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ABSTRACT

The General Accounting Office (GAO) performed this study because: preliminary indications showed that significant savings could be achieved in the procurement of selected computer components; the Federal Government is investing increasing amounts of money in Automatic Data Processing (ADP) equipment; and there is a widespread congressional interest in the procurement, management, and use of such equipment. The study shows that it is common practice for Government ADP managers to obtain all required ADP equipment from computer systems manufacturers even though certain items of equipment can be procured more economically from the original manufacturers or from alternate sources of supply. The findings of the study are summarized in this report which is issued to inform Congress and the head of each Federal agency of the opportunities for obtaining savings when acquiring computer components from sources other than the ADP systems manufacturers. (Author/NH)

REPORT TO THE CONGRESS

Study Of The Acquisition Of Peripheral Equipment For Use With Automatic Data Processing Systems B-115369

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

JUNE 24, 1969

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-115369

To the President of the Senate and the
Speaker of the House of Representatives

This is our report on the study of the acquisition of peripheral equipment for use with automatic data processing systems.

Copies of this report are being sent to the Director, Bureau of the Budget, and to the heads of Federal departments and agencies.

Comptroller General
of the United States

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D I G E S T

WHY THE REVIEW WAS MADE

The General Accounting Office (GAO) performed this study because of:

--Preliminary indications that significant savings could be achieved in the procurement of selected computer components.

--The increasing investment of the Federal Government in automatic data processing (ADP) equipment.

--The widespread congressional interest in the procurement, management, and use of such equipment.

FINDINGS AND CONCLUSIONS

Recently, numerous independent manufacturers of peripheral equipment--magnetic tape units, disk storage drives, etc.--have made a concentrated effort to compete with the systems manufacturers and to offer selected items of equipment directly to users.

The study shows that it is common practice for Government ADP managers to obtain all required ADP equipment from computer systems manufacturers even though certain items of equipment can be procured more economically from the original manufacturers or from alternate sources of supply.

GAO identified selected computer components that are directly interchangeable (plug-to-plug compatible) with certain other systems manufacturers' components and are available at substantial savings.

GAO found that a number of private organizations had installed available equipment of plug-to-plug compatibility and had achieved substantial savings. Yet it found only a few instances where Federal agencies had availed themselves of this economical means of acquiring computer components. Central agency leadership

could provide impetus which would achieve similar savings in the Federal Government. (The General Services Administration (GSA) has recently started a test to determine the possibilities of achieving savings by using equipment of plug-to-plug compatibility.)

On the basis of observations at commercial organizations visited during the study, GAO believes that the acquisition of plug-to-plug compatible components for ADP systems, either in operation or on order, provides an opportunity for Federal agencies to achieve significant savings in costs, an objective which is in line with the President's program of cost reduction in the Federal Government.

GAO believes that, if more systematic attention is given to acquiring non-plug-to-plug components by the executive branch of the Federal Government, significant savings also can be achieved.

GAO estimates that, if plug-to-plug compatible components were used to replace similar components rented by the Government, annual savings would be at least $5 million. If such components were to be purchased, savings would exceed $23 million. (See p. 19.)

GAO believes that, in addition to the estimated savings in acquiring plug-to-plug compatible components, savings are also available in the acquisition of non-plug-to-plug components from sources other than the systems manufacturers.

It is estimated that the purchase cost of such components, now being leased for about $50 million, from the systems manufacturers would be about $250 million; whereas the acquisition price for similar components from an alternative source of supply probably would be about $150 million, a difference of about $100 million. (See p. 27.)

GAO suggests, however, that the potential savings must be evaluated in light of costs associated with combining the components into a total computer system.

RECOMMENDATIONS OR SUGGESTIONS

GAO recommends that the head of each Federal agency take immediate action to implement steps requiring replacement of leased components that can be replaced with more economical plug-to-plug compatible units.

GAO recommends also that the Director, Bureau of the Budget, and the Administrator of General Services provide more specific guidelines for the evaluation and selection of plug-to-plug compatible equipment and for other components.

GAO recommends that, pending the issuance of specific policies, the factors described in this report be used by Federal agencies to evaluate alternate sources of ADP equipment.

Also, inasmuch as third-party leasing arrangements generally result in savings when compared with rental arrangements available from equipment manufacturers, GAO believes that the head of each Federal agency should consider this method of procurement when purchase of the equipment is determined not to be advantageous.

AGENCY ACTIONS AND UNRESOLVED ISSUES

The use of plug-to-plug compatible components for Federal ADP equipment is currently being studied by the General Services Administration. Present plans call for GSA to study also the acquisition of other components and peripheral equipment from alternate sources at a later date. GAO believes the GSA study to be important and that it should be accelerated to provide a basis for promulgating more specific policies for the guidance of Federal agencies in obtaining ADP components from the most economical source of supply.

MATTERS FOR CONSIDERATION BY THE CONGRESS

This report summarizes the findings of the study and is issued to inform the Congress and the head of each Federal agency of the opportunities for obtaining savings when acquiring computer components from sources other than the ADP systems manufacturers.

STUDY OF THE

ACQUISITION OF PERIPHERAL EQUIPMENT

FOR USE WITH

AUTOMATIC DATA PROCESSING SYSTEMS

INTRODUCTION

The General Accounting Office has examined into the acquisition by Federal agencies of peripheral[1] equipment for use with automatic data processing systems. Our review was concerned primarily with (1) the feasibility of the Federal Government's procuring such equipment from sources other than the manufacturer of the ADP system, (2) the advantages of such procurement, and (3) the considerations required in making such acquisitions.

During our review, we examined into:

--The policies established by the Bureau of the Budget and the General Services Administration regarding the selection and procurement of ADP equipment.

--Activities of GSA in the procurement of ADP equipment under Public Law 89-306, an act which provides for the economic and efficient purchase, lease, maintenance, operation, and utilization of automatic data processing equipment by Federal departments and agencies.

--The marketing of peripheral equipment by the computer industry.

--The policies and practices of Federal agencies and commercial organizations relative to the selection and procurement of ADP systems and components.

--The savings available to the Government if certain components were to be obtained from sources other than the manufacturer of the ADP system.

--The factors affecting decisions concerning the acquisition of peripheral equipment.

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[1] Various units or machines that are used in combination or conjunction with the main frame of computer systems, such as magnetic drums, magnetic tape units, printers, storage units, etc.

During our study, we reviewed our conclusions and recommendations with officials of the Bureau of the Budget, the General Services Administration, and the National Bureau of Standards and their views were considered in the final preparation of this report.

CONGRESSIONAL INTEREST

During November and December 1967, the Subcommittee on Economy in Government of the Joint Economic Committee held hearings and obtained testimony relating to the procurement of ADP equipment. Specifically, the Subcommittee was especially concerned that Government procurement practices had tended to favor larger manufacturers of ADP equipment, thus stifling competition from smaller companies. In addition, testimony before the Subcommittee indicated that the numerous smaller producers of peripheral equipment might well participate to a larger extent in furnishing the Government's requirements directly.

In a report[1] entitled "Economy in Government Procurement and Property Management," dated April 23, 1968, the Subcommittee stated that:

> "The General Services Administration should make it possible for smaller manufacturers of ADP equipment to furnish part of the Government's requirements. Specifications should not be designed around the products of certain companies which have the effects of eliminating competition and stifling the incentive of smaller manufacturers."

Subsequent to the hearings, the Chairman of the Subcommittee requested that we examine into the financial advantages of procuring peripheral equipment directly from peripheral or component manufacturers. In our reply to the Subcommittee, dated September 19, 1968 (see app. II), we pointed out that, under certain circumstances, savings might be available to the Government through the procurement of selected ADP components from peripheral manufacturers and suggested the need to adequately consider all the potential technical implications.

We also advised the Subcommittee that we were preparing a more complete report to the Congress on this subject. One purpose of our more complete report is to inform the Congress and all Federal agencies of the opportunities for obtaining such savings and other available benefits in acquiring computer components from sources other than the ADP systems manufacturers.

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[1]Report of the Subcommittee on Economy in Government of the Joint Economic Committee, 90th Congress, 2d Session, Congress of the United States.

GROWTH OF THE COMPUTER INDUSTRY

Although a few experimental computers were assembled during the late 1940s, the general-purpose digital computer did not have its beginning until the early 1950s. Since that time, the growth of the computer industry has been tremendous. By 1955, some 400 computers had been installed in the United States. By 1960, the number of installations approximated 6,000, and, by the end of 1968, the number of computer installations exceeded 67,000. The computer hardware market is believed to have reached a value of about $7.2 billion during 1968 and is expected to grow at a 15 to 20 percent annual rate over the next 5 years.

The computer industry is generally dominated by the computer systems manufacturers whose marketing efforts are devoted to providing complete computer systems along with the necessary technical assistance required to properly utilize the system.

Recently, however, numerous independent manufacturers of peripheral equipment have made a concentrated effort to compete with the systems manufacturers and offer selected items of peripheral equipment for computer systems directly to the user market. These manufacturers generally restrict their marketing efforts to a single product or to individual items of peripheral equipment and concentrate on providing individual equipment components at a lower price than offered by the systems manufacturers.

GROWTH IN USE OF COMPUTERS IN THE FEDERAL GOVERNMENT

In the past several years, there has been very substantial growth in the use by the Federal Government of ADP equipment. The Federal Government now spends about $2 billion annually for the purchase, lease, and operation of ADP equipment. The following statistics accumulated and reported by the Bureau of the Budget and GSA show this growth in the Federal Government's use of computers[1]:

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[1] These statistics exclude most contractor-operated equipment and equipment used in military tactical and intelligence operations.

At June 30	Number of systems
1962	1,030
1963	1,326
1964	1,862
1965	2,412
1966	3,007
1967	3,692
1968	4,232
1969 (estimate)	4,620

Notes: Data subsequent to 1966 is based on the new "ADP Management Information System" administered by the GSA.

Excluded from the above totals are analog computers and computers which are built or modified to special Government design specifications and are integral to weapons systems.

Data on contractor-operated equipment is excluded unless the equipment is operated in the performance of work under cost-reimbursement-type contracts and subcontracts when (1) the equipment is furnished by the Government or (2) the equipment is installed in Government-owned, contractor-operated facilities.

ELEMENTS OF A COMPUTER SYSTEM

A computer system, sometimes referred to as an ADP system, consists of a machine or a group of automatically intercommunicating machine units capable of entering, receiving, storing, classifying, computing, and/or recording data, and includes at least one central processing unit, one or more storage facilities, and various units of input and output equipment. Those units of the computer systems that are defined as input or output devices or as external information storage devices are referred to as peripheral equipment.

