), "Management Rights."

The discussion in this section on work monitoring, where not otherwise cited, is drawn from an OTA contractor report, prepared by the Educational Fund for Individual Rights, Alan Westin, principal investigator, February 1985. The report is based on site visits and interviews in seven Federal agencies between 1982 and 1984, supplemented by a letter of inquiry to 78 Federal agencies, bureaus, and departments in September 1984 to which 44 agencies responded with letters and accompanying documentation. Follow-up telephone interviews were held with 12 agencies that reported significant activity related to work monitoring.

Labor Management Relations and Federal Unions

In the civil service, managers have less control over subordinates than in the private sector, because of civil service rules and protection. Managers themselves are subject to many of the same rules, regulations, and restrictions on wages and on bargaining as are their subordinates. Many Federal managers and professionals belong to professional associations that serve much the same functions as unions;⁸⁵ for Federal employees, this means lobbying Congress rather than bargaining for pay and benefits, since these are set by legislative action.⁸⁶

Federal unions will not be able to mount effective resistance to reductions in employment as these become possible, but they may be expected to monitor changes in job content, job classifications, and compensation as a result of office automation. The position that the largest unions have taken and will take on such issues as stress, risks to health from CRT use,⁸⁷

These include the Federal Management Association, the Professional Management Association, and the Senior Executive Association (the latter open only to those in grades 16-18 and the Senior Executive Service).

Until 1961, membership in unions by Federal workers was not recognized officially, and there was no provision for collective bargaining. However, about 13 percent of nonpostal workers and a much higher percent of postal and blue-collar workers had already joined. Between 1963 and 1969 the membership more than quadrupled, from 180,000 to 843,000. President Kennedy affirmed the right to join unions and a very limited right to collective bargaining in 1962 in Executive Order 10988, and the area for collective bargaining was slightly enlarged by the Civil Service Reform Act of 1978. But Federal unions are still generally precluded from bargaining about wages and fringe benefits, hiring, firing, work assignment, disciplinary actions, and contracting out. Levitan and Noden, *op. cit.*

Federal employees do not have a right to strike, and may be dismissed and subjected to felony charges if they do strike. The Supreme Court has upheld this ruling, saying that the employees' rights under the First Amendment and other Constitutional provisions must be balanced against the right of government to regulate the behavior and speech of its employees. The dismissal of the air controllers when they struck illegally is likely to discourage other strikes for some time. William B. Gould, *A Primer on American Labor Law* (Cambridge: MIT Press, 1982), p. 171.

Thirty-nine States have some form of legislation protecting the right of public employees to organize and bargain collectively. See William B. Gould, *op. cit.*

"Federal employees are not covered by the Occupational Safety and Health Act but agency heads are responsible for maintaining standards consistent with the act (Executive Or-

or access to training, will be important. Federal unions have already adopted guidelines or model contract provisions on VDTs, which they distribute to bargaining committees for use in agency negotiations. Their activism may increase in the future.

Federal white-collar workers are more likely to be represented by a union than are those in the private sector. About 54 percent of GS workers are covered, although only about one-third of those are dues-paying members.” In the national labor force, only 8.5 million white-collar workers, about 17 percent of the total, are members of unions.⁸⁹

Those covered by Federal unions are predominantly women and predominantly in clerical categories. Although figures are not available, it is likely that Federal unions have had a net loss of members in the last several years.

International Comparisons

The International Labour Organization (ILO) says that in developed and developing countries’ public sector employment:

In respect of information processing, it is most likely that the over-all impact of computerization lies **not so** much in the threat of redundancies, but in future limits on growth in clerical and related employment.⁹⁰

der 12196, Feb. 26, 1980); and Federal employees have the right to compensation for disability, death, or injuries sustained in performance of their work (Federal Employees Compensation Act, 5 USC sec. 8101 et seq.).

“About 61 percent of the Federal work force is represented by unions, but this includes 86 percent of Federal blue-collar workers. Dues paying membership is harder to determine; unions are not required to make these figures public. See Sar A. Levitan and Alexandra B. Noden, *Working for the Sovereign: Employee Relations in the Federal Government* (Baltimore: The Johns Hopkins University Press, 1983), pp. 15-20. Federal white-collar workers are chiefly represented by the American Federation of Government Employees (34 percent of those who are covered by union bargaining), the National Association of Government Employees (4 percent), the National Federation of Federal Employees (7 percent), and the National Treasury Employees Union (5 percent). The first two of these are part of the AFL-CIO; the other two are independent.

