Office Automation in State and Local Governments

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There are 50 State and about 78,200 local government units' in the United States. To make general statements about their activities is always difficult; one of the benefits of a Federal system is that the diversity of their approaches to problem-solving provides a living laboratory for public policy formulation.

The workload in State and local government has increased more rapidly in recent decades than that of the Federal Government. Between the end of World War II and 1980, State and local government employment increased steadily to a high of 13.3 million. It has since slightly declined, as pressure for increased administrative efficiency and cost reduction has grown. As a percent of total public sector employment, State government employment increased from 16.5 percent in 1950 to 23 per-

This includes about 3,000 counties, 19,000 municipalities, 17,000 townships, 15,000 school districts, and 26,000 special districts (when they are fiscally and administratively separate from other governmental units). At the beginning of World War II there were about 156,000 local government units, or 49 percent more. The big reduction was the elimination of over 93,000 school districts during the 1950s and 1960s, by consolidations.

cent in 1979; local government's share grew from 50 to 59 percent.' Federal budget cuts and the phase out of Federal grant programs could bring about a massive transfer of administrative responsibility from central to State and local levels of government. This provides a further strong incentive for seeking greater efficiency.

These governments are automating their offices at different paces and following different strategies, and the consequences will be different for each governmental unit. Much of the information now available comes from the limited number of case studies of individual jurisdictions. Many of these case studies have a narrow perspective, being focused on public administration criteria of cost-effectiveness. Relatively little literature is available as yet dealing with effects of office automation on governance, policy, or political responsiveness.

'U.S. Department of Commerce, Bureau of the Census, *Public Employment in 1983,* GE83-No. 1,

STATE GOVERNMENT OFFICE AUTOMATION PLANNING AND PROCUREMENT

Some State governments have gone much further than others in computerizing their offices. Tax and finance operations, personnel records, and routine recordkeeping are however thoroughly automated in almost all States. It is common for a number of State agencies to share a data processing center, but there are usually several or many processing centers within a State government. In planning, procurement, management, and degree

of control over information processing there is wide diversity. Some State governments have realized that computers represent the possibility of a fundamental change in the way public affairs are administered, and have established long-range plans and strategies for effective use of the technology. Other States have not gotten beyond treating office automation as merely the latest marginal improvement in office equipment. Some have let of-

fice automation happen to them, unplanned and incrementally, and are now struggling to rationalize these changes.

This is reflected in procurement strategies. Some States have governmentwide master plans for investment in information technologies while some expect planning to be done on an agency-by-agency basis as part of the budgetary process. Many States, after some floundering, have developed procurement controls and standards for large computer systems, only to be taken by surprise by the infiltration of small computers and word processors, which generally fall below the threshold cost that requires centralized procurement approval.

Minnesota, for example, has highly centralized planning and control of information systems, while in New York State the responsibility is almost completely decentralized. Other States fall along the continuum between these poles.[3] Most States do, however, have some central office or division that coordinates information-technology procurement, if not long-range planning. This office is usually within a department of administration or general services, or in the department of finance. Some States, however, give the responsibility for such coordination to a special commission. For example, in Florida, the Information Resources Commission, made up of the Governor and six major State officials, reviews agency information-technology plans. In Texas, the Automated Information Systems Advisory Panel, with a similar role, has both public and private sector members.

State and local governments are regarded as the largest single market for the microcomputer industry in the next few years.[4] During the early period of acquisition of government computer systems, States were concerned over their ability to maintain their control over public purchasing (especially physical specifications, terms, and conditions of price competition) because of the powerful market positions of a few firms. In this large but disaggregated and dispersed market, it was difficult for State governments to make effective demands regarding physical specifications of systems or to specify the terms and conditions under which they would do business with computer system vendors. The Council of State Governments warned in a 1975 report that:

> There are factors at work which defeat certain long-standing principles of public purchasing. . . . The effects of oligopoly are multiplying.[5]

This led the American Bar Association to develop a Model Procurement Code for State and Local Governments, which was published in 1979. Many States have since developed their own standard contracts and agreements. As State officials have become more knowledgeable and experienced with computer technology the problem has eased.

But more recently, stand-alone word processors and personal computers (PCs) have introduced a new element of uncertainty, since their cost is low enough that their purchase may not require centralized approval. It is common for State agencies and local governments to find that equipment from several different vendors have found their way into government offices with no central plan for—or even inventory of—their spread. For example, one State government report acknowledges that "thousands" of PCs have found their way into large organizations by the 'end-user end-around, that is, users avoiding bureaucratic purchasing procedures by buying their PCs below required dollar review levels.'"

At the State level as in large corporations, microcomputers and stand-alone word processors are almost always superimposed on an existing pattern of centralized computing. A

[1] Many of the examples in this section are taken from an OTA contractor report, *A Comparative Review of Information Technology Management Practices in State Government,* prepared by the Institute of Information Management, Technology, and Policy of the University of South Carolina, John C. Kresslein, research analyst, December 1984.

[3] J. Robert Ippolito (Director, Division of Electronic Data Processing, Florida Department of General Services), "Computer Technology Procurement: Can It Be Standardized for State and Local Governments?" *State and Local Government Review,* vol. 13, No. 3, September 1981, p. 85.

[5] The Council of State Governments, *State and Local Government Purchasing,* Lexington, Kentucky, 1975, p. 7.

[6] State of South Carolina, Division of Information Resource Management, *Personal Computers in State Government,* May 1984, p. 2.

report on personal computers in the government of South Carolina notes that this has caused a rethinking of management strategy:

> In 1979, when the Division of Information Resources Management began its original office automation efforts, the PC was not a viable end-user device for integration into the State's office system model. , . . However, we now see the computing landscape changing to a three level model in which: Level 1 is the corporate mainframe node; Level 2 is the departmental (minicomputer node; and Level 3 is the personal computer node. These levels *more closely match the organizational hierarchy.* At the time of this writing (1984) DIRM has begun efforts to provide management direction and support for the PC and is developing strategies to integrate the PC into its overall State Plan on Technology. (Emphasis added,)'

This State government anticipates, according to the report, that by the end of the decade there may be one PC for every State government office worker.

