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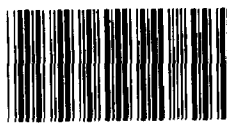
UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

GENERAL GOVERNMENT
DIVISION

MAR 27 1981

B-202584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Mrs. Stella Hackel Sims
Director, Bureau of the Mint
Department of the Treasury

Dear Mrs. Sims:

Subject: Opportunities Still Exist to Better Use the Mint's Data Processing Center (GGD-81-64)

This report is the result of our review of the Bureau of the Mint's automatic data processing center in San Francisco, California. As you know, the data center serves not only the Mint but other Treasury bureaus and Federal agencies as well. We made our review at the center and the Mint headquarters in Washington, D.C., by analyzing computer utilization records and interviewing various management personnel to evaluate how well the Bureau's data processing resources are managed.

We found that utilization statistics for the data center's computer system are not being interpreted or used correctly so that management is not accurately informed as to how much processing capacity exists. As a result, the computer is not being used to its full potential. At the current rates being charged to non-Mint users, this unused capacity represents a loss in annual billings of over $1 million. More importantly, the possibility exists that other agencies may be incurring unnecessary costs for data processing equipment or services when the Mint's facility could be used to meet their requirements.

We also found that, on the basis of its present use, the data center has excess peripheral devices. On the basis of the utilization data we analyzed, we believe that some of this equipment would still be excess to the center's needs, even if the computer were used to its full potential. However, exactly how much of this equipment is or would be unnecessary cannot be determined until the center better monitors computer performance as recommended by previous studies. Procedures to do so should be the basis of a systematic, coordinated, and comprehensive program to better assess the center's workload, increase the resources made available to other agencies, and better justify equipment acquisitions.

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BETTER PERFORMANCE MEASUREMENTS ARE NEEDED FOR MORE PRODUCTIVE USE OF THE MINT'S COMPUTER

Inaccurate measurement of the computer's workload has resulted in Mint officials not realizing how much data processing capacity still exists at the data center. Although Bureau management is under the impression that it is almost fully utilized, we found that about 40 percent of the computer's potential is unused. This capacity represents a significant opportunity for savings to the Federal Government through increased sharing of the data center's facilities with other agencies. To realize these savings, the Mint should make a more detailed analysis of computer usage and use the information on available capacity as a basis to actively solicit additional users.

Computer utilization figures are misleading and incorrectly used

In 1975 the Mint's computer facility installed a commercial software package to collect utilization statistics and other accounting data. The package prepares periodic reports and monthly summaries used by the facility in billing non-Mint users. Although the accounting package could provide information to better manage the facility, the data is not being properly analyzed or interpreted. This has resulted in the Mint believing that the computer is approaching full utilization when in fact the current workload could almost be doubled.

The computer utilization data compiled at the center is relayed to Mint Headquarters without adequate analysis or explanation so that management at that level does not have a clear picture of the center's workload. This misinformation, in turn, has been passed on to the Congress. For example, in testimony before congressional appropriations committees in 1980, Mint officials reported that:

--The current average monthly Central Processing Unit (CPU) utilization rate of the IBM 370/155 was approximately 65 percent. An additional 5-percent increase was anticipated with completion of the spare parts and strip inventory control systems, the financial management information system, and the gold medallion and order processing program.

--This utilization rate increased to between 70 and 80 percent during the Numismatic Coin Operation System (NUCOS) processing cycles when run with the Treasury Payroll/Personnel Information System (TPPIS).

--The utilization rate actually approached 100 percent for short periods during peak processing times.

These statements, however, do not accurately reflect computer usage at the data center.

We reviewed the computer utilization data collected by the center for the 1-year period of March 1979 through February 1980 and found that the monthly average rate ranged from 52 to 65 percent, for a yearly average of 58 percent. The 65-percent figure cited in the testimony refers only to CPU utilization for January 1980. We also found that, as NUCOS is processed biannually, the Mint's computer utilization would increase to between 70 and 80 percent only twice a year. Furthermore, the only occasions when computer use approaches 100 percent is during slack periods when a special software package is run to monitor the efficiency of various applications. The package automatically uses almost all of the computer's excess capacity even though no actual processing of data is done.

Computer utilization statistics can often be misleading. Special care must be taken so that the significance of the data is fully explained and evaluated. The data that is collected also has to be carefully analyzed as to exactly what is being measured. Notwithstanding the problems we found with how computer utilization data is reported, our major concern is with the measurements themselves. These measurements are not being interpreted correctly, resulting in misleading information.

The interpretations used by the Mint do not accurately represent computer usage because they do not reflect the total time the computer is available for processing. Instead, the percentages reflect the time the computer was in an active state although not actually processing data. The time that the computer system was idle--available for processing but waiting to be used--is not accounted for.

To illustrate, the following table contains two different computer utilization measurements for October 1979, the busiest month of the 1-year period ending in February 1980 that we reviewed. Only one of the measurements, the higher, is used by the Mint.