“Henry Levin, “Jobs: A Changing Workforce,” *Chance*, vol. 16, October 1984, pp. 32-37.

“International Labour Organization, *The Effects of Structural Changes and Technological Progress on Employment in the Public Service*, Report I II, Joint Committee on the Public Service, 3d sess. (Geneva: International Labour Organization, 1983), p. 30.

The I LO notes that this will have its most serious effects “on the prospects of women seeking to return to the work force and on school leavers.”

Nearly all governments are trying to improve efficiency and hold down costs, the I LO notes, citing evidence that many advanced countries have made cuts in their public work force as a result of information technologies. For example, Canada had a net reduction of 12 percent in employment in government secretarial positions from 1975-80. Within that general category, the number of typists declined by 35 percent and the number of stenographers by 68 percent, while secretaries increased by 17 percent and operators of office-composing equipment increased by 97 percent.⁹¹

Evidence of employment effects in centrally planned developed nations are, according to ILO, unreported or ambiguous. In developing countries, wherever statistics are available, they often show a shortage of qualified computer personnel.⁹²

A technology forecast done for the Federal Republic of Germany by a consulting firm suggested that if the government adopted a strategy of maximum use of information technology, 75 percent of all public sector office jobs could be standardized, and 38 percent automated.” The ILO recognizes, however, that “owing to cost, lack of planning, a desire to maintain existing work arrangements, or simply bureaucratic inertia such comprehensive plans will materialize only slowly,” and a more likely scenario for most countries is the gradual introduction of components and systems that can later be linked, as the need arises.⁹⁴

Rapid development of telecommunications technology has affected postal workers in many countries, although employment levels have not fallen dramatically. Rather, they have shown slower growth rates in recent years, and

“Ibid.

“11.0, op. cit., p. 28.

“J. Sleight, et al., *The Manpower Implications of Microelectronic Technology* (London: Her Majesty’s Stationery Office, 1979), pp. 77-79, cited in 11.0, op. cit.

“11.0, op. cit., p. 17.

in some countries staff reductions or hiring freezes occurred despite increases in the volume of mail traffic. As to the future, some governments expect reductions in postal, telegraph, and telephone occupations (which in

most countries are all public service jobs) and some do not.⁹⁵

—“ILO, *op. cit.*, p. 42.

EFFECTS OF OFFICE AUTOMATION ON PUBLIC SERVICES

Productivity increases do not necessarily lead to a reduction in labor force numbers or costs. Complementary or alternative objectives may be to increase the volume of products or services delivered, or to improve their quality. Or, increased productivity may merely mean coping with, instead of being overwhelmed by, an increasing workload.

Because our economy increasingly depends on information as a resource and a driver of growth, the office workload is inexorably increasing. The primary objective in office automation is sometimes merely to accommodate this increased workload.⁹⁶ One final meaning of increased productivity is the creation of entirely new information-related services for customers, clients, or constituents.

There has been rapid change in the global economy, and America's role in that economy, since the 1960s. There have also been significant changes—particularly during the 1970s—in the expectations that our citizens have about involvement in Federal decisionmaking, and the demands that they make on government agencies related to information about public resources and public expenditures. In allowing Federal agencies to meet these demands and to accommodate the increased workload, office automation quite possibly helped to avoid serious problems and disruptions that could have weakened the U.S. position of world leadership.

Many managers and professionals report that the quality of analysis, reports, and other forms of decision-related services is improved by office automation, which allows large data-

bases to be collected, manipulated, analyzed, modeled, and systematically applied to policy formulation and decisionmaking. This improvement is more difficult to document and measure than other forms of increased productivity.

It is also possible, however, that office automation may lead to a change in the nature of some government services and even to their deterioration. For example, services could become overly depersonalized and standardized, inflexible, and unresponsive to changing needs, if the technology itself is allowed to drive the design of the service or delivery mechanisms.