State office automation is not limited to computers in the State House or capital city; increasingly, it is including sophisticated systems to provide an interactive network between dispersed nodes of government services. At least two States, California and South Carolina, are planning digital "backbone" networks to link together centers of government activity around the State. Alaska has an audio-conferencing network connecting 70 sites across the State and 17 full-time information offices that are also networked. Michigan has a distributed network throughout the capital complex, with a terminal in every senator's and representative's office.

State legislatures, as well as administrators, are using computers. Most States have electronic data processing systems for statute search and retrieval and reporting on the status of bills before the legislature.[g]

'Ibid. See the case stud~ cm South Carolina government use of computers later in this chapter.

'Linda Schulte, "A Survey of Computerized Legislative Information Systems," *La% Library Journal,* \'ol. 72, winter 1979, pp. 99-129.

THE EXTENT OF AUTOMATION IN LOCAL GOVERNMENTS

By the mid-1970s most large counties and municipalities were also using computer systems for high-volume data processing.[9] By 1980 these governments had an average of 31 operating applications and as many as 30 under development, and were spending an average of $500,000 yearly for automated data processing. The systems tended to be used first and most pervasively for departments of finance. Recordkeeping and printing were other

widely sought applications. [10] More recently, however, a large number of sophisticated applications have been developed for use by local governments, both in the processing of data for routine operations and in the analysis of information for broader purposes of management and planning.[11]

Larger governments usually bought or leased equipment and developed in-house technical staffs, often developing their own software. Others depended on contractual agreements for specific computer applications with a corn-

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'James N. Danziger, "The Use of Automated Information in Local Government, " *American Behavioral Scientist,* vol. 22, No. 3, January-February 1979, pp. 363-392. A survey by the Urban Information Systems Research Group of the Public Policy Research organization indicated that more than 90 percent of cities with populations of 50,000 and *larger,* and 90 percent of counties of over 100,000 people had computer systems, while less than half of those smaller had them. Kenneth I.. Kraemer, William H. Dutton, and Alana Northrop, *The Management of Information Systems* (New York: Columbia University Press, 1981), p. 8.

'"Robert E. Sellers, "Mini- and Microcomputers in Local Government: Their Application and Their Impact, " *State and Local Government Review,* September 1981, p. 91.

''John Leslie King and Kenneth L. Kraemer, "Information Systems and Intergovernmental Relations, " *Public Sector Performance. A Conceptual Turning Point,* Trudi C. Miller (cd.) (Baltimore: The Johns Hopkins University Press, 1984), pp. 102-130.

puter services/time-sharing company. In a few cases local governments acquired computer systems but hired a facility management concern to operate them, or two local governments (e.g., a city or county and a school system) developed a jointly owned and operated computer center. '2

End-use computing is now spreading in the government agencies of large cities.[13] Public Technology, Inc., surveyed its member cities and counties with a population over 400,000 in 1983 and found that among the 50 respondents, 75 percent had microcomputers. By then, 93 percent had one or more minicomputers, and over half had mainframes. A similar survey in 1984 indicated that 77 percent of 84 cities responding (80 percent response) had microcomputers, and 87 percent planned to have them by 1984. '4 There are already hundreds of local government applications programs available for microcomputers.

But despite the low cost of small computers, most small local governments have not yet begun to use them. A survey in 1983 of 162 local governments within the State of South Carolina found that 81 percent were using computers of some kind, but this usually represented centralized computing, or large-volume data processing. While 3 of the 6 large cities were using microcomputers, only 3 of 27 counties, 1 of 12 medium size cities, and 6 of 53 small cities had acquired them.[15]

The International City Managers Association (ICMA) surveyed 5,808 cities of all sizes in 1982, and found that only 13.2 percent of them were using microcomputers, although about one-third planned to buy one or more during the next 2 years.[16] Most of those that had computers were using them for word processing and financial management.

Of the more than 19,000 U.S. municipalities, over three-quarters have populations of less than 6,000. These small towns or villages usually provide the same basic services as larger cities—utilities, fire and police protection, recreation, taxing functions, usually school systems, and often planning departments. In addition, they have many responsibilities under Federal programs, such as administering revenue sharing and block grants.[17] They too are trying to cut costs and increase productivity. In spite of this obvious need it appears that small local units, especially those in rural areas, are not rushing to computerize their offices .18

However, it is possible that the purchase of microcomputers by small governments has accelerated in the last 2 years beyond expectations. As late as 1982, lack of familiarity with computers was probably the major factor impeding their purchase by small cities; until recently there were likely to be few computer vendors in small towns and this market was not being aggressively pursued. This may have changed considerably by 1985.

"Sellers, op. cit., p. 93.

[13]See Special Symposium on Microcomputers in Local Government, *A Public Administration Review,* vol. 44, No. 1, January-February 1944, especially James R. Grieseemer, "Microelectronics and Local Government: New Economies and New Opportunities, " p. 57.

[14]"C-TAC Survey Reveals Members' Information-Handling Resources, " *Public Technology,* vol. 5, No. 11, November 1983. The 1984 data was reported in Joey P. George, "Who Does the Buying?" *Government Data Systems,* August-September 1985.

[15]State of South Carolina, *The South Carolina Local Government Survey of the Use of Computer and Communications Technology,* prepared by the Institute of Information Management, Technology, and Policy, University of South Carolina, 1983.

"Donald F. Norris and Vincent J. Webb, *Microcomputers: Baseline Data Report* (Washington, DC: International City Managers Association, July 1983), as reported in Donald F. Norris, "Computers and Small Local Governments, " *Public Administration Review,* vol. 44, No. 1, January-February 1984, pp. 7off.

"Sellers, op. cit., p. 91.

'"Another survey in 1982 looked at cities and counties in seven Mountain and Plains States. Of 75 cities with populations of 2,500 to 50,000, 68 percent were using computers; of 75 counties under 100,000, 36 percent. Smaller communities were less likely to have computers than larger ones—41 percent of those with 5,000 or fewer people compared to 76 percent of those with more than 10,000 people. Those with city managers were much more likely to have computers than those with mayor/council governments, and metropolitan counties were more likely than rural counties to use them. About one-third of those who were already using computers, but only 16 percent of the nonusers, planned to buy more in the next 2 years. Over three-quarters of those that were using computers had a minicomputer or "bookkeeping system' and only 22 percent had microcomputers (7 percent of all the cities surveyed). Most were using their computer system for payroll and accounting, budgeting, and utility bills. Ninety percent had only one computer, and only 1 percent had as many as four. Norris, op. cit., 1984.