		Hours the computer was actually processing	Percent busy
Hours the computer was active	549	341	62
Hours the computer was available for processing	672	341	51

For the entire 12-month period ending February 1980, the Mint's computer utilization statistics showed the average monthly use to be 58 percent. If the total time the computer was available is considered, the average utilization rate for these 12 months was 46 percent. Thus, there was considerably more unused computer capacity at the data center than the Mint's management believed.

The Mint's computer is still underutilized

Because Mint officials are unaware that the Bureau's computer is not fully utilized, surplus capacity still exists. We have previously reported on this problem ("Opportunities for Improving Computer Use in the Mint" FGMSD 75-19, March 20, 1975). We pointed out that several of the uses originally considered for the computer had never been implemented and that, consequently, the Mint was then using only one-third of the computer's capacity. We recommended that the Mint seek ways to productively use its excess computer capacity, including making this excess available to other Federal agencies through the ADP Sharing Program.

Although the Mint agreed with our recommendations and has solicited some outside users, the computer can still support considerably more activity. The Mint's computer is capable of performing several applications and is able to perform satisfactorily at a utilization rate of nearly 100 percent. However, to account for unexpected downtime, equipment constraints, or other problems that may occur, we believe a realistic utilization level is 85 percent. As previously mentioned, our analysis of 1 year's utilization statistics shows that the computer was actually functioning only 46 percent of the time that it could have been when the data center was open. Consequently, almost 40 percent more of the computer's capacity could be used and still provide a 15 percent contingency factor for emergencies as well as allow for scheduled downtime for preventive maintenance. We estimate this unused capacity represents a loss in excess of $1.2 million in annual billings to non-Mint users at the current rate being charged.

The Office of Management and Budget has recently directed that all executive agencies, to the maximum extent possible, share their excess data processing capacity with other agencies (Circular A-121, Sept. 15, 1980). Although some attempts have been made in the past, the Mint's efforts to acquire additional users for its computer have not been as aggressive as possible--possibly because no one was aware of the extent to which excess capacity existed. The current method consists primarily of informal telephone conversations with the General Services Administration or with potential users who have been referred to the center. As was pointed out in our 1975 report, the ADP

Sharing Program can be a convenient vehicle for identifying new users for the Mint's facility. The Bureau could make more active use of the program by contacting other agencies on its own and assuring that the General Services Administration is notified on a continuing, periodic basis as to the computer's availability

There are other alternatives the Bureau could consider. For example, the Mint could explore the possibility of finding other users from within the Department of the Treasury on a more permanent basis. If additional users still cannot be found, consideration could be given to replacing the Mint's present data center with a facility more suited to its needs. In any event, any decision should be based upon a carefully documented analysis of the Bureau's data processing needs and the computer capacity required for these needs.

THE MINT'S DATA CENTER HAS MORE PERIPHERAL DEVICES THAN IT NEEDS

The Mint's computer has 8 tape drives and 32 disk devices to store and process data. This equipment is in excess of the Mint's current needs and results in unnecessary maintenance costs Even if an additional 40 percent of the computer capacity were used, as discussed previously, we believe the Mint would still have excess disk devices. However, exactly how many would be unnecessary cannot be determined until the management of these devices is improved.

Several years ago the Mint contracted with the Federal Computer Performance Evaluation and Simulation Center (FEDSIM) to review the data center's operations, measure the level of utilization, and identify constraints to improved performance of the computer. Their November 1978 report found the data center's utilization of tape drives to be low. FEDSIM found that during the shift with the heaviest workload, each tape drive was in use only an average of 19.6 percent of the time, or less than 12 minutes per hour. Furthermore, there were no instances of all the tape drives being in use simultaneously. In fact, three tape drives were never used during the time period studied by FEDSIM. In an effort to increase the use of the tape drives, the data center requested users to specify tape in lieu of disk space for their applications.

We did not duplicate the tests FEDSIM performed. However, our analysis of the limited data that was available at the data center shows a strong indication that the use of tape drives is still essentially the same as that FEDSIM found. From March 1979 through February 1980, the computer was active a total of 5,804 hours. Since there are 8 tape drives, there were 46,432 hours (5,804 multiplied by 8) that tape drives could have been used. However, the drives were used only a total of 10,577 hours, or 22.7 percent of the time that was available. Similarly the use of individual tape drives varies considerably. For examp during the busiest month of the 1-year period, half of the tape

drives were used less than 25 percent of the time the computer was active. The busiest tape drive was used only slightly more than half the time the computer was active.

The FEDSIM study also concluded that the data center had more than an adequate number of disk devices. At that time there were 24. The report noted, however, that FEDSIM could not address the question of how efficiently the capacity of each disk was used since the center's customers were responsible for storing data on the disks. Consequently, the possibility existed that the number of disk devices could be reduced if users were to share disks. To facilitate disk sharing, FEDSIM recommended that the data center acquire a software package that would automatically assign space on the disks and thus assure they were better managed. The Mint, however, has not acquired the package. In fact, the data center increased the number of disk devices by 8, from 24 to 32, soon after the report was issued.

Because the Mint's computer has the potential to use the same disk concurrently for more than one job, it is not appropriate to measure the total capacity of all of the disk devices as we did for the tape drives. However, we found that the utilization of individual disk devices is--like the tape drives--low. As the following table shows, from June 1979--when the data center had all 32 disk devices installed--through February 1980, almost half of the devices were used only 10 percent or less of the time the computer was active. Use of the remaining devices varied greatly.

