



UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

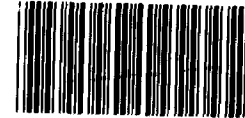
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ACCOUNTING AND FINANCIAL
MANAGEMENT DIVISION

B-210716

MARCH 8, 1983

The Honorable David A. Stockman
Director, Office of Management
and Budget



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Dear Mr. Stockman:

Subject: Small Computers in the Federal Government:
Management is Needed to Realize Potential and
Prevent Problems (GAO/AFMD-83-36)

We have issued several reports to the Congress on problems we observed while monitoring Federal agencies' performance in automatic data processing (ADP), particularly in the management of software--a high-cost area. On the basis of that work and current efforts, we have identified a rapidly evolving problem which relates to the acquisition and use of small computers by Federal agencies. (By the term "small computer," we refer to minicomputers and the smaller microcomputers.) The agencies' lack of planning and management has created a high potential for waste, duplication of effort, and general inefficient use of these resources.

Because of the explosive increase in the acquisition of small computers by the Federal Government and the projections that this trend will continue, we are providing this information, which is based on our preliminary work, to you now to allow appropriate action to be taken as quickly as possible.

TRENDS IN THE USE OF SMALL COMPUTERS

The acquisition of small computers in the Government is increasing faster than that of any other type of computer. Research firms estimate the number of small computers in Federal agencies could reach a million units within the next few years. The general market for small computers is expected to grow 25 percent each year. The value of units installed was estimated at more than \$5 billion in 1980 and may reach \$50 billion by 1990. Our work has shown that although Federal agencies are acquiring small computers in large numbers, they are doing little to deal with problems affecting the computers' economical and efficient use.

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MANAGEMENT ISSUES RELATING TO THE USE
OF SMALL COMPUTERS

The advent of the small computer has introduced management issues that are much different from those associated with traditional data processing. The large centralized data systems, using common data bases which provide the same data to all interfacing systems, are very different from those on which users process their own locally developed applications from their own files. Ordinary users--who are not professional programmers--cannot be expected to do a good job of designing, coding, debugging, and documenting these systems. Also, when users go their own way without central control, potential exists for waste, duplication of effort, and software that cannot be interchanged without modification.

HOW USER AGENCIES ARE ADDRESSING
SMALL-COMPUTER ISSUES

Most agencies do not have enough control over the acquisition and use of small computers. The following conditions we have found indicate an unmanaged situation which can only worsen unless informed and systematic direction is introduced toward some predetermined agency goals.

- Little formal policy and guidance exist that relate to the unique aspects of justifying, acquiring, installing, and operating small computers. Such guidance is particularly needed for work with small computers because they are usually acquired and operated by individuals who do not have ADP skills.
- Agencies are not considering life-cycle costs when acquiring small computers. Past GAO reports have shown that software acquisition and maintenance costs are significantly higher than those of hardware. We noted examples where software costs reached 10 times those of hardware. We also noted indications that agencies fail to realize the significance of software costs. One agency's software cost was twice the amount it had anticipated. The labor used to write programs for small computers can quickly escalate the software costs to many times those of hardware, making the life-cycle costs of using small computers far greater than is indicated by hardware costs alone.
- The accuracy of the data on small computers is receiving little or no verification. Internal audit groups are not verifying the data processed on small computers even though it may be used in management, financial, or other crucial processes. Our reports have identified systems that produce erroneous information even though they were developed by professional ADP personnel. In the small-computer environment--where users with limited ADP skills often do the programming--the potential for using erroneous information is much greater.