Computer hardware includes all the physical components used in a computer system. Computer software includes the programs necessary to make the computer hardware operative. Computer support includes all manpower and other assistance necessary to make and keep the computer hardware and software operative.

In terms of hardware, a typical computer configuration might consist of a central processing unit and the following pieces of peripheral equipment[1]:

[1]List does not include all types of peripheral equipment .

--Disk storage drive

A storage device that magnetically records on flat rotating disks.

--Magnetic tape unit (See P. 16 for photograph.)

Handles magnetic tape. It usually consists of a tape transport, reading or sensing and writing or recording heads and associated electrical and electronic equipment.

--Card read/punch.

Punches holes in cards at designated locations to store data. The device is also capable of sensing and translating the holes in punched cards for internal storage of data.

--Printer.

Spells out computer results as numbers, words, or symbols.

--Plotter.

Inscribes visually a dependent variable.

--Communication devices.

Transfers information from one point, person, or device to another.

--Character readers.

Scans documents to identify characters.

ACQUISITION OF ADP SYSTEMS

FEDERAL GOVERNMENT POLICIES AND PRACTICES

Broad policies and guidelines governing the selection of ADP equipment to be acquired from manufacturers are set forth in Bureau of the Budget Circular No. A-54, dated October 14, 1961, revised by Transmittal Memorandum No. 1 dated June 27, 1967, and Transmittal Memorandum No. 2, dated January 7, 1969. This circular prescribes policies on (a) making selections of equipment to be acquired for use in the ADP programs of the executive branch and (b) making determinations as to whether the ADP equipment to be acquired will be leased, purchased, or leased with an option to purchase.

Also, Public Law 89-306 (Brooks Bill) dated October 30, 1965, provides exclusive authority to the GSA for procuring all general-purpose ADP equipment for use by Federal agencies. However, the law prohibits GSA from exercising responsibilities related to determining ADP equipment requirements, selecting types and configurations, and the use to be made of such equipment. Accordingly, GSA has, limited its involvement in this area to reviews of large computer procurements and to negotiations for the annual Federal Supply Schedules.

Both the Bureau of the Budget and GSA have broad responsibilities relative to the evaluation, selection, and procurement of ADP equipment. In addition, Public Law 89-306 authorizes the Secretary of Commerce (through the National Bureau of Standards) to provide agencies with scientific and technological advisory services relating to automatic data processing and related systems.

We found that as late as May 1, 1969, none of the three agencies had issued specific guidance for determining the feasibility of substituting peripheral equipment from independent manufacturers into systems manufacturers' computer systems. Some actions have been taken, however, which reduce the obstacles that have made such procurements difficult. These actions include adopting as mandatory Federal standards, industry standards concerning character code, magnetic tape, and paper tape. These Federal standards, and others under consideration, will increase compatibility and thereby reduce the technical difficulties in considering procurement of components from sources other than the systems manufacturers.

As mentioned above, steps that the central offices of the executive agencies have taken toward implementation of Federal standards and the work under way in validating certain software to ensure their compliance with basic specifications are additional prerequisites to overcoming existing incompatibility. Although the executive agencies are

moving in the direction of enforcing for Federal use those standards adopted by the United States of America Standards Institute, greater support by the computer suppliers in using such standards in the design of their hardware and software would greatly accelerate the elimination or minimization of incompatibility.

We did note that GSA in its Federal Property Management Regulations amendment E-56, dated January 17, 1969, stated that:

> "Nothing in this section 101-32.407 is intended to preclude or otherwise detract from the procurement of the several components, including peripheral equipment, of a system, or augmenting an existing system, from a number of different sources, if such action will be in the best interests of the Government. Suitable equipment not on a Federal Supply Schedule contract, as well as that which is on such a contract, must be considered."

PROCUREMENT OF COMPLETE SYSTEMS VS. INDIVIDUAL COMPONENTS

The acquisition of an ADP system is usually a major expenditure for an organization. Therefore, the prospective user must carefully weigh all the factors which could have either a direct or an indirect influence on the determination of which system meets his requirements at the lowest overall cost. The difficulty faced by the user in accurately assessing the merits of various systems offered by competitive manufacturers is compounded by many intangible factors, such as, equipment reliability, availability, competence of the manufacturer's support personnel, software performance, and programming complexity among others.

A computer system is made up of a complex combination of various pieces of electronic and electromechanical equipment designed to function as a whole. Each individual component of a computer system is not functional until it is joined to other components and until the proper software is introduced into the system to make it perform. For this reason, some Federal agencies utilize benchmark tests to determine whether a manufacturer's system is capable of fulfilling the system specifications. These benchmark tests consist of representative problems, the solution of which, the system manufacturer is required to demonstrate and run on his proposed equipment configuration within a stipulated time period.

Both the Federal Government and private industry in general follow the practice of relying on a computer system manufacturer to assemble a series of components into a workable system. This method imposes upon the system manufacturer the burden of having to plan for and perform the necessary interfaces [1] and of developing an operative software

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[1] Interface - a surface forming a common boundary between two systems or two devices.

system. Of course, the computer system manufacturer is compensated for this effort and offers the end user a complete system with the following advantages:

--A fully integrated and operational system.

--An available, effective, and operative software system.

--Educational services for training operating personnel.

--A maintenance service for the entire system.

--Expertise and support personnel to assist in initial installation and implementation.

--Back-up-equipment support for initial testing and emergency situations.

The price of computer equipment obtained from a system manufacturer necessarily includes the cost of many of the services described above. On the other hand, independent manufacturers of components do not normally provide these services, specializing instead in the marketing of a particular component or group of components at lower prices. We believe that more and more situations arise when some users do not require all of the support services made available by the system manufacturer. To alleviate the inequity of having these users pay for services not required, it would be necessary for the industry to develop a separate pricing structure for each and every service that is provided. Certain industry sources are promoting such a change in the pricing structure and, if this situation develops, savings now obtainable by procuring components from other than computer system manufacturers might be reduced.

The state of the art today is such that, in selecting a computer, one cannot randomly select various components from various manufacturers with any assurance that, when all this equipment is put together, it will operate as a system. In this regard, once the equipment has been obtained, electronic interface must be accomplished and then the necessary software system must be developed either in-house or by contract with an outside firm. Although this concept of purchasing components from various manufacturers is a complex one, it is generally recognized in the industry that, by so doing, the sophisticated user can obtain at a savings the best available equipment for a particular application.

The recent efforts made by independent peripheral manufacturers to market their equipment directly to the end users of computer systems should generate added competition within the industry and should result in greater exposure of such equipment to the end users. Greater familiarity with what is being offered will make it possible for end users to

consider for procurement a greater variety of components. However, if the Government users are to benefit from this added competition, they must reappraise their procurement practices and make provisions for soliciting and evaluating components offered by these manufacturers. We have found that the general practice in the past has been to deal exclusively with systems manufacturers. Consideration was given to independent peripheral manufacturers only in those situations where special purpose equipment was required or in other very unusual situations.

We recognize that limiting the computer procurement process to systems manufacturers is the most expedient method of procurement; however, such a method does not recognize the possibility of obtaining increased competition for certain components nor of achieving the potential benefit to be derived from use of another manufacturer's components. We also recognize that to expand procurements to include every conceivable manufacturer in the industry would be impracticable under the present selection system because of the infinite variety of components that might be proposed to fill the Government's requirements. We do believe, however, that procurement procedures should be established to give more consideration to independent peripheral manufacturers' components.

It is apparent that, at the present time, the Government users must place a great deal of reliance on the computer systems manufacturers. However, we believe that Government agencies can and should develop the necessary technical expertise required to conduct a marriage of various computer components. This expertise, we believe, can be developed gradually if agency officials give consideration to the following procedures in procuring computer components from sources other than computer systems manufacturers:

--To replace or add a component to an installed system

--To replace a component being procured as part of a total system with one available from another source

--To assemble components into an integrated computer system

The most complex method of computer procurement is when each component of a system is procured on an individual basis and when the necessary system engineering and the necessary software operating system are to be developed in-house or are to be contracted for. Recognizing that such a sophisticated manner of procurement may not be practical at the present time, we believe that considerable savings could result if:

(1) for existing computer installations, consideration were to be given to the procurement of additional or replacement components either from the original equipment manufacturer or a supplier of components that are equivalent to and can directly replace (are plug-to-plug compatible) components offered by the system manufacturer or

(2) after having selected a system manufacturer's computer for procurement, an effort is made to determine if selected components could be obtained from an alternative source. Of course, in each case, the component manufacturer would have to demonstrate that his component offers financial savings and can be interfaced with the computer manufacturer's system with no resulting degradation in system operation or major effect on previously run benchmark tests or evaluations.

Although the above procedures are concerned primarily with the procurement of a new system and the addition to or replacement of an individual component, we believe that data processing managers in general should be alert to the marketing of new products by manufacturers of peripheral equipment who can easily replace, at a savings, a system manufacturer's components. Such an example would include the above-described plug-to-plug compatible components which are generally sold or leased at a lower cost than the system manufacturer's components and do not result in any interface or software problems.

NEED TO CONSIDER MORE ECONOMICAL SOURCES OF SUPPLY FOR COMPONENTS

We have found that in certain instances Federal agencies can achieve significant savings through the use of more economical sources of supply for ADP system components. Rather than relying on procurement of ADP systems from computer systems manufacturers, we believe Federal managers should consider the following:

--Procurement of equivalent plug-to-plug compatible components.

--Procurement of components that are not plug-to-plug compatible directly from the original manufacturer.

--Procurement of components from alternate sources of supply.

--Competitive procurement of magnetic disk packs.

PROCUREMENT OF EQUIVALENT PLUG-TO-PLUG COMPATIBLE COMPONENTS

During the past 2 years, certain manufacturers of independent peripheral equipment have emphasized the development and marketing of equivalent plug-to-plug compatible components at prices which can result in considerable savings to computer users. These components are plug-to-plug compatible in the sense that the computer system manufacturer's component can be unplugged from the computer and immediately replaced with the independent manufacturer's component. (See pp. 16 to 17.) Both components function in the same or similar manner and the computer functions just as though the computer system manufacturer's component is still being utilized. No changes to the computer programming system are necessary.

During our review, we focused our attention on two types of plug-to-plug compatible components being marketed by manufacturers of independent peripheral equipment as replacements for similar components marketed by a large computer manufacturer. These components were magnetic tape transports (also called tape drives) and disk storage drives.