Number of disk devices in each percentile	Disk device usage as a percent of computer active time
15	10 or less
1	11 - 20
1	21 - 30
0	31 - 40
7	41 - 50
2	51 - 60
4	61 - 70
2	71 - 80
0	greater than 81
Total disks 32	

Our analysis of tape and disk use over a 1-year period shows that the Mint has sufficient peripheral equipment to easily absorb the almost doubled workload which would result from the increased use of the computer's central processing unit. We believe that even with such an increase the data center would still have more disk devices than necessary. An increase in computer utilization would not necessarily result in a proportional increase in tape or disk use, since this is a function of the kind of job being run. However, for purposes of illustration, a 100-percent increase in the use of tape drives would still result in the drives being

used only 36 percent of the time available. Similarly, a 100-percent increase in disk device utilization would still result in half of them being used only 25 percent or less of the time the computer was available.

Although the data center's tape drives and disk devices are owned by the Mint, each drive and device costs about $1,900 and $1,000 a year, respectively, to maintain. Some of these costs could be avoided if the data center limited itself to the amount of equipment necessary for its workload. Moreover, the possibility exists that other Government agencies could avoid the expense of renting or buying such equipment by acquiring the Mint's excess tape drives and disk devices. However, the exact number of excess devices that currently exists, or would remain if the workload were increased, cannot be determined until a study is made of how efficiently data is being stored on the tapes and disks. As the FEDSIM report noted, such a study would be greatly facilitated by a software package for automatic disk space management. As of yet, no action has been taken on FEDSIM's recommendation.

CONCLUSIONS

Incomplete and inaccurate computer utilization measurements have caused Mint officials to believe the data center was functioning at close to full capacity. In fact, the computer can accommodate almost twice its present workload. In addition, the center has excess peripheral equipment for the computer so that unnecessary costs are incurred to maintain it. Both of these problems have a common cause. The Mint is not collecting the performance data necessary to assess the computer's workload, evaluate its efficiency, and determine what additional equipment is or is not necessary to support it.

Increased sharing of the Bureau's computer with other Government users would assure that expensive equipment is being productively used and alleviate the possibility of agencies incurring costs to acquire data processing capability already available. Similarly, the Mint should determine how much peripheral equipment its computer requires and take the appropriate measures to dispose of what is not necessary. This will save money for the Bureau by reducing maintenance expenses as well as reducing the cost to other agencies who could acquire the Mint's excess equipment.

RECOMMENDATIONS

We recommend that the Bureau of the Mint:

--Assure that the San Francisco data center is performing as efficiently and effectively as possible by making certain that the necessary performance and utilization measurements are collected and properly interpreted.

--Use this information as a basis for a computer performance management program to furnish periodic reports to management at the center and Mint headquarters on the extent to which data processing capacity is available and computer equipment is being used.

--On the basis of the information provided by the performance management program, try to ensure that the Mint's data processing capacity is fully utilized and that the data center's computer equipment is commensurate with its needs.

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We discussed our findings with Mint officials, including the Deputy Director and the Chief of the Data Center who generally agreed with our recommendations and our observations that the center could support additional work.

The Chief of the Data Center, however, disagreed as to the extent of computer underutilization. He pointed out that tests taken with more sophisticated monitoring devices during a recent 3-week period showed that the center was using most, if not all, of its computer capacity. In discussing these tests further with him and others, we learned that the reported high utilization was for one 10- or 12-hour period during the 3 weeks in which the computer monitoring devices were installed. High utilization readings for such a short term do not show overall computer utilization because workloads fluctuate. Short-term tests, such as the one cited by the Chief, are valuable for pinpointing specific performance problems; however, since they do not show overall computer utlization, they cannot be used to determine if computer resources are being used efficiently over a long period of time.

The Chief of the Data Center also said the accounting data we used was inappropriate for measuring computer utilization. We disagree. The accounting data that we used is appropriate--and is typically used in the computer industry--to obtain information on long-term computer utilization. Also, as we point out above, the current accounting system was designed to provide and is capable of providing a great deal of information about the computer's utilization and performance.

The Chief agreed that there was an urgent need to review disk device utilization, but he said that current funding limitations precluded the acquisition of a disk space management system as recommended by FEDSIM. In our opinion, the acquisition of a disk space management system would help improve disk device use because of its greater capability to better utilize disk storage space. Indications are that installation of such a system would result in reducing the number of disk devices through more efficient use of disk storage space because even with the current practice of allowing each job a separate disk, the devices are still underused.

We commend the initiative shown by the Chief in assessing the center's computer capacity and his desire for improved disk space management. We believe these initiatives should be made part of an overall program to systematically assess the computer's capability and to use that capability more fully as we have recommended above.

Copies of this report are being sent to the Secretary of the Treasury, the Director of the Office of Management and Budget, and interested congressional committees. We would appreciate being advised of any actions you plan to take on the matters discussed in this report.

Sincerely yours,

W. J. Anderson

William J. Anderson
Director