A Case Study of Expanding Responsibilities

The history of office automation in the Office of the U.S. Trade Representative is one illustration of office automation providing the means of meeting new challenges and avoiding disruptive overload in carrying out new government responsibilities.⁹⁷

The Trade Act of 1974, authorizing U.S. participation in a new round of multilateral trade negotiations, elevated to cabinet status the position of Special Trade Representative and assigned that officer responsibility for representing the United States in the negotiations, and administration of the Trade Agreements Program under that and other existing acts.

 “This section is drawn from an OTA contractor report, William Neufeld, *Office Automation in the Office of the U.S. Trade Representative*, February 1985. OTA is indebted to the Office of the U.S. Trade Representative for cooperation in allowing this study to be made and in facilitating the research by the contractor. The case study is also summarized in app. B.

⁹⁵Alan Porter, David Roessner, et al., *Office Automation Outlook, 1985-2000*, contractor report for OTA, February 1985.

The Office of the Special Trade Representative, which until 1972 had only about 30 employees, had grown to about 126 employees by 1980, when it became the Office of the U.S. Trade Representative. In 1980 it was assigned overall responsibility for formulating and coordinating foreign trade policy among all government agencies, representing the United States in all trade negotiations regarding the General Agreement on Tariffs and Trade (GATT), East-West trade, international investment, commodity agreements, the Organization for Economic Cooperation and Development, and the UN Conference on Trade and Development.⁹⁸ These developments reflected the growing importance of world trade in the U.S. economy.

During the 1960s, the small agency had needed more and more data to use in developing positions for multinational negotiations. There was no central database on trade volumes, tariff rates, exports and imports, etc. Data was kept or reported by many different agencies, in different forms, and categories. The Washington headquarters and the Geneva negotiating office relied on different sets of data collected from different sources, which made policy coordination difficult.

Planning to build a computerized trade database began in the late 1960s, but not until 1977 did an integrated database begin to function, serving many agencies and lodged for administrative purposes in a large computer system at the National Institutes of Health.⁹⁹ The development of the interagency trade database helped pave the way for office automation within USTR. It did not come about piecemeal but was systematically planned and implemented over a 5- or 6-year period, to mesh with the large computer system. It has so far cost only about \$2 million (including about \$1 million investment in hardware).

⁹⁸The President in 1984 proposed to Congress the creation of a Department of International Trade and Industry, with USTR under the direct control of the Secretary of that Department.

⁹⁹Renamed the Trade Policy Staff Committee Trade Net in 1984, the system provides a number of member agencies with data directly available through dial-out computer terminals.

Through a combination of central computer operations, personal computers, and stand-alone and shared-logic terminals the USTR staff now has the capabilities of word processing, spreadsheet analysis, on-line data management, graphics, correspondence control, internal electronic mail, teletext, facsimile, and telex. Users can access the general database, and also a "magazine" containing USTR schedules, recent trade and labor summaries, and economic news. They can call up trade data on bilateral trade balances, imports and exports, domestic and foreign trade actions, and GATT documents. They can communicate through their terminals with the members and staff of the Trade Policy Staff Committee (the nine agency committee that provides analyses and recommendations to the senior level Trade Policy Committee) and of its subcommittees, and can electronically transmit documents to them. They can communicate by teletext with the Geneva office, USTR ambassadors, and staff members on travel, and can use this method of transferring documents between Geneva and Washington. Hard copy original documents can also be facsimile.

In interviews, nearly all professionals on the USTR staff and half of senior managers said that they use terminals extensively, for up to 75 percent of their working hours. Professionals who were interviewed say that they can complete a project in half the time it would take without their computers. They also reported that the increased productivity had allowed them to clear a backlog of work that always built up in the past. Senior staff reported that they could ask for work on shorter deadlines. Some members of the professional staff reported that because of electronic communication and transmission of documents, the time required for review and clearance of trade-policy positions has in many cases been cut in half.

At least in the perception of many professional staff members, the USTR has been able to take on a continually expanding workload, and maintain or improve the quality and pace of performance at the same time, because of information and communication technologies.