We found at least three independent companies that were marketing plug-to-plug compatible magnetic tape transports at savings in purchase costs of up to 58 percent below the computer manufacturer's price. Savings in monthly leasing costs would amount to as much as 25 percent. (See p. 20.)

We also found at least three independent companies that were marketing plug-to-plug compatible disk storage drives. These units were being offered at as much as 29 percent below the purchase price of the computer manufacturer's component and 24 percent below the computer manufacturer's monthly leasing price. (See p. 22.)

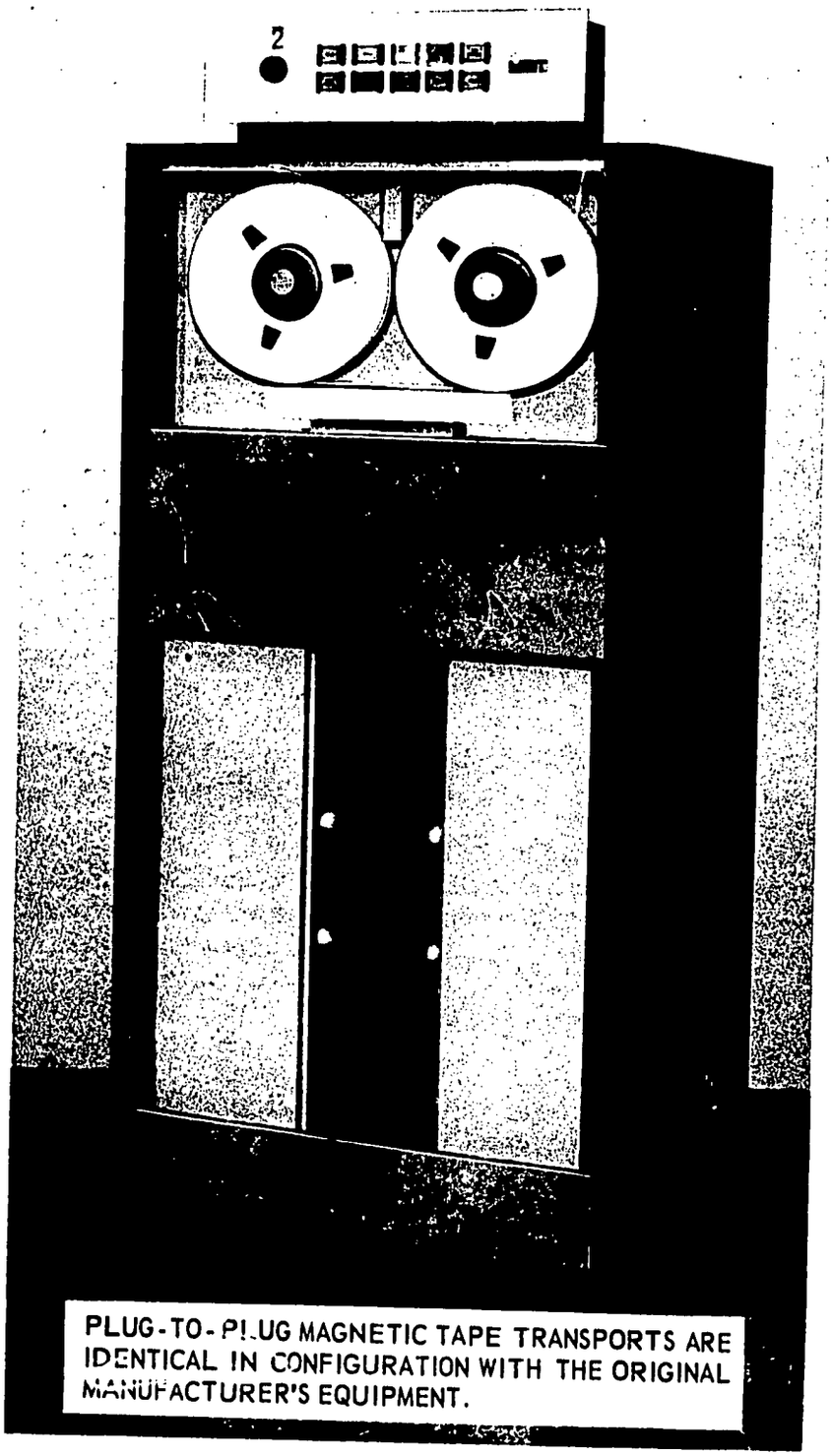
Although this type of equipment has been generally available since 1967, only a few Government installations have ordered or installed plug-to-plug compatible equipment. Also, we found that in August 1968 the Chief of Naval Material had directed the Commander, Naval Supply Systems Command, to investigate the feasibility of replacing certain tape drives located at the Ships Parts Control Center in Mechanicsburg, Pa., with plug-to-plug compatible tape drives marketed by peripheral equipment manufacturers. Although the results of the study were not available for our review in March 1969, the directive brought out the following significant factors:

1. The connectors on the new tape stations and the present brand X tape stations are identical. Interfacing with the present brand X computers and intermixing with present brand X tape stations are as simple as plugging the new stations into the tape control unit. No modification of software is required and present tape reels are freely interchangeable between the present brand X tape stations and the new tape stations.

2. Compared to the second-generation brand X tape stations, the new third-generation tape stations provide the advantages of automatic loading, longer possible tape life, integrated electronic circuitry, fewer parts, and no mechanical maintenance adjustments.

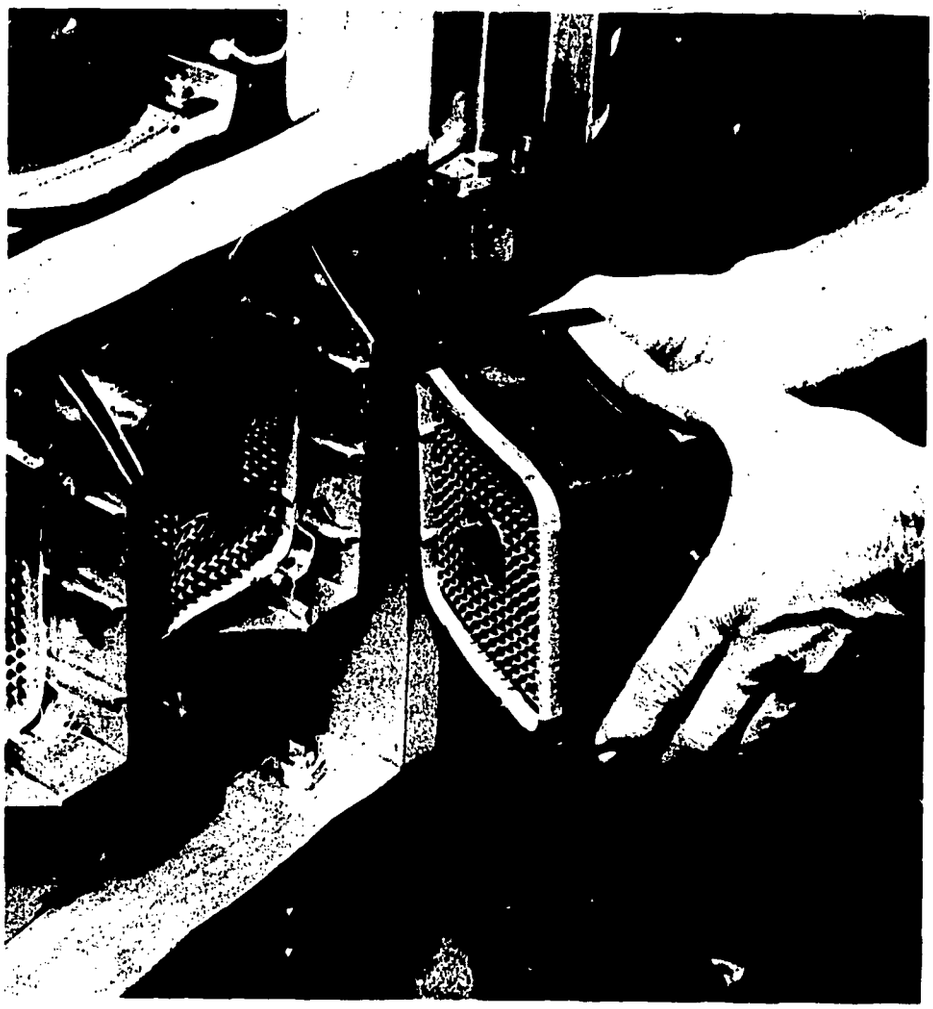
3. There are in excess of 500 rented brand X tape stations connected to brand X computers at activities under the Naval Material Command. Replacement of all of these tape stations could result in a considerable rental savings to the Navy. In addition, replacement of such a large quantity of tape stations should open the way to replacement of other rented peripheral components on the brand X computer systems with completely interchangeable and lower cost peripherals now being marketed by other vendors, such as line printers, page printers, disk units, removable disk packs, conversational terminals, and high-speed batch terminals.

FRONT VIEW OF
PLUG-TO-PLUG
MAGNETIC TAPE UNIT



PLUG-TO-PLUG MAGNETIC TAPE TRANSPORTS ARE IDENTICAL IN CONFIGURATION WITH THE ORIGINAL MANUFACTURER'S EQUIPMENT.

ATTACHMENT OF PLUG-TO-PLUG
MAGNETIC TAPE TRANSPORT
TO COMPUTER SYSTEM



PICTURE ABOVE SHOWS AN EQUIVALENT PLUG-TO-PLUG COMPATIBLE MAGNETIC TAPE TRANSPORT BEING PLUGGED IN DIRECTLY, USING THE SAME POWER AND SIGNAL CONNECTORS AFTER THE ORIGINAL MANUFACTURER'S EQUIPMENT WAS REMOVED FROM THE EDP SYSTEM. THE COMPUTER INTERFACE CIRCUITRY IS IDENTICAL; PROGRAMS ARE IDENTICAL; TAPE LOADING IS IDENTICAL; DIAGNOSTICS FOR PREVENTIVE MAINTENANCE ARE IDENTICAL. NO MODIFICATION OF THE MAIN FRAME OR CONTROLLER IS REQUIRED.

... further information on the feasibility and advantages of using plug-to-plug compatible equipment, we visited several private organizations that were using this type of equipment. They reported that they had no serious technical problems with the independent manufacturers' components and that cost savings were significant. The identity of these organizations and their estimates of savings are shown in the following tabulation. Brief resumes of the experiences of these organizations are included in the appendix.

