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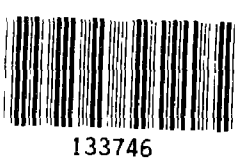
Report to the Secretary of the Navy

August 1987

ADP ACQUISITION

Navy Has Not Justified an Additional PERSPAY Computer



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United States
General Accounting Office
Washington, D.C. 20548

Information Management and
Technology Division

B-221554

August 21, 1987

The Honorable James H. Webb
The Secretary of the Navy

Dear Mr. Secretary:

This report addresses the Navy's requirements and justification for acquiring an additional mainframe computer for its personnel and pay systems consolidated computer center project, known as PERSPAY. We performed this evaluation to follow up on two prior GAO reports.[1] PERSPAY is a Navy initiative to place automatic data processing operations for the Navy's military personnel and payroll applications in one location in Cleveland, Ohio. Previously, these applications were processed separately in Washington, D.C., and Cleveland. Preliminary Navy plans call for PERSPAY to be followed by PERSPAY II around March 1990. With the PERSPAY II acquisition, which will cost an estimated $108.6 million, the Navy plans to totally replace the Cleveland data center's computer equipment, rewrite the computer programs for the personnel and payroll applications, and possibly integrate these two applications.

In January 1984, the Navy awarded a $39.8 million contract for PERSPAY to International Business Machines Corporation (IBM), for three large mainframe computers currently installed at the Navy's Consolidated Data Center in Cleveland. The contract, which expires in March 1990, also included an option for a fourth computer for the Data Center. The estimated installation and life-cycle costs[2] for the additional computer are $2.6 million and $3.7 million, respectively.

The Commanding Officer, Navy Finance Center, indicated the computer option may be exercised in the near future. Data Center officials contend that the anticipated increased use of fourth generation languages and interactive processing, future use of a data base management system, and provisions for mobilization and disaster recovery would require additional data processing capacity, thus the need for the fourth computer. Yet, the Center has not conformed to federal information resources management regulations which require that a comprehensive requirements analysis be made prior to a computer acquisition. Instead,

[1] ADP Acquisitions: Information on Navy's Personnel and Pay Computer Project (GAO IMTEC-86-6FS, January 23, 1986) and ADP Operations: Consolidation of Navy's Personnel and Pay Computer Resources (GAO-IMTEC-86-11BR, March 27, 1986).

[2] Includes hardware purchase, hardware maintenance, software licenses, and software support costs over the computer's estimated 5-year life.

the Data Center used a straight-line projection of historical computer utilization data to demonstrate that present capacity would be insufficient for meeting users' needs in the future. In our opinion, forecasting future work-load growth solely on past experience offers no assurance that the historical work load will accurately reflect future requirements, and, by itself, does not constitute an acceptable requirements analysis.

Also, we found that, although required to do so under federal information resources management regulations, the Data Center had not adequately considered cost-effective alternatives for satisfying its stated need for additional computer capacity. Less costly options to purchasing a computer might include reducing or restricting the significant amount of computer software development and testing (over 50 percent of the Data Center's work load) that is currently being done. Analysis of options along these lines is important because the software development and testing work load may consume inordinate amounts of critical resources, such as input/output channels and memory. The characteristics of the production work load relative to the software development and test work load may lend itself to separating these work loads and placing them on different processors, the end result of which could be more effective use of total available computer resources.

Data Center officials acknowledged the need to better define, document, and relate present and future processing requirements to capacity planning and have several initiatives under way to improve their requirements analysis and capacity planning capabilities. These include (1) issuing a strategic planning guide that describes several management information systems which will help quantify work-load and other data, rather than relying on best-guess estimates for future requirements, and (2) sending out a "data call" to measure changes in customers' processing requirements over the next year. However, except for the recent data call, the benefit of the Data Center's initiatives is still 1 or 2 years away.

In our opinion, the Navy should accurately assess its future requirements before exercising the PERSPAY option, for two reasons. First, a multimillion dollar commitment for an additional computer should not be made unless there is a base of solid information on which to make an informed decision. Second, it is possible that a less costly, interim solution could be found if the Data Center conducted the required alternatives analysis.

To ensure that the Data Center's computer needs are met without making unnecessary expenditures, we recommend that the Secretary of the Navy direct the Commanding Officer of the Navy Finance Center to do the following:

- Not exercise the option to procure an additional computer until a comprehensive requirements analysis is completed. This should include identification, quantification, and validation of present and future work loads.
- Attempt to satisfy the Data Center's computer capacity requirements, until the PERSPAY II procurement, by exploring less costly alternatives. Specifically, the Center should explore those alternatives required by federal regulations, and other options, such as shifting test work loads to free computers during peak hours.