- Some agencies do not know how many and what kind of small computers they have because they lack formal approval and accountability procedures. This indicates little effort on the part of many agencies to standardize hardware for compatibility among field sites. It prevents the sharing of common software and data files.
- Few agencies have software and documentation standards for small computers. This results in less portable software because it incorporates vendor-unique features and other local variations.
- Agencies do not know what applications are on their small computers. This contributes to redundancy in software development and shows loss of control over the information processing function.
- Agencies have not justified the cost of purchasing small computers, even where quantity purchases were made.
- Agencies have few procedures in effect to provide security and backup to prevent loss of critical data on small computers.
- Agencies do not know to what extent their small computers are being utilized. We found one example where an agency was in the process of procuring about \$7 million worth of minicomputers when the approximately 20 small computers it already had were being used at only about 15 percent capacity.
- Individual agencies are doing redundant studies of small-computer issues.
- Few formal software libraries have been established to facilitate software exchange between user organizations. In one example where a library did exist, inadequate procedures relating to identification codes, documentation, and required use hindered its effectiveness. We recently found an example where the same application was developed six times by different, decentralized organizations within the same agency.

HOW CENTRAL AGENCIES ARE ADDRESSING
SMALL-COMPUTER ISSUES

We discussed small-computer problems with officials of both the General Services Administration and the National Bureau of Standards. We found that the Bureau has published a bibliography of articles on small computers and plans to publish next year a summary of the experiences of selected organizations. Their efforts are directed primarily toward technical issues. According to General Services Administration officials, a policy statement from OMB to user agency senior ADP officials is needed to give them specific

guidance on how to manage small computers. They believe the Bureau of Standards could probably publish the results of product testing and should publish technical advisory guidance for agencies' use.

PRIVATE SECTOR CONCERNS

The private sector has also recognized problems in the management of small computers. Some of these concerns are typified by the following excerpts from a recent business publication:

"* * * spreading like wildfire * * * garbage in garbage out * * * only the person using the [personal] computer knows exactly what data and assumptions were used to generate a solution. * * * the information processed by personal computers can differ greatly from that in the corporate data bank because a manager gathers data that are never checked against corporate files. * * * if a small system is doing a critical program and only the manager who wrote the program knows how it works, the company could be in a serious position."

BROADER IMPLICATIONS OF SMALL-COMPUTER PROBLEMS

The problems we have cited to this point deal, for the most part, with individual deficiencies that affect cost effectiveness and efficiency in the short run. Some of the problems may have far-reaching implications for broader policy areas.

Future networking capability

One prediction is that private, switched digital networks will grow 500 percent over the next few years. Improved telecommunications technologies and more competitive communication rates make possible the interconnection of personal computers, word processors, and work stations. Interconnection seems to be the next level of technology--the new dimension in data processing. The desirability of computer architectures that would allow the sharing of data among all users is obvious. The hodgepodge of incompatible hardware in place as a result of the present approach to acquiring small computers will seriously impede agencies' ability to form such networks.

The Paperwork Reduction Act

In December 1980, the Congress enacted Public Law 96-511, The Paperwork Reduction Act. The act calls for designating a senior official within each agency to be responsible for carrying out the agency's information management activities in an efficient, effective, and economical manner. The concept of information resource management (IRM) is emerging in ADP organizations. Both the act and the IRM concept focus on centralizing the management of information activities. The act emphasizes the basic principle that senior

management oversight and control are needed to ensure that an agency efficiently, effectively, and economically uses its information resources and complies with Federal information policies, principles, standards, and guidelines. The act also stresses the importance of centrally managed information resources and comprehensive planning.

The decentralization of data processing through the use of small computers, with the lack of oversight, central planning, and control noted in our work, would appear to be moving agencies away from the direction intended by The Paperwork Reduction Act.

Reform 88

The White House has announced a long term plan that prominently features compatibility of all Government administrative computer and communication systems. A primary goal of the plan is to replace "the diverse and separate (agency computer) systems---with compatible components throughout the federal government." The project is expected to take about 6 years, until 1988; hence, the "Reform 88" designation. Deputy OMB Director Joseph Wright stated that the lack of central, compatible information systems adversely affects the Government's ability to adequately prevent waste, fraud, and abuse of programs.

The incompatibilities among hardware and software, the lack of central planning and oversight of acquisition, and the use of small computers will make implementation of the "Reform 88" concept increasingly difficult.