Organizations visited	Annual rental savings	Purchase savings
American Airlines New York, New York	$ 82,000	
American Cyanamid Company Wayne, New Jersey	36,000	
McDonnell Douglas Corporation Douglas Aircraft Division Long Beach, California	54,000	
General Electric Company Missile and Space Division Valley Forge, Pennsylvania	40,000	$311,000
Johns Manville Service Corporation Finderne, New Jersey	7,500	
Lockheed-California Company Division of Lockheed Aircraft Corporation Burbank, California	129,000	
Long Island Lighting Company Hicksville, New York		200,000
The Reader's Digest Association, Inc. Pleasantville, New York	13,000	
A major industrial corporation		240,000

Savings available by using plug-to-plug compatible components

A plug-to-plug compatible component:

--Is directly interchangeable with another manufacturer's component, and

--Does not require any hardware or software modification for interface.

In view of the above, the rental and purchase prices of plug-to-plug compatible components can be effectively compared with the prices of the components which they can replace. During our review, we examined into the pricing of plug-to-plug compatible tape drives which were readily available from more than one market source.

Government-wide benefits immediately available

We estimate that annual savings of at least $5 million could be realized if selected models of tape drives and disk storage drives being used by the Federal Government were to be rented from independent manufacturers of peripheral equipment rather than from the systems manufacturers. If these same tape drives and disk drives were to be purchased rather than rented from manufacturers of independent peripheral equipment rather than the systems manufacturers, we estimate possible savings of about $23.5 million.

Our estimates of savings are based on information contained in the GSA inventory of computer equipment for the fiscal year 1968 and on the following factors:

--A total of 1,733 tape drives and 459 disk drives being rented by Government agencies and representing models currently available from independent peripheral manufacturers marketing plug-to-plug compatible replacements.

--The systems manufacturers' fiscal year 1969 Federal Supply Schedule price lists and the independent manufacturers' published price lists. Quantity discounts, which are published by the independent peripheral manufacturers, are not reflected in our estimates.

--Assumed one-shift-a-day usage. The system manufacturer has an extra-use charge for more than 176 hours of usage a month and the independent manufacturers generally provide unlimited use for the basic monthly charge.

We have found as further illustration of the potential impact on Government ADP expenditures that selected tape and disk storage drives, which are now owned by the Federal Government and which represent an investment of about $57 million, are of a type and model that are available for purchase from independent peripheral manufacturers of equipment for about $31 million, a difference of $26 million.

In view of the potential impact which this form of procurement could have on ADP expenditures, we strongly urge agency officials to immediately consider the use of plug-to-plug compatible tape and disk storage drives. If it should be determined that it would be advantageous to purchase such components, we believe that competitive bulk procurement by GSA would be most advantageous to the Government.

We believe also that efforts should be made by agency officials to investigate the availability from independent peripheral manufacturers of components other than tape and disk storage drives which might be available at similar savings.

Tape drives

The Government generally obtains from the computer system manufacturer a number of tape drives for each computer system installation.

Because the largest computer system manufacturer has the most tape drives already installed, independent manufacturers devoted their early efforts to the development and marketing of a plug-to-plug compatible replacement for this manufacturer's tape drives.

During our review, we identified at least three alternate sources for tape drives which can be directly interchanged with the system manufacturer's component. The following comparison of purchase prices shows that plug-to-plug compatible tape drives are available from alternate sources at savings of 17 to 58 percent as compared to the system manufacturer's purchase price.

Per unit purchase price

Model	System manufacturer	Alternate source		
		A	B	C
1	$36,000	-	-	$15,900
2	41,250	-	-	18,400
3	41,250	$17,700	$18,500	17,600
4	37,200	16.000	17,000	16,400
5	42,450	18,000	18,500	18,100
6	22,700	16,000	18,200	16,000
7	22,700	16,000	18,200	16,550
8	36,760	21,700	21,100	18,100
9	36,760	21,700	21,100	18,900
10	25,030	-	20,800	19,600
11	39,090	-	25,000	24,600

In the above schedule, the model 5 tape drive represents the greatest opportunity for savings.

The prices shown above for the alternate sources are for the purchase of one unit. If the user purchases more than one unit, quantity discounts of from 2 to 16 percent are available depending on the quantity ordered. One alternate source offers different quantity discounts for each model. The system manufacturer's prices which were taken from the fiscal year 1969 Federal Supply Schedule are also unit prices; however, the supply schedule does not provide for quantity discounts.

We have been advised by plug-to-plug compatible tape drive manufacturers that they have the capability to upgrade, at a nominal charge, a tape-drive model used with second-generation equipment to the model configuration needed for use with third-generation equipment.

In addition to the savings available in purchase prices, the following schedule shows savings of 9 to 26 percent in monthly rental prices.

Per unit monthly rental prices

Model	System manufacturer	Alternate source		
		A	B	C
1	$700	-	-	$580
2	900	-	-	-
3	900	$720	$700	720
4	750	637	651	625
5	950	760	700	760
6	500	425	450	425
7	500	425	450	425
8	810	650	600	648
9	810	650	600	648
10	550	-	500	468
11	860	-	650	688

As previously noted, model 5 offers the greatest potential for savings because it has the largest price variance and is the most commonly used replaceable tape drive in the Government.

The above monthly rental rates of the system manufacturer are from the fiscal year 1969 Federal Supply Schedule which allows the Government a maximum of 176 hours of usage per month. Additional usage in excess of 176 hours per month is charged at 30 percent of the basic monthly rate for models 1 through 5 and at 10 percent for the remaining models. The alternate sources of plug-to-plug compatible tape drives offer unlimited monthly use of their equipment with the exception of source "B" which charges 10 percent of the basic rate for use in excess of 176 hours per month on models 6 through 11.

With respect to maintenance costs, we found that the independent manufacturers of peripheral equipment offer maintenance plans which are comparable to those of the systems manufacturers and, when the equipment is purchased, maintenance plans are available at a slightly lower price.

Disk drives

Another item of peripheral equipment which the independent manufacturers have recently begun to market is a plug-to-plug compatible

disk drive. This item of equipment can also be used to directly replace, at a savings, the disk drive used by a major system manufacturer. As shown below, we identified three alternate sources of supply which offer savings of 20 to 29 percent in purchase prices and of 16 to 24 percent in rental costs. Comparable maintenance plans are also available at a savings.

	System manufacturer	Alternate sources		
		A	B	C
Purchase price	$25,510	$20,000	$18,100	$20,500
Monthly rental	590	496	450	483

In this comparison, the system manufacturer's purchase price and monthly rental rate were obtained from the fiscal year 1969 Federal Supply Schedule. As noted previously, the system manufacturer's monthly rental rate is for 176 hours of use. Additional monthly use is charged at 10 percent of the basic monthly rate. All of the above plug-to-plug compatible disk drive suppliers provide unlimited monthly use of their equipment.

Third-party leasing arrangements

In addition to the savings available by the leasing of plug-to-plug equipment from peripheral equipment manufacturers, we found that savings in rentals are available from third-party leasing firms. As shown in the appendix (see pp. 41 and 43), two of the commercial firms visited used third-party leasing arrangements for obtaining plug-to-plug compatible equipment. Because third-party leasing arrangements generally result in savings when compared to rental arrangements available from equipment manufacturers, we recommend that the head of each Federal agency consider this method of procurement when purchase of the equipment is determined not to be advantageous.

Technical characteristics

Although we did not make a technical evaluation of the plug-to-plug compatible equipment marketed by the independent manufacturers of peripheral equipment, we did determine that the technical specifications of their equipment generally equaled or exceeded those of the system manufacturer. In addition, the users which we visited generally indicated that the technical operation of the equipment met their requirements.

Recommendation

In view of the significant savings available from the purchase or lease of plug-to-plug compatible components and the ease with which such equipment can be installed, we recommend that the Director, Bureau of the Budget, and the Administrator of General Services issue more

specific central policy guidance and take the necessary steps to require that all agency heads give consideration to the feasibility of using such equipment.

In the meantime, we recommend that the head of each Federal agency require managers of their data processing installations to consider the use of plug-to-plug compatible peripheral components. We believe that such action should be taken not only in the case of computer systems already installed but also in those instances where systems are being evaluated and selected for procurement.

PROCUREMENT OF COMPONENTS THAT ARE NOT PLUG-TO-PLUG COMPATIBLE FROM THE ORIGINAL MANUFACTURER

Some computer systems manufacturers approach self-sufficiency while others are dependent on peripheral manufacturers to provide certain components. In some instances, the computer system manufacturer may rely on the manufacturer of peripheral equipment to provide the complete component which is to be included in his computer system. In other instances, the system manufacturer might purchase only selected or critical parts of a component and then complete the fabrication of the component.

We believe that there is a potential for the Government to obtain significant savings through the purchase of certain computer components direct from the original manufacturer. The following example demonstrates the type of savings possible when aggressive managers adequately evaluate the various sources of supply for computer components. Although the example may be somewhat unique, we believe that it illustrates the need to recognize and consider the savings possible through direct procurement.

When the United States Fleet Numerical Weather Facility at Monterey, California, required additional storage capacity for its computers, a determination was made that such equipment could be obtained, at a savings, directly from the original manufacturer of the equipment rather than through the computer system manufacturer. Therefore, the facility in 1966 and 1967 made two negotiated procurements of drum-storage devices and related controllers from the actual manufacturer of the equipment. Equivalent equipment from the computer system manufacturer would have cost an additional $475,200, as follows:

Purchase No. 1		
Computer system manufacturer's price	$530,000	
Drum manufacturer's price	480,500	
Savings		$ 49,500
Purchase No. 2		
Computer system manufacturer's price	$845,500	
Drum manufacturer's price	419,800	
Savings		425,700
Total savings		$475,200

Note: The computer manufacturer's prices are those appearing in the Federal Supply Schedule for the years 1966 and 1967.

It should be noted that, in the above example, the facility was able to specify that the equipment purchased had to operate with the existing standard drum read/write subroutines. Such a requirement alleviated the necessity to make any changes in the computer's programming system to accommodate the drum-storage device. This was possible because in this case the computer system already had, as a component, a drum-storage device which had previously been provided by the independent manufacturer to the computer system manufacturer and marketed as part of the system.

PROCUREMENT OF COMPONENTS FROM ALTERNATE SOURCES OF SUPPLY

The general policy of the Federal Government as set forth in the United States Code (41 U.S.C. 252 and 10 U.S.C. 2304) provides that all procurements shall be made on a competitive basis, whether by formal advertising or negotiation, to the maximum practicable extent. Although competitive procedures may be followed in the selection and procurement of a particular computer system, Federal agencies generally procure all of the individual components from the same computer system manufacturer. Also, if additional components are to be added to the system at a later date, an agency will generally obtain the component directly from the computer system manufacturer. We believe that, in both instances, savings can be achieved by considering, in addition to the computer system manufacturer, alternate sources of supply for selected individual computer components.