PERSPECTIVES ON THE EFFECTS OF PUBLIC OFFICE AUTOMATION

Early commentaries on State and local government use of computers tended to be theoretical rather than empirical, and often took one of three basic perspectives:[19]

●Information technology will rationalize not only operating procedures but the political/policy process.
●Adoption of information technology will be driven partly by "the technological imperative" and partly by the self-seeking actions of a technical elite, uncontrolled by humane values and unresponsive to public attitudes.
   Information technology is no different from other technology and other kinds of information resources, and will have no unique or discernible effects on government.

The first of these perspectives tended to be found in public administration literature, while the second tended to come from political scientists, perhaps reflecting the different relative values that the two disciplines place on efficiency and responsiveness.

Enthusiasts often saw automation as a way of achieving the goals of the old reform movement, and claimed that technology would increase productivity, cut costs, improve decisionmaking, allow better management control of operations, improve job satisfaction, and allow streamlined governments to offer more and better services. Critics feared that it would lessen the responsiveness of bureaucrats to citizens, put a technological elite in charge of the local political process, shift power from elected representatives to hired managers, deskill jobs, and greatly increase the costs of government.

The Effects of Local Government Automation

Some local governments were indeed taken aback by the costs of office automation because they had not anticipated that the life-cycle costs of the equipment, with the sup-

port and training required, would so far exceed investment costs. The first phase of computerization, at least, may not have reduced labor costs but rather stimulated the hiring of clerks because it required input of massive amounts of data.[20] There were widespread expectations of a shortage of trained personnel in local government .[21]

Other effects were mixed but generally favorable. In some jurisdictions administrative control was improved, and workers reported increased job satisfaction. There are indications in many cities that office automation tends to reinforce, rather than change, existing patterns of bureaucratic and political power.[22] Some social scientists make this point more strongly, concluding that computerization of local government has benefited those who already have broad power and control in the local hierarchy. They usually argue that

"K. I.. Kraemer, J.N. Danziger, and J.L. King, "Local Government and Information Technology in the United States, *Local Government and Information Technology>*, Informatics Studies No. 12, OECD, Paris, 1978.

-'J. L. King, "Local Government Use of Information Technology: The Next Decade, *Public Administration Review*, vol. 42, No. 1, January-February 1982, p. 31.

--For example, a study of 42 cities from 1975 to 1979 found evidence for improved administrative control and operating performance, especially where computers were used for routine tasks, for example, tax recordkeeping and traffic-ticket processing. In applications, such as support of police detect ives' investigations or planning and policy analysis, the results were mixed or marginal, or the evidence was ambiguous. P: ffects on job satisfaction and the office work environment were said to be beneficial; the researchers said that this was often an unplanned, unanticipated benefit.

The same survey concluded that there was some evidence that office automation reinforced existing pat terns of bureaucratic power rather than changing them. I n most cases, a trend toward centralized, professionalized management in local government seemed to be strengthened as a result of automation. The perspective of the research group in this case was clearly that of public administrators who placed high value on rationalizing government activities. They found that the most successful implementations of automation were "alwa~rs linked with the most advanced and sophisticated technology and a highly professionalized work force; the sociotechnical approach, emphasizing "user-friendly" equipment, human relationships, and worker involvement in planning and decisionmaking, often worked best from the perspective of individuals, but at the cost of some sacrifice of efficiency.'*Evaluation of Information Technology in Local Governments, 1975-1979. a survey by the urban information systems research group of the Public Policy Research Organization, reported in Kraemer. et al.. op. cit., pp. 27ff.

'Danziger. op. cit.

there is a need for explicit democratization of government computer strategies.[23]

Local governments collect and use information for two broad categories of activity—management of routine government operations, and planning and analysis.[24] Most of the information systems and applications in use are for operational purposes-management of government revenues, payrolls, etc. But local governments must collect and use information for scores of activities; two middle-size cities, in 1980, identified over 300 distinct operational information systems (not all then computerized).[25] This operational data, in summarized or aggregated form, is also useful for planning and management, especially status reporting, performance analysis, and compliance analysis.

Computer programs and models have been developed for these purposes, including, for example, fiscal impact analysis, land use, transportation analysis, urban development planning, and expenditure forecasting models. Many of these are in the public domain and others are readily and inexpensively available; but relatively few governments have used them, and these are primarily the larger municipalities. It maybe that most local government organizations do not yet have the expertise required to use these tools, but it may also be that modeling does not fit the informal, pragmatic, personalized mode of decisionmaking characteristic of government close to the grass roots of democratic government.[26]

There are many examples of local governments using information and communications technologies in innovative ways that can be copied and adapted by other communities. For example, Jacksonville, FL, is using electronic printing and a local-area network to keep its city ordinances up to date. Amendments passed by the city council are immediately incorporated in the code, and supplements are printed four to six times yearly, whereas formerly the one supplement per year required 6 months and up to $50,000 to prepare. The Office of General Counsel reports that it has reduced costs by "eliminating the need for a large staff of editorial lawyers, printers, typesetters and other personnel. " Boston has required its licensee for cable television to link with a coaxial cable network all public buildings, including municipal offices, schools, and fire and police buildings. The system provides electronic mail, and the city's 29 word processor systems will be part of the network. During the last municipal election a direct link was setup between the ballot counting at City Hall and local television and newspaper offices.[27]

San Diego developed a computer-based planning and management system to determine the most cost effective location for the city's service units in order to reduce travel to and from work sites. By reassigning crews and equipment among existing stations the city will realize an immediate net cost saving of over $445,000.[28] Fort Collins, CO, installed an automated information system for use by police officers that allowed it to eliminate one position in the Records Department, freed room for three additional workstations, and increased the reliability and integrity of criminal justice information.

The effect of the advent of personal computers in local government offices, even if it is now occurring more rapidly than was ex-

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"James N. Danziger (University of California-Irvine), *Computers and Politics: High Technology in American Local Governments (New* York: Columbia University Press, November 1981).

"This analysis draws heavily on the conceptual framework provided by King and Kraemer, op. cit., see especially pp. 106-110.

"King and Kraemer, op. cit., p. 107.