CONCERNS EXPRESSED BY SENIOR ADP OFFICIALS OF USER AGENCIES

In several interviews with senior ADP officials, we discussed both real and anticipated problems associated with their use of small computers. A summary of those concerns is:

- Protection of proprietary data and compliance with the Privacy Act.
- Ensuring that information maintained in private data bases is forwarded to upper management.
- Inaccurate data stemming from nonprofessional programming.
- Incompatibility of both hardware and software.
- Control of input and retrieval of data in data bases.
- Loss of agency data when programmers leave without providing documentation.
- Inability of nonprofessional users to diagnose problems.
- Power struggles between the central data processing organization and small-computer users.

- Inconsistencies between agency goals and user-perceived need for small computers.

Perceptions of actions needed

User agency officials to whom we spoke identified several needs:

- OMB policy is needed on the control of microcomputers by agency management and the relationship of other issues, including the Privacy Act, to small computers.
- Printed, "cookbook-type" guidance is badly needed so that agencies will not need to do so much investigation on their own. If possible, hardware and software products should be centrally tested and evaluated and the results published. Most agencies seemed to think the National Bureau of Standards should do this; several agencies indicated the General Services Administration could also fill this role.
- Negotiation by the General Services Administration of better prices (mentioned by several agencies).
- Augmentation of Federal standards for programming languages, file media, and other matters that are now vendor-unique (mentioned frequently).

CONCLUSIONS AND RECOMMENDATIONS

The use of small computers in the Government has advanced much faster than agencies' efforts to manage these resources. Existing guidance, directed toward large computers and centralized data processing, does not cover some of the unique aspects of the small-computer environment. Present conditions allow waste and inefficiency in the short run, and adversely affect broad policies and goals in the long run. Lack of planning and guidance at all levels has allowed uncoordinated and uncontrolled proliferation of small computers. Collectively, these constitute a large block of resources that need increased attention from data processing management.

We recommend that the Office of Management and Budget, working with the General Services Administration and the National Bureau of Standards in their respective areas of responsibility, formulate policy and issue guidance to Federal agencies to provide the framework for a more informed, controlled, and systematic approach to the justification, acquisition, installation, and operation of small computers.

We also recommend that the Director, OMB ask the Reform 88 staff to (1) specifically address the impact and implications of small low-cost computers, (2) report to him on how much and what kind of guidance is needed, and (3) make recommendations to him on the guidance to be issued on small computers. At a minimum, we suggest that the effort to develop such policy and guidance address the following issues.

- Determination of what life-cycle costs should be considered in justifying the purchase of small computers.
- Guidance in the acquisition phase, including:
 - (1) Evaluation techniques for hardware selection.
 - (2) The use of centralized procurement to obtain quantity discounts.
 - (3) The importance of compatible hardware to allow software sharing and implementation of the current broad policy concepts stated above.
- Guidelines for more efficient operation of small computers, including:
 - (1) Software standards:
 - Programming language standards need to be augmented to standardize small computer operations that they do not now include, to reduce the use of vendor-unique extensions that will hinder later conversion and re-use of the software.
 - Operating systems standards needed to reduce re-training of users on different systems.
 - (2) Data standards for media, including floppy disks, to aid data sharing.
 - (3) Controlled software development to reduce redundant efforts.
 - (4) Data control procedures that will:
 - Reduce the tendency for individuals to keep private accounting information and data bases that should be known to the organization, and thereby reduce redundant data collection.
 - Verify the accuracy of data on small computers.
 - Provide security guidelines; for example, how to protect sensitive data stored on microcomputer diskettes.
 - Allow interfacing of data bases between small and large computers.
- Guidance, training, and education on:
 - (1) Software package selection.
 - (2) Hardware selection, operation, and maintenance.

(3) Application building and control.

- Guidelines for changing organizational relationships to accommodate shifts in data processing responsibilities.
- Suggestions on what functions should be done centrally to maintain adequate control while allowing maximum flexibility. These guidelines should complement those implementing the Paperwork Reduction Act.
- Guidelines on the use of, and the furnishing of Federal supplies for, personally owned computers doing Federal work.
- Any necessary guidance to the General Services Administration concerning property management and procurement.

This report contains recommendations to you. As you know, 31 U.S.C. 720 requires the head of a federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of the report, and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

Sincerely yours,


W. D. Campbell
Acting Director