We recognize that various technical considerations are necessary when a component is to be procured from a source of supply other than the computer system manufacturer. Such technical consideration includes the need to provide a proper electronic (hardware) and software interface which is necessary to properly integrate the component into the system. However, when significant savings are possible, we believe that Federal agencies should study and consider the integration of computer components procured from alternate sources of supply.

During our review, we noted that a private research organization increased the storage capacity of its computer system by contracting with a peripheral equipment manufacturer for the addition of a controller and drum-storage unit. The decision to procure these units from a peripheral equipment manufacturer was made after an evaluation of various storage units available from both computer system and peripheral equipment manufacturers. This evaluation showed that purchase of the peripheral equipment manufacturer's unit would result in savings of about $100,000 when compared to the price of an equivalent unit sold by a computer system manufacturer.

The firm that supplied the drum-storage unit completed the necessary electronic interface and the research organization took on the task of modifying the computer executive[1] software system to accommodate the unit. It was estimated that the software interface would require about 5 man-months of effort by highly competent computer software personnel. Nevertheless, it was decided that the savings would far outweigh the cost of the software interface. Moreover, as a fringe benefit, the preparation of the software interface increased the knowledge and expertise of the research organization's programming staff.

In another example, we found that the University of California's Lawrence Radiation Laboratory, an Atomic Energy Commission contractor, obtained additional core memory capacity from sources other than the computer system manufacturer. In this instance, because the type of unit desired was not a part of the computer system manufacturer's standard line, it was necessary for the laboratory to prepare technical specifications for the type of unit that was desired. On the basis of bids received, equivalent units from the computer system manufacturer would have cost an additional $503,200, as follows:

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[1] An integrated collection of service routines for supervising the sequencing of programs by a computer.

Source No. 1	
6 units at $41,200	$ 247,200
2 units at $37,000	74,000
Source No. 2	
6 units at $37,600	225,600
Total	$ 546,800
Computer manufacturer's proposed price	
14 units at $75,000	1,050,000
Difference	$ 503,200

These examples illustrate the need for agency managers to seriously consider the various sources of supply rather than to rely on sole-source procurement from computer system manufacturers.

Potential savings available by using components that are not plug-to-plug compatible

According to the GSA inventory of computers in use in the Federal Government as of June 30, 1968, the Government has purchased many items of computer peripheral equipment (such as large core, drum, and disk storage devices) having a value of more than $240 million and, in addition, the Government rents similar equipment at an annual cost of more than $50 million. Inasmuch as the Federal Government has not in the past generally procured individual computer components on a component basis, this equipment was, for the most part, obtained as a part of a system acquired directly from the computer system manufacturer.

If the savings made available by independent manufacturers of peripheral equipment in the marketing of plug-to-plug compatible components and, if the savings illustrated by the examples included in this report (see pp. 20 to 22) are indicative of the possible savings that could be achieved if the Government obtained major items of peripheral equipment from alternate sources of supply, we estimate that the Federal Government could probably achieve savings of a magnitude sufficient to warrant a complete reappraisal of the current practice of acquiring computer systems on a systems basis.

We estimate that, if the $240 million worth of components already owned by the Federal Government had been acquired from alternative sources of supply, savings approximating $100 million might have been achieved. Moreover, for the components now being leased for about $50

million a year, we estimate that their purchase value from the system manufacturer would be about $250 million; in comparison, the acquisition price for similar components from an alternative source of supply probably would be about $150 million or about $100 million less.

Our estimates are only rough approximations of the possible savings and do not reflect estimates of the costs that might be involved in solving the software and hardware interface problems. However, computer technology has developed rapidly in recent years and is still developing and the full impact on Federal Government operations and expenditures in this area cannot be accurately predicted. The potential savings in procurements for future years could be significantly larger than the totals shown above.

Recommendation

In view of the significant savings that may be realized when acquiring non-plug-to-plug components that are included in an ADP system, we recommend that the heads of all using departments and agencies investigate the feasibility of acquiring components from alternate sources of supply and interfacing the independent manufacturers' components into manufacturers' computer systems.

COMPETITIVE PROCUREMENT OF MAGNETIC DISK PACKS

A magnetic disk pack is a removable, interchangeable, random access memory device which is used in conjunction with a disk storage drive as a type of peripheral equipment for computer systems. A disk pack resembles a stack of phonograph records enclosed in a plastic case. The number of disks varies. However, the most popular model has an assembly of six magnetic coated disks. Magnetic disk packs are ideal for off-line storage of vast amounts of data which can be randomly accessed at a high rate of speed. Because of this versatility and large storage capability, the use of disk packs has increased both in the Federal Government and in private industry.

Disk packs are listed by the General Services Administration in the Federal Supply Schedule contracts along with disk drive equipment. Partly because of this, Federal agencies generally procure a number of disk packs along with each disk drive from the computer system manufacturer. Disk packs are generally standard in design; can be used interchangeably on most disk drives produced by system manufacturers; and are available from numerous sources. Accordingly, we believe that disk packs should be competitively procured.

During our review, we found that, generally, system manufacturers and independent manufacturers set the purchase price of their popular model disk pack at $490, which is the same as the price established by the largest manufacturer of computer systems. As of July 1968, two of the independent manufacturers had announced reductions in the price of their disk packs to $300.

In the recent past, the General Services Administration centrally procured magnetic tape for computers used by Federal agencies. Federal specifications were developed and selected suppliers were placed on a qualified product list. By formally advertising the bulk of its magnetic tape requirements, the Government was able to obtain about a 50 percent decrease in the previously negotiated prices. As a result of the savings achieved in magnetic tape procurements and the similarity of disk packs to magnetic tapes, the General Accounting Office in June 1968 sent a letter and brought to the attention of the General Services Administration the need for making a determination of the feasibility for developing Federal specifications for disk packs and the savings that could be achieved if the Government formally advertised its needs for these items. We believe that the price reduction of 39 percent announced by two disk pack suppliers in 1968 indicates the forces of competition at work and further supports our view that sizeable savings can accrue through the use of formal advertising procedures for the procurement of magnetic disk packs.

Recommendations

In view of the significant savings available and the interchangeability and standard design of magnetic disk packs, and the existence of numerous sources of supply, we recommend that the Administrator of General Services give priority to the development of Federal specifications and establishment of qualified product lists for use in the procurement of disk packs through formal advertising. In the meantime, we recommend that, in view of the price reductions extended by two independent manufacturers, the head of each Federal agency procure his magnetic disk pack needs from the most economical sources of supply.

NEED FOR DEVELOPMENT OF STANDARD INTERFACE

The state of the computer industry today is such that, with the exception of plug-to-plug compatible peripheral devices, components cannot generally be directly interconnected with other manufacturers components or systems. In this respect, both an electronic and software interface generally have to be provided before the equipment can be interconnected.

A solution to this problem, which is now being considered by the industry, is the possibility of standardizing the interface media between peripheral equipment and the central processing unit. Interface standardization would stimulate competition in the peripheral equipment industry and would allow the user to select the peripheral equipment best suited to its requirements.

To this end, the United States of America Standards Institute (USASI), a privately supported organization acting as the national clearinghouse and coordinating agency for voluntary standards in the United States, has created a committee for input/output interfaces in order to consider the feasibility and practicality of input/output interface standardization.

Although the committee has been in operation since early 1967, progress has been slow in accomplishing desired objectives. The problems associated with this undertaking are many, but basically stem from the following:

1. Standard interfaces can take several forms and can be located at several points in the system. The point in the system at which the interface is made will have a direct bearing on the ease in which components can be interconnected. For example, if the interface is made between the central processing unit and the peripheral control unit, the peripheral manufacturer will have to consider certain software implications. On the other hand, if the interface is made between the peripheral control unit and the peripheral device, the peripheral manufacturer will only need to provide for the proper electronic connections. Attachment of the peripheral device will be as simple as the attachment of plug-to-plug compatible equipment discussed elsewhere in this report. However, standardization of the interface at this latter point could well put some constraint on the system manufacturer in development of future systems.

2. It is recognized and agreed that a standard interface can be developed. However, it is not obvious whether a standard interface is economically practical or advisable for the

industry. Further, it is not clear to the committee members whether or not the ADP community desires a standard interface.

We believe that the development of a standard interface will promote industry competition and result in certain economies. It will provide the users with increased flexibility by allowing the selection and use, regardless of the manufacturer, of those components best suited to achieve the desired objectives. Under such circumstances, the users would be in a better position to match system specifications with available equipment.

FACTORS TO BE CONSIDERED IN MAKING PROCUREMENT DECISIONS

In evaluating whether it is more advantageous to procure components from sources of supply other than from the computer system manufacturer, it is not sufficient to consider only the differences in price. Procurement of ADP equipment is a complex undertaking and the integration of individual components into a system may present problems. In every instance where a more economical source of ADP equipment is being evaluated we believe that, as a minimum, the following factors should be considered:

--Operational capability of equipment
--Need for electronic and/or software interface
--Maintenance responsibility and availability
--Contract terms
--Relative costs
--Magnitude of procurement

All of these factors are important and, in our opinion, should be considered in the formulation of the Government's policies for making ADP equipment evaluations.

OPERATIONAL CAPABILITY OF EQUIPMENT

Since an ADP system is an integrated group of components which must operate as a whole, the operations of one component could affect the entire system. Accordingly, when Federal agencies are considering the use of a component not furnished by the computer system manufacturers, care must be exercised to insure that use of the component does not seriously affect the throughput operations of the ADP system.

For example, during our review we noted that certain plug-to-plug compatible tape transports had a slower rewind speed under certain conditions than the system manufacturer's equipment. Our inquiries into the use of such equipment revealed that the slower rewind speed was the result of an attempt to reduce certain malfunctions associated with tape transports and that, in actual use, there was no noticeable effect on overall computer operations. With regard to plug-to-plug compatible disc drives, we noted that one manufacturer had actually increased the speed of operation of his equipment in order to provide for a faster throughput time.

The question of operational capability is more important when an agency is considering the use of a component to be obtained from an alternate source of supply. Under these circumstances, the necessary electronic and software interface might affect the throughput or processing time required to complete the operation of the ADP system. However, we believe that such an effect should be evaluated in light of the requirements to be placed upon the system.

NEED FOR ELECTRONIC OR SOFTWARE INTERFACE

When a peripheral manufacturer's component, which is not plug-to-plug compatible, is to be used in conjunction with another manufacturer's component or ADP system, an electronic and software interface is generally necessary.