"An analysis by Professors King and Kraemer of the University of California-Irvine concludes that in terms of producing improvements in performance, most attempts to use these models for planning and management have been "practical failures, " because of several problems:
- Information collected for operational use is generally not aggregated at the appropriate level for, or organized for, planning and management purposes. Local governments collect relatively little data appropriate for assessment of output.
- Models must be fitted to the expected analyses, and this level of analytical competence is not always readily available.
- Behavioral and political constraints:
  –Data useful for performance and compliance analysis often depends on self-evaluation by government officials and this affects their behavior in collecting/reporting the

data–especially if it is to be used to evaluate performance.
  –The assumptions used in constructing models may be unrealistic in a specific situation and location, given the diversity among American communities.
  —Models tend to be used to rationalize or defend decisions already made for political or other reasons rather than to help make decisions.
(King and Kraemer, op. cit., p. 108.)

'-Reported in "The Government Office, ' *Office Administration and Automation,* September 1984.

"Information provided by Public Technology, Inc., to OTA from a list of PTI computer-technology award winners, November 1984.

pected in 1982, will not be apparent for some time, especially since they are likely to come into use without systematic planning, at a very uneven rate, and in many governments with little attention at the highest level of management.

EXAMPLES OF OFFICE AUTOMATION IN STATE AND LOCAL GOVERNMENT

In the absence of a large body of cross-jurisdictional comparisons, some brief case histories are presented as illustrative of what is taking place in government offices. They are not necessarily "typical," but they provide a picture of some of the possible outcomes of office automation for States and municipalities.

The State of South Carolina

South Carolina falls about midway among the 50 States in size (it ranked 24th in terms of population, in 1980) and in government revenue per capita (38th in 1980). Like other States, South Carolina began to acquire computer systems during the 1960s and 1970s. In 1981, South Carolina was spending as much as 6 percent of its operating budget for telecommunications, data processing, and office automation, but without any systematic plan, strategy, or control over these expenditures .29 In buying equipment or services for data processing some State agencies had underestimated the costs by as much as 50 percent. In a decade, expenditures for managing data had more than tripled; and outlays for telecommunications in 1980 were 38 times greater than in 1960.[30]

The Governor, the State Budget and Control Board, and leaders of the State legislature agreed that something must be done. The time was right since the legislature was then working on a new Model Procurement Code. The consensus across branches of government was important, because power in this State government is particularly fragmented and diffuse. The heads of major State agencies are elected separately rather than appointed by the Governor, and therefore tend to have their own unique relationships with legislators as well as their own constituencies. The Governor consequently must often depend on powers of persuasion to initiate any change within the State bureaucracy.

With a powerful consensus among State leaders that some way must be found to cut the burgeoning costs of information management, it was possible to take action. The State administration began efforts to develop a comprehensive information resources management strategy. Key officials throughout government were interviewed, and State agencies were asked to develop productivity objectives. On this basis a preliminary State Plan on Technology was developed, and later a Master Plan. Agencies were asked to prepare their own 3-year plans for use of information technologies.

The Department of General Services was reorganized to create a new Director of Information Resource Management and a division by that name (DIRM) under the Budget and Control Board. Another important step was

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- 'This section relies heavily on work done for agencies of the State (especially the Division of Information Resource Management of the State Budget and Control Board) by Donald A. Marchand, John C. Kresslein, and others at the Institute of Information Management, Technology and Policy, College of Business Administration, University of South Carolina. Reports, to be referenced at points in this section as "South Carolina (number), " include:

1. *Information Resource Management: A Statewide Strategy*, April 1983.
2. *The South Carolina Local Government Survey of the Use of Computer and Communications Technology,* November 1983.
3. *Implementing Information Resource Management in State Government: The South Carolina Experience,* Research Report RR-84 -1(K-84-8), May 1984.
4. *Personal Computers in State Government,* May 1984.
5. *A Manager's Guide for Implementing Information Resource ,Slanagement(IRM) in a State Agency,*June 1984.
6. *Office Automation in the Office of the Governor,*January 1985.
7. *Initial Evaluation of Productivity Benefits Achieved From SOAPS,* Progress Report No. 2, July 1983.

However, neither specific State agencies, the Institute, the university, or the authors cited abet'e are responsible for the interpretation and analysis in this section, which is solely that of OTA analysts.

South Carolina (5), p. 5.

the creation of a new series of personnel classifications under the title Information Resource Management, to encourage the appointment of such specialists in each agency.

The State Plan, as it developed, encompassed office automation, telecommunications, and large-scale data processing technology. The backbone of the planned technology is to be a statewide microwave network for voice, data, and video transmission. (See figure 10-1.) This network, which is planned for completion in 1986, will cost an estimated $16 million, but is projected to save the State $100 million over the next 20 years. The State "did not set out initially to establish its own communication system, " university consultants say, "but sought instead the most cost-effective alternative with the goal of controlling communication costs. "[31] The planners sought and got bids from 25 private industry vendors but none could provide what was wanted.

Another aspect of the State Plan was a systematic approach to office automation (meaning, in the beginning, large-scale computer applications). An 18-month pilot project was begun in August 1981. Task forces and study groups were formed to consider procurement and standards, ergonomic issues, training needs, user perceptions, and contingency planning and security needs. The major objectives in office automation were:

- automation of formerly manual tasks to reduce manpower requirements,
- direct time-saving applications and work redistribution to reduce time and manpower requirements,
- time-saving applications providing opportunity to do additional work, and
- quality improvements in office products.

The first pilot project was purchase of three IBM 8100s and 100 peripherals for the Department of General Services in mid-1982. In the following year further advanced data processing applications were installed, and technical assistance was given to other State agencies. The Model Procurement Code passed by

the legislature in 1981 provided strong induce ments for agencies to comply with standards formulated by the Department of General Services' new DIRM. DIRM must oversee any procurement of over $2,500. The State would coordinate long-term contracts under which agencies would receive a significant discount on computer-related purchases. Office automation standards were developed in 1982 and subsequently revised.

By September 1983, an electronic network linked the Governor's Office with nine critical agencies within the State House Complex— the office of the Executive Director of the State Budget and Control Board, the Health and Human Services Finance Commission, the Department of Agriculture, the Division of Human Resources Management, the Department of Social Services, the Office of the Secretary of State, the Department of Insurance, the Division of General Services, and the Division of Information Resource Management.