The staff has grown little if any during the 5 years in which office automation was implemented.¹⁰

Changes in the Nature of Delivered Services

Standardization and depersonalization of government services is a possible outcome of office automation. In the OTA case study of municipal agencies in New York City,¹⁰¹ referred to earlier, an agency providing social services to disadvantaged clients reorganized the application and recordkeeping process so

¹⁰⁰In 1980 after reorganization and expansion of responsibilities, the Office had 116 permanent full-time staff plus 10 Assistant U.S. Trade Representatives, or approximately 126 people. In 1984, it has 122 permanent staff members. But USTR has always used detailees from other agencies, and some consultants and part-time people. When this case study was done in 1984, the inclusion of such people brought the number of people working at USTR to 183; the number of such people on hand in 1980 could not be determined.

¹⁰¹This material is drawn from an OTA contractor report, *The Effects of Office Automation on the Public Sector Workforce—A Case Study*, prepared by the Labor Institute (Professor Joan Greenbaum, principal investigator), February 1985.

as to use standardized coded forms. When inaccurate or incomplete information is fed into the computers it cannot be detected until late stages of the process, at which time the case has to be put on hold. Case workers say that some clients do not understand computerized forms and throw them away; others are intimidated by them and throw them away. Many of the municipal employees say that the quality of the services they deliver has been degraded.

The Federal Government also delivers some services directly to individuals and households; for example, social security checks. With office automation some element of personal attention to the difficulties or foibles of recipients may be lost. The less educated or sophisticated, and those with language limitations, are more likely to be unable to cope with formal, unfamiliar processes. Thus, as the delivery of government services is automated, special procedures may be needed to assure that the access that some people have to services, or the attention paid to their needs, is not inadvertently degraded.

EFFECTS ON GOVERNANCE

Bureaucracy—a hierarchy of authority, specialization of functions, and formal channels of communication and command—is the basic structure of government as it is of all complex formal organizations. Bureaucracy is a valuable form of organization because it allows expertise to be harnessed, focused, and directed toward collective ends.

Bureaucracies serve both despotic and democratic societies. In a highly technologized society, it can be argued that democracy can exist only because bureaucracy provides a way of using experts without being ruled by experts. Policy can be made by political representatives, and implemented by the hierarchy of specialists under their control and oversight.

But as bureaucracy becomes larger and more complex, the specialization of functions at the lower ranks can become extreme—"rationali-

zation' of tasks makes the work routine, monotonous, and finally mindless. The managers may spend increasing amounts of time correcting and coordinating, and little time doing anything productive. Some political theorists argue that in the electronic era, elaborate bureaucracies may be unnecessary. Information and communication technologies may offer a way to replace overly large and complex bureaucratic structures with more autonomous units assuming responsibility for an entire job.

This prescription would be hard to implement in government without some sacrifice of accountability. Those who want to transform bureaucracies into "democratic work groups" tend to see formal channels of communication and control as a byproduct of specialization of functions, or to imply that they are antithetical to participatory democracy. But formal communication channels are

also a mechanism for achieving accountability, including accountability of bureaucrats to politically responsible policy makers. Within government, for example, communication typically moves through a series of nodes of authority.¹⁰² The flow of information also involves in many cases a flow of authority. The presence of an authorizing signature on or with the information may give it force—that is, cause something to happen. It may create or make binding the acknowledgment of an obligation. At least it acknowledges the receipt of the information. The signature, in other words, expresses a personal responsibility or validation of the information or some action associated with or flowing from it. Finding a fully adequate electronic substitute for the handwritten signature, as an easily recognizable and widely accepted validation for the origin and receipt of messages, is only one aspect of the problem and probably a minor one.¹⁰³ Electronic sign off may merely replace the buckslip and the paper-based signature of authority and accountability.

But a signature is only one example of the set of procedures that in a government bureaucracy are designed to control and standardize behavior. The procedures usually include the designation of particular, formal channels of communication through which information (and authority) must flow. The flow is limited to these designated channels not only for the sake of efficiency and control, but to make it auditable in the future. These procedures not only guarantee control, for those at the top of the bureaucracy, but they also protect the general public; they are the means of making power lawful, of limiting its exercise

¹⁰² “The discussion here draws heavily on Ronald M. Lee. “Automating Red Tape: The Performative vs. Informative Roles of Bureaucratic Documents,” *Office: Technology and People*, vol. 2 (The Netherlands: Elsevier Science Publishers B. V., 1984), pp. 187-204.