We conducted our review at the Navy Finance Center's Consolidated Data Center in Cleveland, Ohio, where work-load and related data concerning the PERSPAY additional computer decision were being compiled. We also interviewed Data Center officials who were involved with evaluating, justifying, recommending, and buying data processing equipment for use at the center. (Appendix I provides additional detail on our objectives, scope, and methodology; appendix II presents our findings.)

We performed our review in accordance with generally accepted government auditing standards. To solicit the views of responsible officials within the Department of Defense, we provided them with a draft copy of this report and allowed 30 days for receipt of comments on the report's findings, conclusions, and recommendations. Because Defense did not provide written comments within this time period, we have not included a copy of their comments in this report. However, we did obtain official oral comments on a draft of the report. Defense generally concurred with our findings, conclusions, and recommendations and has initiated actions to implement the recommendations. We have recognized and addressed their comments, where appropriate, within the text of this report.

We are sending copies of this report to the Secretary of Defense; the Director, Office of Management and Budget; and interested congressional committees and subcommittees. We will make copies available to others upon request.

Sincerely yours,

Ralph V. Carlone

Ralph V. Carlone
Director

Objectives, Scope, and Methodology

The objectives of our review were to (1) determine the status of the Navy's decision to exercise the PERSPAY contract option for acquiring another computer for the Consolidated Data Center; (2) assess the process the Data Center used to define and validate its requirements; (3) determine the cost of the additional computer; and (4) identify alternatives pursued by the Data Center in lieu of acquiring the optional computer.

To meet our objectives, we interviewed Data Center officials involved with evaluating, justifying, recommending, and procuring automatic data processing equipment for use at the Data Center. We collected pertinent capacity planning, computer utilization, and work-load analyses and statistical forecasting data compiled by the Data Center. Our analyses of these data, along with our review of government automatic data processing acquisition regulations, enabled us to assess the Data Center's rationale and justification for additional computer capacity.

We also interviewed Data Center officials to determine the extent to which alternatives other than acquisition had been considered for meeting the data processing requirements of Data Center customers. In addition, we reviewed the PERSPAY contract and cost records to substantiate the cost of the additional computer.

Our review was conducted from August 1986 through May 1987 at the Navy Finance Center's Consolidated Data Center in Cleveland, Ohio. As part of our review, we requested but did not receive, within the 30 days allowed, official written comments from the Department of Defense on the findings, conclusions, and recommendations contained in this report. However, we did obtain official oral comments on a draft of the report. Defense generally concurred with our findings, conclusions, and recommendations. We have recognized and addressed their comments, where appropriate, within the text of this report.

Navy's PERSPAY Project

Historically, the Navy Finance Center in Cleveland, Ohio, and the Naval Military Personnel Command in Washington, D.C., had operated separate computer centers to support their respective military payroll and personnel data processing requirements. This changed, however, in 1979 when the Navy established the PERSPAY project to consolidate the two data processing operations at a single site. (PERSPAY stands for personnel and payroll.) The Navy selected the Finance Center's Consolidated Data Center in Bratenahl, Ohio, as the computer facility for the consolidated effort. Currently processing all of the Navy's military payroll and most of the personnel applications work load, the Data Center maintains nearly 1.1 million military accounts with annual disbursements of over $12 billion.

In February 1981, the General Services Administration granted the Navy procurement authority to acquire PERSPAY computer equipment for the Data Center. This acquisition was intended to be an interim measure until a fully competitive follow-on acquisition could be accomplished. In January 1984, the Navy awarded a $39.8 million contract to IBM for three IBM 3081 computers, an IBM 4341 computer, and necessary systems software, maintenance, and other components. Included in the contract were options for computer upgrades and a fourth IBM 3081.

Since the contract award, the Data Center has upgraded the performance of its three installed computers by increasing memory capacity, and may exercise its option to acquire the fourth computer. With an estimated installed cost of $2.6 million and life-cycle cost of $3.7 million, the additional computer would increase the Data Center's installed memory capacity by one-third—from 72 to 96 megabytes.

Need for Additional Computer Is Not Substantiated

Throughout our review, Data Center officials indicated that they would be exercising the option for acquiring the additional PERSPAY computer. At first, they said that the decision would be made by March 1987, but at the close of our review in May 1987, the Commanding Officer, Navy Finance Center, told us that the decision to exercise the option might be made in the near future. In commenting on a draft of this report, Defense representatives indicated that the Navy's PERSPAY program sponsor had verbally directed the Finance Center's Commander, in November 1986, not to exercise the computer option until the Finance Center had completed requirements analyses and evaluated alternatives for meeting those requirements.