The electronic interface is generally accomplished by the peripheral manufacturer. In some cases, the peripheral manufacturer may also complete any necessary software interface. However, in other cases it might be the responsibility of the user to complete the interface. The peripheral manufacturer might provide the user with certain flow diagrams indicating how the software interface would have to be accomplished. The actual changes to the ADP programming system would then have to be prepared and made by the user.

The completion of a software interface is generally a complex task and therefore should be carried out only by individuals with the necessary experience and technical expertise. Further, such a task should not be undertaken if the estimated costs would exceed the anticipated savings--other benefits being equal. If savings warrant and the user lacks the necessary technical capabilities, consideration can be given to obtaining the required software expertise from outside commercial firms.

MAINTENANCE RESPONSIBILITY AND AVAILABILITY

When an ADP component, which is not provided by the computer system manufacturer, is installed for the Government, maintenance service may have to be provided by more than one group. We found that generally organizations having maintenance performed by more than one group experienced no particular difficulties as a result of the split maintenance responsibility. It is important to establish, however, that the peripheral manufacturer providing maintenance for his equipment can do so in a manner which does not result in degradation of system operation.

Where there are many different components from various companies that make up an ADP system, it may not be feasible to have the maintenance performed by many groups. In such a case, the user agency might consider negotiating with one manufacturer for all maintenance work. Federal supply contracts negotiated by the General Services Administration with computer system manufacturers generally provide that upon mutual agreement the system manufacturer will maintain, for a price to be agreed upon, items of equipment interconnected to the system but not provided by the computer manufacturer. As an alternative, users can subcontract the maintenance of the conglomerate system to a service organization.

Alternatives for maintenance

When a computer system is composed of components from more that one manufacturer, and the equipment is Government-owned, there are

generally four methods of maintaining such equipment:

1. By contracting with each equipment manufacturer.

   Each component manufacturer would provide maintenance service for its component.

2. By contracting with one manufacturer to maintain all equipment.

   The Government would probably contract with the manufacturer whose equipment made up a majority of the system. Federal Supply Schedules negotiated by the General Services Administration contain provisions for this type of maintenance.

3. By contracting with an independent service company to maintain all equipment.

   The maintenance function would be performed by service company personnel.

4. By establishing an in-house maintenance program.

   All equipment making up the system would be maintained by Government personnel.

Under rental contracts with the equipment manufacturers, maintenance usually is provided by the individual component manufacturer.

Maintenance problems anticipated by Government managers

Many reasons have been advanced by Government managers for their reluctance to utilize computer components available from sources other than the computer system manufacturers. We found that the most frequent reason cited was the anticipated problem of dual maintenance in those situations where each component manufacturer provided maintenance services for its own equipment.

We recognize that, if a computer system consisted of various manufacturers' components and each manufacturer provided its own maintenance, problems could conceivably arise especially in situations where an impasse is reached as to which manufacturer's equipment is at fault and responsible for a system failure. Based on our visits to private organizations that have operated their data processing center under dual maintenance arrangements, we found that maintenance personnel from different manufacturers can effectively maintain an overall computer system. Moreover, we believe it can be shown that, in the past, dual-maintenance has not affected the many data processing networks which have been operated with various manufacturers' equipment, including different types of communication links.

Advantages of in-house maintenance

The alternative practice of having the Government perform its own in-house maintenance would, we believe, be the ideal solution to the maintenance of a computer system consisting of components from more than one manufacturer. Moreover, in addition to the savings available in maintenance costs[1], maintenance engineers and technicians would have a thorough knowledge of the system operations. This knowledge and know-how might then be put to use in evaluating alternative sources of supply for components or in accomplishing necessary hardware or software interfaces.

When evaluating the feasibility of obtaining computer components from sources other than computer system manufacturers, Government managers should objectively analyze the dual maintenance situation. Moreover, the added benefit of system knowledge in regards to component procurement should be recognized when in-house maintenance practices are being considered.

CONTRACT TERMS

In doing business with peripheral manufacturers who have not as yet negotiated Federal supply contracts with the General Services Administration, Federal agencies should make an effort to obtain terms consistent with those provided by firms that have Federal Supply Contracts. Such terms could be most important in those situations where equipment is being leased.

For example, if any agency is leasing a major portion of an ADP system from a computer manufacturer and this equipment can be released by the agency upon 30-days' notice, an agreement generally should not be entered into with another manufacturer for a component which must, as a minimum, be leased for a period of one year. We believe that in such a case, an effort should be made to negotiate similar terms with both manufacturers.

Similarly, if all equipment is being leased, the agency might want to consider agreeing upon terms as to the responsibilities of all peripheral manufacturers if an equipment malfunction results in a need to reprocess data.

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[1]See Comptroller General's Report to the Congress on "Maintenance of Automatic Data Processing Equipment in the Federal Government" dated April 3, 1968 (B-115369).

Other factors which should be given consideration and agreed upon include:

--The need for an understanding of each party's responsibilities insofar as the accomplishment of a complete and proper interface.

--The responsibilities of each party and the extent of services to be rendered if one manufacturer should cause a change in his component resulting in the need for additional changes in other components.

RELATIVE COSTS

Since the use in an ADP system of components not provided by the computer manufacturer can result in various problems, we believe that an agency should not consider such an undertaking without an adequate evaluation of the potential savings and identification of all potential problems.

For example, in a situation where estimated savings are marginal and problems abundant, such an analysis would probably dictate use of one source of supply for most components. However, if the estimated savings are significant and the problems relatively insignificant, good management would dictate the use of more than one source of supply.

MAGNITUDE OF PROCUREMENT

When the Government procures a large number of computer systems, such as approximately 150 computer systems for the Air Force base level data automation, it would appear to be most beneficial to consider procurement of certain components from a source other than the computer system manufacturer.

Certain components marketed by peripheral manufacturers might have a greater capability to perform the job required when compared to the component marketed by the computer system manufacturer. Plug-to-plug compatible components would appear to pose little, if any, problems. Any savings to be obtained as a result of the procurement of a component for one system would represent only a small portion of the savings available in a multiple procurement. Moreover, the cost of any interface problems, once solved, would be spread over a large base, giving added support to such a method of procurement.

Recommendation

The several factors discussed above as warranting consideration in the procurement of ADP components from more than one source are all important. Pending issuance of more specific central policy guidance in the executive branch, we recommend that the heads of Federal agencies consider these factors in making their studies and reaching decisions on selection of ADP equipment.

ANTITRUST SUIT

The Attorney General of the United States, on January 17, 1969, entered a complaint against the International Business Machines Corporation (IBM), in the District Court of the United States for the Southern District of New York, charging violation of Section 2 of the Sherman Antitrust Act (15 U.S.C. 2). Among other charges, the complaint charges that IBM is pursuing a manufacturing and marketing policy that has prevented competing manufacturers of general purpose digital computers from having an adequate opportunity to compete for business. Section 2 of the complaint charges as follows:

> "(a) Maintained a pricing policy where by it quotes a single price for hardware, software and related support and, thereunder, (i) discriminated among customers by providing certain customers with extensive software and related support in a manner that unreasonably inhibited the entry or growth of competitors; and (ii) limited the development and scope of activities of an independent software and computer support industry as a result of which the ability of its competitors to compete effectively was unreasonably impaired;
>
> (b) Used its accumulated software and related support to preclude its competitors from effectively competing for various customer accounts;"

The possibility that IBM will change its marketing policy and the effect it will have on the other equipment manufacturers and the current method of acquiring complete ADP systems from main frame manufacturers as a result of the Justice Department's antitrust suit is a factor that cannot be fully evaluated at this time.

APPENDIXES

EXAMPLES OF ORGANIZATIONS USING

PLUG-TO-PLUG COMPATIBLE COMPONENTS

Following are examples of private organizations which have benefited through the use of plug-to-plug compatible ADP components. This information is based on interviews with data processing officials and examinations of selected records.

The following pages include examples of organizations that replaced original equipment rented directly from the system manufacturer or leased from a third party with plug-to-plug compatible components or rented or purchased from the plug-to-plug compatible component supplier or leased from a third party. The financial benefits of replacing the original ADP components were substantially different for each organization. However, to calculate the full financial benefit of replacing original rental units with purchased plug-to-plug compatible equipment, it would be necessary to determine, among other things, the projected use of the equipment, the residual value, the cost of money required to purchase, and the effect of the purchase on the corporation's tax liability.

It is not the purpose of this presentation to disclose private information of the listed organizations but rather to point out that substantial benefits did accrue to those organizations which procured plug-to-plug components to replace components originally obtained from system manufacturers. Accordingly, in the examples which follow we have limited our estimates of savings to the difference between rental prices or purchase prices of the equipment discussed.

American Airlines, New York, N.Y.

This company has four major computer systems in operation. These systems include the SABRE System at Briarcliff Manor, New York, one of the world's most advanced airline reservation services; a maintenance control system for monitoring and directing all maintenance activity at its Tulsa, Oklahoma, facility; another system at Kennedy International Airport which is used in selecting optimum jet flight plans; and, an administrative system in New York City which ties all of the systems together into a meaningful whole and provides the basis for an automated management information system.

Recently, on three of its four systems, the company undertook a program to replace sixty-two tape drives, which were leased from the manufacturer of the computer system, with plug-to-plug compatible tape drives produced by a peripheral manufacturer. The number of tape drives to

be replaced represents a commitment to the peripheral supplier to supply tape drives for which a plug-to-plug compatible model is available. Based on a comparison between the basic monthly lease price of the original unit and the replacement unit, we estimate that the company will realize annual savings in equipment leasing costs of about $82,000.

The system manufacturer's basic rental charge provides for a monthly usage of 176 hours per unit. For every hour of usage over 176 hours, an additional rental charge is assessed. The peripheral supplier's base rental charge contains no such limitation. Accordingly, should the company utilize the peripheral manufacturer's tape drives for periods in excess of 176 hours a month, additional savings will be realized.

We were advised that, prior to undertaking the replacement program, the peripheral supplier provided a tape drive to the company for its use and evaluation. On the basis of the results of 100 hours of operation, and because of the apparent savings to be realized through reduced monthly leasing costs, the company undertook a two-phase replacement program. The first phase provided for replacement of twenty-six tape drives at the administration center in New York City. After these become operational, the remaining thirty-six drives will become part of the systems at Briarcliff Manor, New York, and Tulsa, Oklahoma.