¹⁰³ Many organizations rely on the use of a combination of identification numbers or names and passwords to substitute for a signature. A few are developing techniques based on the concept of public key encryption, a mathematical technique developed in 1977 at the Massachusetts Institute of Technology (*EMMS*, vol. 9, No. 13, July 1, 1985). Many people deny the need for electronic signatures, on a practical basis, saying that messages sent by computer are no different from messages sent by telephone or telegraph.

within agreed on boundaries. Some political scientists fear that reliance on telecommunications both within and between organizations (e.g., electronic mail) makes it difficult to control or to monitor the flow of information and blurs the location of both authority and responsibility. For example, changes in a database may be made without an authorizing signature, or instructions may be transmitted to contractors by persons without adequate authority for fiscal commitments.

Thus, bureaucratic procedures, including formal channels of communication, are integral parts of the concepts of due process and accountability. But to the extent that information and communication technologies offer new opportunities—and perhaps new temptations—to ignore, evade, and erode those established channels, care must be taken that they do not diminish the accountability of government officials. The rules and established channels could persist, ossify, but be ignored.

The principle of accountability, carried to extremes, leads to inscribed, detailed, and inflexible rules for every process and procedure. Information technology may provide a healthy corrective, making information so generally available that bureaucratic authority is constantly challenged in a productive, rather than a disruptive, way. But when information is electronic rather than paper-based, it propagates more rapidly, is less closely identified with its source, is both more accessible and at the same time more opaque to the casual seeker. It may tend to be used less responsibly. The public could find itself less able than before to identify and hold responsible the propagator, or the user, of information.

On the other hand, as information becomes the subject of formal resources management, it is also possible for its use to become so encumbered with safeguards and procedures that access to it is reduced for both the public and the experts. None of these untoward consequences is inevitable. But the pervasiveness of new information technologies does mean that government information-handling is likely to change in unanticipated ways.

Over a decade ago Kenneth Laudon pointed out¹⁰⁴ that information about a government organization affects that organization in four ways:

- it affects the organization's reputation with the public, with its primary constituents, and with its employees (and, although not mentioned by Laudon, with those who oversee the organization in Congress);
 - it affects the organization's autonomy—the more public information there is about the organization's inner workings, the less independent the role it can play in formulating policy;
 - the loss of full control over internal information tends to make an organization defensive and may lessen its own propensity to self-evaluation; and
- increased public information constrains the informal accommodations an organization can make with influential actors in its environment (congressional critics, interest groups, other agencies, etc.).

In short, when the flow of information within and from an organization becomes less controllable, the organization tends to react in ways that are sometimes desirable, from the standpoint of democratic responsiveness, and sometimes not desirable. It cannot be assumed a priori that information technology makes information management more efficient, from the viewpoint of organization managers; nor can the relationship between information management and effective performance of an agency's mission be fully anticipated.

Another major concern is the way in which information technology may be used either to increase government's collection and use of information about individual citizens, or to increase citizens' access to information about government. Abuse of the capability to collect, aggregate, and use information about citizens, to violate the citizen's privacy, or to make the citizen more visible to government and more susceptible to its control, has been

¹⁰⁴Kenneth Laudon, *Computers and Bureaucratic Reform* (New York: John Wiley & Sons, 1974).

a pervasive concern. These issues are being addressed in another OTA report, an assessment of government information systems.¹⁰⁵

Many enthusiasts for information technology anticipate that it will greatly increase citizens' ability to know what government is doing and how, and to use that information to evaluate, influence, and participate in public decisionmaking. Four kinds of information about government are of primary interest to citizens, especially to citizens actively attempting to monitor or to participate in public decisions:¹⁰⁶

- information about decisionmaking, policies, and practices internal to an agency—budgeting and programming priorities, planning, key appointments and assignments, the locus of authority for specific actions and decisions, the actions of specific officials, etc.;
- evaluations, reviews, status reports, and other policy-relevant information from actors external to the agency, such as administration officials, congressional oversight committees, etc.;
- intermediate and final outcomes of specific cases and decisions, especially individual client problems such as social security eligibility or income tax appeals, and other personal data; and
- information about the costs of agency decisions and actions to citizens—paperwork burden, personal records disclosure, inequities in application of regulations, etc.