For automating the Governor's Office two minicomputers were linked to host computers at DIRM and the University of South Carolina; there are 22 workstations, 3 data processing terminals, 7 letter-quality printers, a line printer, and a data processing printer. A recent assessment concluded that the result was a 53 percent cumulative time saving in actual time to complete all tasks studied (approximately one-half person year), with an average time saving per task of 5.3 percent or approximately 112 person hours per year.[32] The improvement in time to complete each task was estimated to be about 86.5 percent. Three tasks that were done externally are now done internally (answering employment application letters, approximately 10 per day; preparing proclamations; preparing 200 news release envelopes, about twice each week) with an improvement in turnaround time of about 94 percent. Nine of twelve typewriters have been relinquished for redistribution to other offices.

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[31]**South** Carolina (4), p. 15.

[32]**South** Carolina (6). The specific tasks studied were property management certification, grant report, audit report, grant award letters and forms, consolidated vouchers (math calculations), updating office personnel lists, preparing governor's schedule, repetitive letters, commission letters, educational statistical report.

Figure 10-1.—An Example of a Statewide Integrated Communication Network for South Carolina
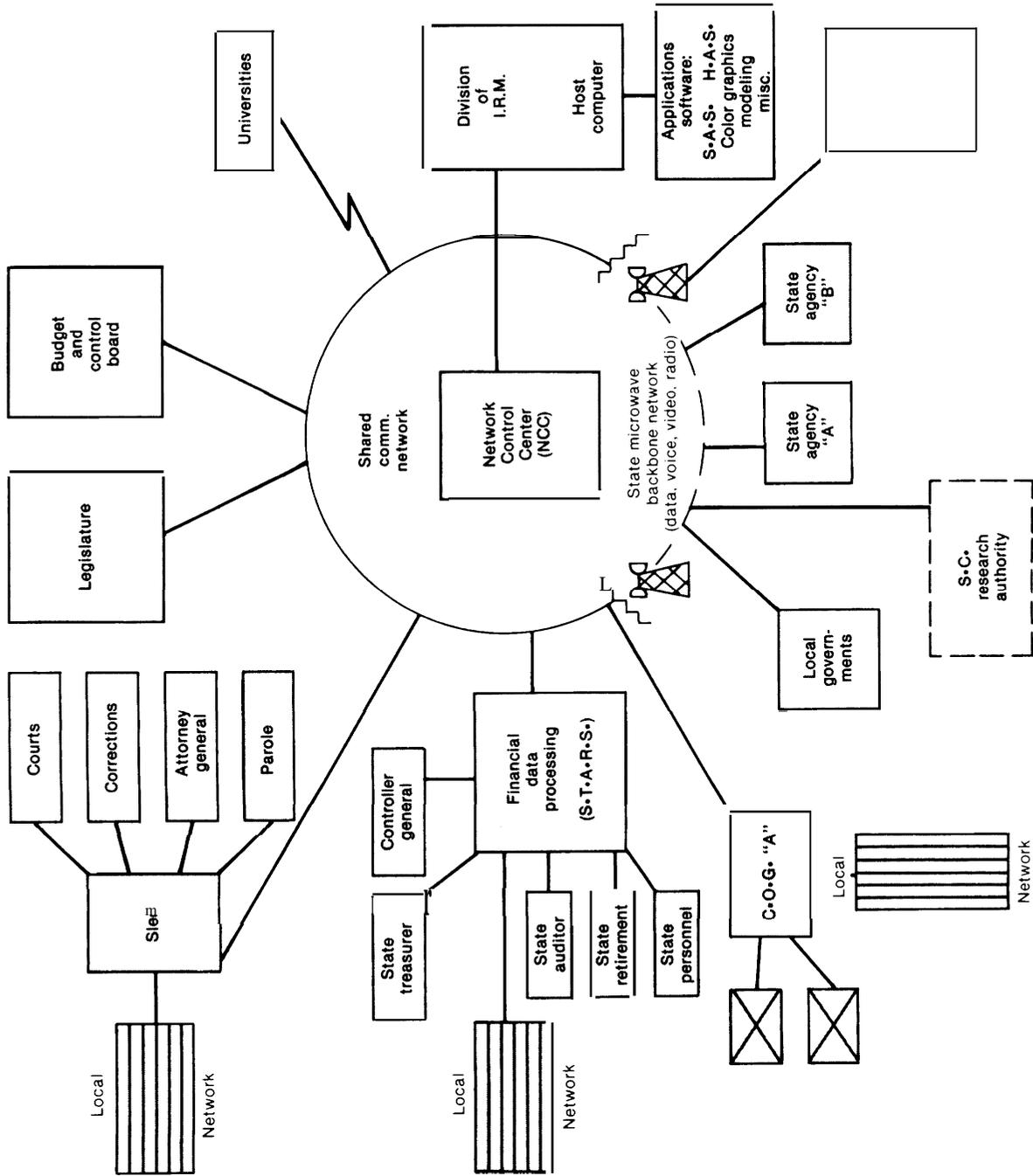
More qualitatively, the assessment found that the successful adoption of the Governor's Education Improvement Act in 1984 was "partially achieved through the efficient and effective use of the office automation capabilities" that were used for creating the text, completing 100 major revisions, preparing the related speech by the Governor with 18 major revisions, and performing mass mailings to constituents, related to the act. The Governor's Executive Assistant was quoted as saying that without office automation capabilities the act would not have been adopted in that fiscal year, or would have contained a lesser program content. The assessment concluded that:

> . . . (0)ffice automation is indeed initially more costly than conventional or semiautomated techniques. It also is extremely difficult to precisely measure the quantitative productivity improvements and equally as difficult . . . to determine the return on investment . . . However, . . . (automation resulted) in the capability to produce and distribute information faster and more accurately and to make more accurate and timely decisions . . . Indeed, the. . . technologies helped improve the level of service and the relationship of the Office of the Governor to the citizens of this State.[33]

The Legislative Services Group also automated (with 200 word processing terminals connected to a mainframe) and terminals were put in the offices of legislators. Through the system, legislators can access and track bills and amendments and search the State Code of Laws. Word processing, data processing, key-word search, and calendaring are also provided.