Company officials advised us that they have had two minor problems with the new tape drives. However these problems were easily remedied. Additionally, there was some apprehension originally on the part of company officials with regard to the use of separate maintenance personnel for the tape drives. The Manager, ADP Operations, informed us, however, that he believed that the dual maintenance responsibility could be managed effectively. Finally, we were told that in view of the potential savings, the tape drive replacement program was worth the effort.

American Cyanamid Company
Wayne, New Jersey

This company, with divisions and subsidiaries located throughout the world, is a leader in the manufacture and sale of agricultural and consumer products as well as pharmaceutical, chemical, and certain building products. Through its wholly owned subsidiary, Formica Corporation, it is the leading producer of plastic laminates for industrial and decorative purposes.

At the company headquarters in Wayne, New Jersey, the administrative and financial data processing center recently replaced a total of ten tape drives with plug-to-plug compatible models marketed by an independent peripheral manufacturer. These tape drives are all used on the same computer system and replaced ones that were originally rented from the system manufacturer. Company officials stated that

the basic reason for the replacement was to realize savings in monthly rental costs. We were also informed that depending on the performance of the new tape drives, consideration would probably be given to replacing the tape drives used on other computer systems at the data processing center. We estimate that the company will realize annual savings of about $36,000 in tape drive rental costs as a result of the replacement of the ten system manufacturer's tape drives with the plug-to-plug compatible models of the independent manufacturer.

A company official informed us that, when the new plug-to-plug compatible tape drives were installed, no serious difficulties were encountered. Moreover, operation of the peripheral manufacturer's tape drives did not, in his opinion, affect the system operating efficiency or throughput capacity. Operational capability and performance of the new tape drives were considered to be equal to that experienced with the system manufacturer's tape drives. As to maintenance, both the tape drive manufacturer and the system manufacturer provide on site customer engineers for their equipment. Although some initial problems were encountered due to lack of familiarity with the computer main frame by the peripheral manufacturer's customer engineer, we were informed that these problems were resolved and that the dual maintenance arrangement was satisfactory.

McDonnell Douglas Corporation
Douglas Aircraft Division
Long Beach, California

The Douglas Aircraft Division of this company is engaged primarily in the manufacture of DC-8, -9, and -10 commercial aircraft and of certain military aircraft spare parts. In support of these activities, Douglas operates a general-purpose computer center in Long Beach which utilizes 14 various computer systems to perform business and technical applications on both Government and contractor funded activities.

In November 1967 and January 1968, Douglas leased a total of 22 plug-to-plug compatible tape drives under a third party leasing arrangement. These units were obtained to replace 20 of the system manufacturers' tape drives which were connected to two of the computer center systems. The leasing of the replacement units from a third party resulted in an annual rental savings of $54,000 over the rental price charged by the system manufacturer for comparable units and also provided two units for standby support at a monthly charge of only $125 each for maintenance service. These savings do not take into consideration the California sales use tax and do not provide an allowance for extra use rental which had to be paid to the system manufacturer but is now avoided because of an arrangement for unlimited usage of the plug-to-plug compatible tape drives.

Douglas officials advised us that installation of the plug-to-plug compatible tape drives did not require any modification to the computer systems. In addition, we were advised that maintenance provided for the tape drives was comparable in quality to that provided by the system manufacturer.

General Electric Company
Missile and Space Division
Valley Forge, Pennsylvania

The Missile and Space Division of this company, headquartered at the Valley Forge Space Technology Center, Valley Forge, Pennsylvania, is a major Government contractor for various organizational elements of the Department of Defense and National Aeronautics and Space Administration. In support of its scientific and administrative operations, this division operates a multi-functional computer center located at King of Prussia, Pennsylvania.

On the basis of a cost study, this division instituted a program to replace a total of 29 rented magnetic tape drives used on three of its company-owned computer systems with plug-to-plug compatible tape drives provided by a peripheral equipment supplier. Of the 29 new tape drives, 17 units were purchased and the remaining 12 units were acquired on a rental basis. Company officials stated that the ultimate objective of this program was to maintain equal or better system efficiency and to take advantage of the economies to be realized by obtaining the replacement tape drives directly from a peripheral equipment supplier.

We estimate that the company saved about $311,000 in the initial price by purchasing 17 of the tape drives directly from the peripheral equipment supplier, instead of purchasing them from the system manufacturer. We also estimate that the company will realize annual savings in excess of $27,000 in rental costs for the 12 remaining units exclusive of the savings that may be realized in extra use charges. Additionally, we estimate that the company will realize annual savings in excess of $12,800 on maintenance costs for the 17 units purchased from and being maintained by the peripheral equipment supplier.

Company officials stated that only minor problems were encountered during the period of installation and acceptance testing for the tape drives acquired directly from the peripheral equipment supplier. Further, they believed that they have received good support through dual maintenance arrangements and stated that no serious problems have been experienced.

Missile and Space Division officials also advised us that details of the tape drive conversion project have been forwarded to other departments of the General Electric Company.

Johns Manville Service Corporation
Finderne, New Jersey

This company located in Finderne, New Jersey is one of five regional data processing centers which service some 70 Johns Manville operating locations handling in excess of 100 different product lines. Both accounting and statistical support is provided by the center's two large computer systems.

Because of company goals of reducing costs and improving performance, officials at the center initiated a program to replace six systems manufacturers' tape drives with faster plug-to-plug compatible units available from a peripheral equipment manufacturer. In addition to obtaining units with a 50 percent faster tape speed, we estimate that lower rental prices from the peripheral equipment supplier will result in an annual savings of $7,500.

Although use of the faster tape drives required modification of the tape drive controllers, we were advised that no other system changes were required and that operation of the new units was considered to be superior to those which they replaced. Since the new units are being rented, maintenance is being performed by the supplier. Johns Manville officials stated that no problems had been encountered with this type of maintenance arrangement.

Lockheed - California Company
Division of Lockheed Aircraft Corporation
Burbank, California

This company is primarily engaged in the manufacture of the L-1011 Airbus, Army helicopters, Navy anti-submarine warfare aircraft, and other aircraft. In support of these activities, the company has eight computer systems in operation which are used for business and technical applications related to both its Government and private work.

In 1967 the company entered into a five year, third-party leasing arrangement for 32 plug-to-plug compatible tape drives produced by a peripheral equipment manufacturer. Company officials reported an annual cost reduction of $129,000 as a result of the replacing of 31 of the system manufacturer's units with 32 of the peripheral manufacturer's plug-to-plug compatible units. In addition, the company has the added benefit of an extra tape unit which is used as a standby unit.

Prior to acquiring the units, the company developed a comprehensive evaluation and acceptance test procedure which was used to evaluate the performance of the tape drives during a 5-day acceptance period provided by the peripheral manufacturer. Company officials stated that connection of the new tape drives did not require any modifications to the computer hardware or software. They further stated that the new tape drives have had no significant effect on the computer system capabilities or performance, and that system downtime did not change significantly as a result of installing the plug-to-plug compatible units. We were also informed that the company is considering acquiring additional plug-to-plug compatible units to replace other system manufacturer's units.

As to maintenance, the independent tape drive manufacturer maintains his equipment and the system manufacturer maintains the balance of the equipment. The decision to have each manufacturer maintain his own equipment was based on the belief that each manufacturer could best maintain

his own equipment. Company officials advised us that the independent tape drive manufacturer's maintenance service is comparable to that provided by the system manufacturer.

Long Island Lighting Company
Hicksville, New York

This company is a large gas and electric utility which services about 730,000 customers. At the company's Hicksville, New York, data processing center, there are five computer systems of varying size which are used to maintain customer accounts and perform various administrative functions.

In 1968, the company replaced twelve magnetic tape drives used on one of its company-owned computer systems with plug-to-plug compatible models available from a peripheral equipment supplier. The original tape drives were rented from the computer system manufacturer and were replaced by the company because of (1) the apparent savings in monthly costs and (2) the opportunity to replace six of the tape drives with more advanced models and still achieve an overall savings in monthly rental costs. The manager of the data processing center informed us that they decided to initially rent the new tape drives and after reliability of the units was established the company exercised an option to purchase contained in the rental agreement.

We estimate that the company realized savings in excess of $200,000 in the purchase of these tape drives from the peripheral equipment supplier.

We were also informed that the company has entered into an agreement to rent from the peripheral equipment supplier two additional tape drives for another of its computer systems. These tape drives, in addition to providing a monthly savings in rental costs of about $150, will provide management with data on which to evaluate the possible replacement, at additional savings, of the remaining tape drives now in use on this and on another computer system.

We were informed that the magnetic tape drives obtained from the peripheral equipment supplier were installed without any modifications to the computer system and are considered to have performed at a level equal to or better than the replaced equipment. We were also informed that the maintenance provided by the peripheral equipment supplier was equal to that previously provided by the computer system manufacturer and that no significant problems had been experienced due to the dual maintenance arrangement.

The Reader's Digest Association, Inc.
Pleasantville, New York

At its corporate headquarters in Pleasantville, New York, the Reader's Digest Association operates 11 automatic data processing systems for the administration of magazine and book subscriptions. With a magazine circulation in excess of 17 million copies per month, much of the work at the data processing center consists of customer account

maintenance, preparation of address labels, and the printing of personalized advertisement material.

The company recently contracted with a peripheral equipment supplier for the rental of five plug-to-plug compatible tape drives which are to be used in conjunction with three of the data processing systems in operation. We were informed that the determining factors which led to the decision to use the plug-to-plug compatible tape drives were (1) their technical superiority as compared to the system manufacturer's units and (2) the savings in rental costs which we estimate to be about $12,000 per year.

Corporate officials also informed us that they are installing a plug-to-plug compatible disk storage drive which will replace a unit rented from the computer system manufacturer. In addition to reducing annual rental costs by an estimated $1000, the replacement unit is expected to increase the efficiency of the system because of faster access speed to the stored data.

Company personnel stated that no modifications to the computer systems were required in order to install the plug-to-plug compatible tape drives and that no difficulties had been encountered as a result of splitting the maintenance responsibility between different maintenance personnel. The experience in terms of performance of these units as compared with the performance of the units replaced, is not yet definitive.

A major industrial corporation

During our review we visited one of the largest industrial corporations with headquarters on the East Coast which operates a data processing center and offers computer power to all within the corporation. In this case, we are respecting the wishes of this major corporation for anonymity. The data processing center uses 18 computer systems to process administrative, statistical, engineering, and technical data for all operating divisions within the corporation. Included in these 18 systems are first, second, and third generation equipment, some of which is rented, some is under leaseback agreement, and one is company-owned.