Citizen access to the first two kinds of information has been widened by the Freedom of Information Act and other laws. Particularly when organized into public interest groups, citizens are generally able to obtain

¹⁰⁵*Government Information Systems*, forthcoming from OTA's Communication and Information Technologies program later in 1985.

¹⁰⁶This analysis draws on that of Donald A. Marchand and Mark E. Tompkins of the University of South Carolina, presented before the panel on Information Control Policy at the Annual Conference of the American Society for Public Administration, Phoenix, AZ, 1974, and later published as "Information Management and Use in Public Organizations: Some Impacts on Citizen Participation," *State and Local Government Review*, September 1981, p. 103.

such information readily. Information technologies make it easier and less costly for an agency to supply such information when demanded by citizens. Some agencies are giving citizens direct access to such data through information systems.

The citizen has much less access to information about the status or progress of his or her individual dealings with government agencies as a client; for example, in appealing income tax decisions. Here the individual is dependent on the agency to give up information, and has no means, technological or otherwise, to access it directly. But the agency can use information technology to collect, or at least to aggregate, process, use, and disseminate information about the client. In this case, "the client's information-processing relationship with the public agency is likely to be one-sided. . . . the client must reveal information about himself to get services from the public organization."¹⁰⁷

The thrust of this argument is that information technology improves the agency's ability to get or use information about the citizen as client, but does not improve the client ability to know about the progress or outcome of his or her own case as it is handled by an agency. But even the first kind of benefit cannot always be assumed; that is, that agencies will have better data about clients. As already noted, New York City social services workers reported that many of their clients ignored, failed to understand, or were intimidated by standardized forms, and also that erroneous information fed into the automated system could not be caught and corrected until late in the process.¹⁰⁸ In this case information technology may have degraded the client information going to the agency, without improving the citizen/client control over it or access to it.

The fourth kind of information, about the direct and indirect costs of government action to the public, is diffuse and hard to make specific. Citizens have difficulty in figuring out exactly what a change in policy or procedures would cost them in taxes, additional paper-

work, narrowing of options, or political power. The same is true in many cases for those who would benefit from government action. Thus, "the poor," the "disadvantaged," or the "small businessman" who are targets of government programs, may not even know that they are or would be affected.

Information technology could be of help to both citizens and government agencies in making this kind of data available.¹⁰⁹ Office automation could improve the ability of agencies to target the recipients of their services through conducting surveys and analyses, improved special census counts, and collection and analysis of information about clients as a group. It can be designed to improve the handling of client correspondence and to allow customized response to inquiries. However, information technology can also be implemented in such a way that relationships between government and constituents are further standardized and dehumanized, or information delivered to constituents becomes so highly technical and jargon-laden as to become useless to those who are not highly educated or even to those who are not specialists in fields such as contract law, taxes, or health delivery. Mechanisms such as forms for requesting information from, or delivering information to, a citizen are often designed for the convenience of the computer, or data processor, rather than for clarity to the citizen.

This creates a real possibility that information technology, unless used with care and judgment, could further increase the disadvantages confronting those who are already educationally and economically disadvantaged. The effects of information technology on the delivery of government services, and more importantly, on the quality and equity of governance, must be carefully monitored so that corrections can be made if needed.

¹⁰⁷This is not the conclusion of the authors cited above, Marchand and Tompkins, who conclude on the contrary that information technology is of little direct help to either the agency or "the citizen as victim." They argue that because information technology and the ability to access and use it is not equally available to all, it has distributive effects on the ability of citizens to use information about government to monitor and influence policy; current information policy has regressive distributive effects—it benefits the well-to-do more than the disadvantaged.

¹⁰⁷Marchand and Tompkins, op. cit., p. 106.

¹⁰⁸*The Effects of Office Automation on the Public Sector Workforce—A Case Study*, op. cit. (OTA contractor report).