Automating State offices was not accomplished without significant problems. Those identified at an early stage of the process were those found in nearly every large organization –functions beyond word processing tended to be underused because people had not been taught how to use them; there was sometimes a mismatch between capabilities provided and those needed; and distribution of terminals was sometimes not appropriate so that people queued to use them in some places while other terminals were idle. But four-fifths of the clerical staff and over half of managers and professionals said that the new systems had improved not only their productivity but their attitudes toward their work.[34]

By 1983 it was clear that personal computers were rapidly being added to State offices. Their prices often fell below the threshold at which there is central oversight. There was concern about the potential lack of compliance with office automation standards, which could cause compatibility problems later, yet the flexibility that PCs offer pointed them to becoming the "primary office automation workstation, " university consultants said.[35]

A survey of 10 agencies in early 1984 showed at least 500 microcomputers in use, and that number was likely to double during fiscal year 1985. The Comptroller General's Office was using two personal computers to design a financial reporting system to be used by small State agencies.[3'] Several agencies reported that there was a high demand for personal computers, and staff members were dissatisfied and frustrated by the necessity for sharing them. No local area networks (LANS) were yet in place in these agencies and use of shared hard disks was just beginning. But the two State universities were planning campus-wide networks and four of the agencies were interested in developing them.

The State now requires personal computers to be bought under a term contract, so that all agencies enjoy the volume discount and **guarantees** of support negotiated by the State. It is officially anticipated that by the end of the 1980s there may be **one** microcomputer for every State **white-collar** worker. DIRM has purchased software packages for PCs that pro vide 'English-language-like query capability' and facilitate the downloading of data from mainframes **to** PCs. PCs and mainframes will be linked using leased or dial-up lines to allow

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'South Carolina (6), p. 2.

"South Carolina (7).
"South Carolina (7), p. 26.
"South Carolina (4).

end-users controlled, preauthorized access to central government databases.

Several State agencies and institutions (e.g., the Department of Mental Retardation, the Tax Commission, a State technical college, and the State university medical school) are systematically developing their own long-range, information-resource management plans.

Throughout the process of automating government offices, this State government has used university experts to monitor and report on progress and problems in achieving its stated objectives. A broader assessment from the perspective of effects on delivery of government services, governmental responsiveness to citizens, and on the locus and exercise of governmental power is to be undertaken but is not now available.

New York City

The Mayor's Office of Operations in New York City cooperated with OTA in studying the effects of public sector office automation by encouraging and facilitating a case study by The Labor Institute of automation in three municipal departments—the Department of Finance, the Department of General Services, and the Human Resources Administration. [37]

New York City has for several years been under intense pressure to reduce government operating costs and increase revenues. Major reorganizations aimed at increasing productivity took place in city government departments both before and during office automation. The case study focused on the consequences of automation for the clerical, managerial, and professional work force, and on their perceptions of how it affected both them and the services that they deliver to the public.

Many of the workers who contributed their insights to this study said that in spite of some early misgivings, they like office automation. However, there is at the same time a high level

of dissatisfaction. Some—both clericals and professionals-felt that their jobs had been degraded, and their own interest in the job eroded.

Most said that their own productivity had increased; and some said that the quality, quantity, and timeliness of services delivered by their work units had improved. But in other cases, services have been depersonalized, standardized, and routinized; accountability of individuals, if not of the government as a whole, has been decreased.

The clerical workers in the three departments are group clerks, office aides, office associates, technical support aides, and word processor operators. The clerical work that has been automated was all done manually until 1982, but now requires personal computers, word processors, Automated Forms Systems, and other systems.[38] For example, at the Bureau of Child Support (in HRA) a clerical work unit formerly typed between 400 and 600 letters each week. Now a clerk enters a code to select forms to be sent to a client from nine forms that are generated by an automated system. Clerks at the Income Maintenance Center once hunted for paper files on particular clients as they were needed by eligibility specialists; now the files are called up on a cathode ray tube (CRT) and the needed data is printed out. personal computers are used in the Real Property Transfer Tax Unit of the Department of Finance to call up information on property sales history and determine the market value of property. Word processors are used for tax billing, as well as for generating reports, mailings, memoranda, and other documents in all of the departments. In one department the most proficient typists were removed from their old work units and placed in a central production unit.

Effects of Office Automation on the Public Sector Workforce: A Case Study of New York City, done under an OTA contract by The Labor Institute (New York): Joan Greenbaum, principal investigator, with Cydney Pullman and Sharon Szyzmanski, February 1985.

"Twenty-eight clerical workers took part in workshops and group interviews for this case study. They are predominantly women, and predominantly black and Hispanic. host have completed high school and a few have completed college; they have worked for the city from 2 to 10 years, and have been using computerized office systems for at least a year. The clerical workers spent most of their 7-hour workdays using the systems, and usually have two 20-minute breaks, in addition to 1 hour for lunch.

One goal of city government is reduction of the clerical work force and this has been occurring. Managers report that the objective is to reduce the clerical work force about 15 to 20 percent through attrition. The effects of office automation cannot always be clearly separated from the effects of reorganization that either preceded or accompanied it, but much of that reorganization was itself for the purpose of making better use of the new technology. One work unit manager reported that the automated systems have already resulted in a 15 to 20 percent reduction in clerical staff over 3 years.

Clerical workers said that when automation began, they were fearful of losing their jobs and afraid that they could not learn the new systems. Minimal formal training was provided by vendors. Most of the workers learned from coworkers, and then taught others. Now the workers generally approve of the automation, saying that it freed them from tedious manual work and allowed them to learn new skills, and that they can now produce better quality work, at a faster rate. They also say, however, that they still need more and better training and that they are not being adequately compensated for what they perceive as their newly learned and higher level skills.

Because the new systems can handle a larger volume of work in a shorter period of time, most of the workers work more steadily and take fewer breaks.[39] Those doing data entry in many cases say that their control over their work has decreased because it is paced by the machine. However, those in one kind of decentralized word processing pool ("clusters' now have relatively more variety in what they are keyboarding and also have to prioritize it, so that they feel they have more control over their work.[40]

[39]Their union, AFSCME, has negotiated two 20-minute breaks for VDT users in some work units, but the workers say that they do not always take them because they are too busy. Some, however, say that they take informal breaks when necessary to relieve eyestrain and back discomfort.

[40]In two word processing units, one a pool and one a cluster, some similar effects were found, including rotation of jobs and prioritization of work; but for different reasons. The cluster is a smaller unit where management encourages worker involvement in everything from selecting equipment to organizing the work. In the word processing pool the increased control that the workers have is due to a virtual lack of supervision. As a result, workers must work as a team to coordinate and organize the unit's work.