We found that the data processing center has within the past two years replaced 12 magnetic tape drives rented from the computer system manufacturer with units purchased from a peripheral equipment manufacturer. These units are used with a first generation computer that is company-owned. Management of the installation stated that this replacement was made to take advantage of potential savings in equipment costs. We estimate that the corporation involved saved about $240,000 by purchasing these new units from a peripheral equipment supplier rather than from the computer system manufacturer.

Management stated that several power and timing modifications were

required on the replacement units since this was the peripheral equipment manufacturer's first experience at interfacing its tape drives with a first generation computer system. However, they further stated, that subsequent to the "shakedown period" the replacement tape drives have performed satisfactorily and that no significant problems have been experienced with the administration or performance of having maintenance done by the computer system manufacturer and the tape drive manufacturer.

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C 20548

B-164462

SEP 19 1968

Dear Mr. Chairman:

This is in reply to your letter of December 18, 1967, requesting that we investigate certain points raised in a letter dated December 8, 1967, from the Honorable William B. Widnall concerning testimony given to the Subcommittee on Economy in Government on November 30, 1967, by Mr. Lewis R. Caveney of the Bryant Computer Products Division of Ex-Cell-O Corporation. Specifically, it was suggested that we (1) substantiate the illustration presented by Mr. Caveney to the Subcommittee which showed that, if the Government had procured a computer system on the basis of buying from peripheral manufacturers rather than from one system manufacturer, the savings to the Government would have amounted to $429,250 and (2) study computer procurements in both the General Services Administration and the Department of Defense to determine what savings could accrue to the Federal Government by direct procurement of peripheral parts of computer systems from peripheral manufacturers.

During our review of the details of the Mr. Caveney's illustration, we found that the peripheral manufacturer (Bryant Computer Products) does not publish a complete price list. Instead, a price is quoted for each installation, depending upon the amount of work involved in connecting the equipment to the computer manufacturer's system. We found that, in connecting a complex piece of equipment like a memory system to a computer manufacturer's system, it was necessary for the peripheral manufacturer to provide for the proper electronic interface between the equipment and the computer system or that it might be necessary to provide other arrangements to achieve this objective. Also, it might be necessary for the peripheral manufacturer and/or the user to complete the required modification to existing computer programs. This might involve reprogramming of the computer's control system to allow the computer to properly address and extract information from the memory system.

We were advised by Bryant Computer Products that the price quoted in its illustration did not include the additional software costs necessary to have a complete memory subsystem. Diagnostic programs used to test the equipment will be required if changes to a standard

operating system are involved or if it is necessary to reprogram the computer's control system. We were advised also that preparation of these programs might be subcontracted to Bryant or to independent software companies; or they may be written by the user of the system. It therefore is apparent that the savings claimed in the illustration were based on a comparison between the system manufacturer's price for a particular item of the equipment and the independent peripheral manufacturer's price for that item. However, the savings computed in this manner do not take into account (1) the additional software costs necessary to fit the peripheral manufacturer's component into the system and (2) other factors which are discussed below and which could result in additional costs.

As to the savings that could accrue to the Federal Government by direct procurement of peripheral parts of computer systems from peripheral manufacturers, we pointed out in our report to the Congress on "Maintenance of Automatic Data Processing Equipment in the Federal Government" (B-115369, April 3, 1968) that there was a possibility for Government agencies to achieve significant savings or other benefits through direct procurement of certain computer components and spare parts from original manufacturers or alternative sources of supply rather than to rely on sole-source procurement from computer manufacturers. To demonstrate the savings available, the report showed that the United States Fleet Numerical Weather Facility had saved $475,200 as a result of two negotiated procurements of drum-storage devices and related controllers from the actual manufacturer of the components and parts. These procurements were made in order to add additional components to an existing computer system and thereby increase operating capacity. We believe that this illustration points out a need for additional study and consideration of independent peripheral manufacturers as a source of supply for selected procurements. However, computer components have not been standardized, in general, to the point where one manufacturer's component can be directly utilized in conjunction with another manufacturer's component or system. Therefore, possible savings and other benefits from procurement from peripheral manufacturers must be evaluated in light of the following factors:

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--The acceptance by the user of complete responsibility for software and hardware operation. Guarantees previously offered by the system manufacturer may not be available.

--The responsibilities of both the peripheral manufacturer and the user for necessary electronic and computer program modifications. If the user is to be responsible for the software interface, consideration must be given to the cost for undertaking such a task or contracting it out to a software company.

--The additional costs that may be required in the future to provide for improvements to the software operating system. Since the user's system will be operating with a nonstandard software system, improvements will have to be either developed by the user or adapted from improvements offered by the system manufacturer.

--The amount of technical support, education, and training that will be available if not all components are supplied by the system manufacturer.

--The effect on operations and costs as a result of dual maintenance agreements if the system manufacturer will not accept maintenance responsibility for components not provided as part of his system.

--The effect on operating efficiency and throughput capacity as a result of use of a peripheral manufacturer's component.

--The effect on system compatibility and standardization relative to other systems operated by the user.

--The ultimate effect on the pricing of components by the large system manufacturers.

Public Law 89-306 provides exclusive authority to the General Services Administration (GSA) to procure all general-purpose automatic

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data processing (ADP) equipment and related supplies for use by Federal agencies. Although GSA negotiates the ADP equipment contract terms and conditions, each agency is responsible for selecting the best system or equipment necessary to meet its needs.

Generally Federal agencies select a computer system on the basis of procuring all equipment from a single systems manufacturer. For example, the Air Force EDP Equipment Office, which is responsible for evaluating and selecting computer systems for the Air Force, does not, as a standard practice, directly solicit offers from peripheral manufacturers, but requires the system vendor to act as a prime contractor for the entire system. The peripheral manufacturers, therefore, under the standard practice, bid their equipment through or with a systems manufacturer who will be responsible for the entire computer system. This is the case even in those instances where independent manufacturers market peripheral components which are directly interchangeable with the equivalent computer manufacturers component. We did find during our study of peripheral manufacturer's products a number of instances where directly interchangeable components were available at a price substantially less than the price charged by the computer manufacturer for its comparable component.

Because benefits can accrue to the Government by acquiring certain components from independent peripheral manufacturers, we are preparing a more complete report to the Congress on this subject.

Please advise us if we can be of further assistance or if our representatives can provide you with additional details. We plan to make no further distribution of this report unless copies are specifically requested, and then we shall make distribution only after your agreement has been obtained.

Sincerely yours,

Comptroller General
of the United States

The Honorable William Proxmire, Chairman
Subcommittee on Economy in Government
Joint Economic Committee
Congress of the United States

U.S. GAO, Wash., D.C.

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

STUDY OF THE ACQUISITION OF PERIPHERAL EQUIPMENT FOR USE WITH AUTOMATIC DATA PROCESSING SYSTEMS

B-115369

D I G E S T

WHY THE REVIEW WAS MADE

The General Accounting Office (GAO) performed this study because of:

--Preliminary indications that significant savings could be achieved in the procurement of selected computer components.

--The increasing investment of the Federal Government in automatic data processing (ADP) equipment.

--The widespread congressional interest in the procurement, management, and use of such equipment.

FINDINGS AND CONCLUSIONS

Recently, numerous independent manufacturers of peripheral equipment--magnetic tape units, disk storage drives, etc.--have made a concentrated effort to compete with the systems manufacturers and to offer selected items of equipment directly to users.

The study shows that it is common practice for Government ADP managers to obtain all required ADP equipment from computer systems manufacturers even though certain items of equipment can be procured more economically from the original manufacturers or from alternate sources of supply.

GAO identified selected computer components that are directly interchangeable (plug-to-plug compatible) with certain other systems manufacturers' components and are available at substantial savings.

GAO found that a number of private organizations had installed available equipment of plug-to-plug compatibility and had achieved substantial savings. Yet it found only a few instances where Federal agencies had availed themselves of this economical means of acquiring computer components. Central agency leadership

could provide impetus which would achieve similar savings in the Federal Government. The General Services Administration (GSA) has recently started a test to determine the possibilities of achieving savings by using equipment of plug-to-plug compatibility.)

On the basis of observations at commercial organizations visited during the study, GAO believes that the acquisition of plug-to-plug compatible components for ADP systems, either in operation or on order, provides an opportunity for Federal agencies to achieve significant savings in costs, an objective which is in line with the President's program of cost reduction in the Federal Government.

GAO believes that, if more systematic attention is given to acquiring non-plug-to-plug components by the executive branch of the Federal Government, significant savings also can be achieved.

GAO estimates that, if plug-to-plug compatible components were used to replace similar components rented by the Government, annual savings would be at least $5 million. If such components were to be purchased, savings would exceed $23 million. (See p. 19.)

GAO believes that, in addition to the estimated savings in acquiring plug-to-plug compatible components, savings are also available in the acquisition of non-plug-to-plug components from sources other than the systems manufacturers.

It is estimated that the purchase cost of such components, now being leased for about $50 million, from the systems manufacturers would be about $250 million; whereas the acquisition price for similar components from an alternative source of supply probably would be about $150 million, a difference of about $100 million. (See p. 27.)

GAO suggests, however, that the potential savings must be evaluated in light of costs associated with combining the components into a total computer system.

RECOMMENDATIONS OR SUGGESTIONS

GAO recommends that the head of each Federal agency take immediate action to implement steps requiring replacement of leased components that can be replaced with more economical plug-to-plug compatible units.

GAO recommends also that the Director, Bureau of the Budget, and the Administrator of General Services provide more specific guidelines for the evaluation and selection of plug-to-plug compatible equipment and for other components.

GAO recommends that, pending the issuance of specific policies, the factors described in this report be used by Federal agencies to evaluate alternate sources of ADP equipment.

Also, inasmuch as third-party leasing arrangements generally result in savings when compared with rental arrangements available from equipment manufacturers, GAO believes that the head of each Federal agency should consider this method of procurement when purchase of the equipment is determined not to be advantageous.

AGENCY ACTIONS AND UNRESOLVED ISSUES

The use of plug-to-plug compatible components for Federal ADP equipment is currently being studied by the General Services Administration. Present plans call for GSA to study also the acquisition of other components and peripheral equipment from alternate sources at a later date. GAO believes the GSA study to be important and that it should be accelerated to provide a basis for promulgating more specific policies for the guidance of Federal agencies in obtaining ADP components from the most economical source of supply.

MATTERS FOR CONSIDERATION BY THE CONGRESS

This report summarizes the findings of the study and is issued to inform the Congress and the head of each Federal agency of the opportunities for obtaining savings when acquiring computer components from sources other than the ADP systems manufacturers.