Most of the New York City clerical workers say that even though they like the new systems, they also suffer from increased stress. They report increased eyestrain, backaches, and headaches. Many of the new systems have been installed in old offices with unsuitable furniture and lighting, and poor ventilation; excessive noise from printers, and wires or cables stretched haphazardly around the floor, add to the risks to health and comfort.

Almost all of the clerical workers do more work than before automation. Some say that they now have a better understanding of "the whole picture, " that is, what the agency does and how. The sharing of information and cooperative learning that has occurred has generally increased the interaction between coworkers. But frequently this interaction is forced; it is an attempt to overcome problems caused by lack of supervisory coordination, lack of formal training, and problems with the equipment. The only way that work gets done is by the workers going into a huddle and finding some way to get around the problem. The workers overwhelmingly say that they have more interest in their work now, although as they fully master the new process some anticipate that it will become boring.

In New York's city government, paraprofessionals, who have less formal training than professionals, can perform some of the work of professionals and assist them in other tasks. Some paraprofessionals are now using computers and related devices, although usually less intensively than the clerical workers. Typically, they may review computerized files or scan data for 2 or 3 hours a day interspersed with other duties and activities.[41] For example, in the Bureau of Child Support (HRA) preassignment investigators are now reviewing forms, generated by computers, to track down information about absent parents who are evading child support payments. In the Income Maintenance Office (also HRA) eligibility specialists use computers to review client

[41]Nine paraprofessionals participated or were interviewed for this case study, They were predominantly black and Hispanic women between the ages of 30 and 50, all high-school graduates, most with some college training, They had worked for the city from 5 to more than 15 years and are now using automated data-entry and or data-retrieval systems in their work.

files for recertification of public assistance eligibility.

The eligibility specialists also have extensive direct contact with clients by telephone; they help them with emergencies such as evictions, fires, or illness. These paraprofessionals rate the work they do with computers for about 10 hours a week as the most satisfactory of their tasks. They report that their productivity has increased and the quality of the output improved after automation. The workload has also increased; because more information is available they are now required to submit more reports, and their deadlines are tighter. Although many feel that they have a better sense of "the whole picture" and more control over their work, many feel that they are overworked, undercompensated, and that the quality of services delivery has not necessarily improved.

The preassignment investigators in the Bureau of Child Support also rate their reviewing of files by computer as the most satisfying of their tasks. They have almost no direct contact with clients, using forms almost exclusively in processing cases. But while they find reviewing these forms more satisfying than their other major task of sending out form letters, automation has not, in their opinion, improved the quality of the services.

The paraprofessional workers also complain of eyestrain, backpain, and headaches, even though they spend much less time in front of CRTs than do the clerical workers."

Professionals in these three city departments vary widely in the extent to which they use computers or other forms of office automation, but their jobs have also been strongly affected." For example, in the Department of General Services, analysts in the Commissioner's Office of Management and Analysis use Wang VS terminals or IBMs linked to a

mainframe computer for data input or inquiry, or word processing. Tax auditors in the Tax Examinations Unit use IBM PCs for data inquiry and input, and caseworkers in the Bureau of Child Support use IV Phase terminals for similar purposes.

Before automation, tax auditors in the Real Property Transfer Tax unit handled all aspects of a tax audit. Particular cases and case followup were assigned to one auditor. As automation is being introduced, this unit, with a staff of seven, is being merged into the much larger Examinations Unit, which now handles eight kinds of municipal taxes. This represents the beginning of a larger reorganization in which all tax auditors in the unit will be trained to handle all eight types of taxes. Auditors acknowledge that the computer generates more information, quicker, and thus provides more control over the status of each case. Yet the auditors are dissatisfied with the overall process. With the reorganization of the work unit, the tax audit procedure has become fragmented and more clericalized. Some of the auditors are frustrated with what they perceive as a decreasing need for their professional training and judgment.

Analysts in the Office of Management Planning and Analysis say that the improved quantity, quality, and accessibility of data has resulted in improved services from their office. Unlike other employees participating in the case study they do not see an increase in work because of computers. Rather, the computers have changed their perceptions of their jobs. The expansion in the amount, speed, and wider range of reliable information has given the analysts more varied and creative possibilities for solving problems. They feel that their influence has increased as they go beyond identifying problems and become more involved in working out solutions.

But caseworkers in the Bureau of Child support think that the services provided by their unit have definitely not been improved by Automated Forms Service. Some of their clients, they report, ignore all standardized forms, others are intimidated by computerized forms and will not respond to them. The caseworkers say that the data fed into the sys-

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'-Seven of the nine paraprofessionals who contributed directly to this case study have had to get stronger eyeglass prescriptions since they began using a VDT.

"Fifteen professionals participated in workshops and interviews. They included 9 men and 6 women (80 percent were white), and their ages ranged from 20 to 40, with the average in the mid-20s. All have college degrees and the majority some graduate-school training. A few have worked for the city more than 15 years, but most less than 4 years.

tern is often inaccurate, and that, thanks to automation, errors are not caught until late in the progress of a case, which must then be held up until the errors can be corrected. Also the system has generated increasing numbers of small procedures that not only increase the amount of work but also the chance for errors.

These caseworkers, before the automated forms service was adopted, wrote or typed numerous letters. They no longer perform such clerical duties,[44] but paradoxically their position is being deprofessionalized. Since they are no longer solely responsible for deciding what letters to send out, their control over a case throughout its history is not as complete. Their job title is being changed from "caseworker" to "eligibility specialist. " A college degree is no longer required, and the new job title does not have the range of possible grade levels that went with the old title, so that opportunities for promotion are decreased. This job degradation was not caused by office automation, but office automation was used to foster an ongoing process.

The professionals as a group have mixed perceptions about other effects of automation on their work. They generally report that interactions with coworkers increased, with sharing of ideas about uses of the systems. They continue to pace their own work to suit themselves and the needs of a particular project, as professionals generally can. Some report an increase in "petty" supervision, apparently because supervisors can review more drafts of reports and more easily ask for changes. Some see the increased use of data (because more is available) as an increase in their workload, while others perceive this in terms of more options for solving problems. Most think that their ability to perceive "the whole picture" of their agency's work is enhanced; yet some say this is marred by increased uncertainty as to the long-range effects of computerization on government.

Both caseworkers and auditors, however, feel that they have lost some control over their work, because it has been fragmented. Caseworkers, by being relieved of clerical aspects of their work have also been relieved of knowledge about its progress and outcome. Crucial steps are taken by other people who do not know the whole story. Auditors do not always complete an audit they have initiated, as it may be passed on to others. Both the caseworkers and these auditors say that their overall job interest has decreased.

Managers, those top-level administrators who set broad policies and exercise overall responsibility for their execution, have also been affected by office automation, although they may or may not use any microelectronic devices themselves.[45] Some of the top-level managers in these departments use word processors for memos, notes, drafting materials, etc. Some use electronic mail and messaging. Most also use database inquiry from time to time; a few reported using spreadsheeting, graphics, list files, and typesetting functions. These managers used a computer from 2 or 3 hours a week to as many as 15 hours. Mostly they had learned by watching others use the systems, but a few had taken courses.

Buying microcomputers for managers to use was said to be much harder to justify "to the city" than buying large systems for clerical use. Most of the purchases were approved on an experimental basis. But all of the managers said that computers increased the speed and improved the quality of their work, and allowed them to do new kinds of work. Almost all also said that computers increase the amount of work to be done.

The managers, however, were more concerned about the effect of office automation on their departments than on their own work habits. Some were eager to use office automation to reduce the work force and their operat-

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[44]Their work was rationalized and restructured to relieve them of some of the paperwork, prior to automation. The clerical workers who took over the paper work became overloaded, and Automated Forms Service was brought in to relieve this problem.

[45]Seven managers were interviewed in-depth; they include a department commissioner, an assistant commissioner, a deputy general counsel, and the directors of four major offices within departments. They included 4 men and 3 women, between the ages of 28 and 50, who have worked for the city between 1 and 15 years. Their own use of computers varied from ''none, to working (at home) for several years on a computer.

ing costs. Others felt that the combination of civil service rules and union resistance would keep that from happening in the near future, but that other changes set in motion by automation would nevertheless have major impacts on the delivery of government services. Said the Commissioner of a large municipal department:

Since the city civil service ensures that jobs and people stay, I feel that this offers us room to experiment with using computer tools for new uses. I see the line between clerical and managerial workers blending. A clerical worker is not just a clerk and a manager is not just a manager.

UNANSWERED QUESTIONS ABOUT INFORMATION TECHNOLOGY AND GOVERNANCE

In all public sector offices, office automation is increasingly tied to and part of larger information systems, and the effects on quality of governance must be considered as a whole. In State and local governments this is particularly important because this is the level of government most likely to impact directly on individuals and households on a daily basis. To the extent that this assessment has considered public sector offices, it has been directed almost entirely to the effects of office automation on government itself, its productivity, effectiveness, and efficiency. There has been only peripheral attention to the ultimate effects on the constituents and clients of government offices.

A study of 42 cities, in the first phase of office automation from 1975 to 1979, found improved administrative control and operating performance, increased job satisfaction, and improvements in the offices as working environments.[46] The survey also produced evidence that office automation reinforced existing patterns of bureaucratic power, and in most cases, this meant a trend toward centralized, professionalized management at the expense of the power of elected officials. This was one of very few cross-jurisdictional studies and also one of even fewer that looked at effects on power relationships within government.

To date, the sparse and fragmented literature on government office automation and on the broader topic of government information systems, and the case studies reviewed above, suggest some further questions that should be thoroughly studied. If information and communication technologies can, as now appears highly probable, increase the efficiency of State and local governments and decrease their operating costs, what can be done to help the citizens of small as well as large governmental units enjoy these benefits? How can office automation be implemented and managed so that it improves, rather than degrades, the work life of civil servants and thus attracts to government service capable and dedicated people? Can office automation improve the effectiveness and responsiveness of government, as well as its efficiency?

Several aspects of governance on which office automation has a direct bearing were beyond the scope of this assessment, but are particularly worth further consideration. One is the ability of governments to gather essential information needed to carry out their responsibilities effectively. A second is the ability of citizens to know and understand what their governments are doing—i.e., access to information. A third is the ability of citizens to withhold some personal information from government—i.e., civil liberties. Finally, there are questions about how information technologies affect the nature and the equitable distribution of government services.

[46] Evaluation of Information Technology in Local Governments,1975- 1979, a survey of the urban information systems research group of the Public Policy Research Organization, reported in Kraemer, et al,, op. cit.,pp. 27ff.

This assessment, although it did not address the question directly, nevertheless indicates that office automation can improve the quality as well as the quantity of information available to government decisionmakers and planners. It can also make it easier for the representative branches of governments to exercise oversight over executive agencies, and for all branches of government to increase their analytical and planning capabilities.

However, all improvements in the ability of government to gather, integrate, and use information also increase the danger that this information can be misused. Questions of confidentiality and civil liberties arise at the local and State level as well as at the National level.

Office automation could also be used to allow government offices to be more effective and efficient in responding positively to requests for information about government activities. The prevailing Federal policy of information resources management, which is now being adopted by many States, is based on the principle that information is an economic resource and is to be managed accordingly. In itself this principle is not hostile to the objective of increased public access to information, but it does not necessarily include that objective. Some States are, however, making concerted and systematic attempts to give the public access to government information by means of public information systems. They are confronting technological, economic, and legal problems in doing so, and have so far had mixed results.

There are disturbing hints, although as yet only hints, that government office automation can change the nature of government services in ways that are not completely desirable. For example, it may standardize and depersonalize the way in which some services are delivered. To the extent that depersonalization or standardization reduces the likelihood of discrimination, favoritism, arbitrariness, or corruption, it is good. To the extent that it makes government less humane, less sensitive to individual needs, and particularly to the needs of the handicapped, the poor, and the ignorant, it is not good. To the extent that it results in people and their personal needs and problems being regarded as interchangeable, manipulable statistics, it is a deterioration in civil life.

These questions, as already noted go beyond the scope of this assessment. Some of them, especially those related to citizens' access to public information and to the protection of privacy, security, and civil liberties, will be addressed in a forthcoming OTA assessment of government information systems. All of these questions should however be the subject of serious scrutiny by citizens, scholars, and decisionmakers at State and local levels.