The Data Center has not adequately substantiated whether it needs or when it would buy an additional computer. According to Data Center officials, their historical trends in computer usage suggested additional computer capacity might be needed as early as September 1987. Besides the historical usage data, Data Center officials contended that increased capacity would be needed to meet new data processing requirements, such as a data base management system, anticipated increases in the use of fourth generation languages, and for contingencies, such as mobilizations and disaster recoveries.

Our analysis indicates, however, that the Data Center is relying too heavily on historical data, rather than on a validated requirements analysis, as the basis for its justification. While the Data Center's historical trend data shows continued growth in computer utilization, the extrapolation of this trend does not take into consideration the relationship between processor utilization and identified user needs or future work loads, which may or may not be representative of the past. Further, as of March 1987, the Data Center had neither adequately defined nor quantified the expected increases in current and future data processing work loads, nor had it assessed the timing of their impacts on present capacity. Finally, the Data Center had not validated its current work loads as of that date.

Data Center's Justification Is Not Based on a Requirements Analysis

Documentation developed by the Data Center to justify the additional computer falls short of government standards for supporting automatic data processing acquisitions. Federal Information Resources Management Regulation parts 201-20 and 201-30 specify that the acquisition or augmentation of an existing capability shall be preceded by a comprehensive requirements analysis. The analysis should include the following factors: present and projected work loads; computer applications and components; the nature and accessibility of the data generated, transmitted, or stored on the proposed equipment or system; and the validation technique employed.

The Data Center is using work-load forecasts based on historical computer utilization data for predicting when its existing computers will become overburdened (or "capacity constrained"). Using December 1985 as a starting point, the Data Center has been accumulating and tracking the production, system, test, and interactive data processing work loads of its two customers, the Navy Finance Center and the Naval Military Personnel Command. By continuously measuring the volume of data handled by the existing computers, the Data Center is determining

the amount of data flowing into and out of the computer system and the amount of storage capacity needed by the system.

Applying a mathematical technique known as simple linear regression analysis, the Data Center plots the composite historical work-load data (i.e., a consolidation of production, system, test, and interactive work loads) to graphically depict future computer work loads or utilization. The Data Center's projections, which assume that an underlying linear (straight-line) pattern exists in the historical data, suggest that the current computers could become capacity constrained by September 1987. However, according to the Data Center's own utilization data, its computers were operating at only 55-percent capacity during prime time.

In our opinion, the amount and type of data the Data Center is using to forecast work loads or utilization do not constitute a comprehensive requirements analysis because the data do not relate identified users' needs and future work loads to processing requirements. Moreover, the work loads upon which the projections were made were not validated. Validation, a vital ingredient to requirements analysis, is user-management's confirmation that their applications will continue to be processed as in the past, or a description of how processing requirements will change in the future. Without validation, the Data Center's forecasts run the risk of overestimating or underestimating future computer resource needs.

Data Center's Justification Does Not Define or Quantify Planned New Work Loads

Data processing requirements for future use of fourth generation languages, a data base management system, and increased interactive processing have not been adequately identified or quantified by the Data Center. Additionally, the Data Center's needs determination excluded capacity provisions for two contingencies, mobilization and back-up recovery, that the Data Center plans to support. These future work loads, together with an assessment of when and how they would affect present capacity, must be ascertained before the Data Center can reasonably determine its future capacity needs.

The Data Center's efforts to estimate future processing requirements for use of fourth generation languages, a data base management system, and increased interactive processing have primarily consisted of measuring computer resource usage in "mini" test environments. By projecting the test results to a larger universe of users and transactions, the Data Center believes it can determine the overall capacity impact of

these new types of applications. However, the capacity planning officials at the Data Center conceded that the number of users and transactions is unknown, which makes it difficult to predict the capacity impacts of the new computer applications. Although they felt more confident of the capacity-impact estimate for increased interactive processing, the estimate reflects measurements only of the Data Center's actual test work load.

Regarding contingencies, in December 1986, the Data Center signed an agreement with two other Navy activities to provide guaranteed backup data processing services in the event of a disaster, such as a fire, flood, earthquake, or terrorist act. This is only the initial step in quantifying data processing requirements for these contingencies.

A similar situation applies to estimates of the capacity requirements to support mobilization (putting armed forces into a state of readiness for active service). Although Data Center officials arbitrarily estimate that mobilization requirements will consume 20 percent of the Data Center's currently installed computer capacity, they admit that there is no sound basis for this estimate. During our review, the Data Center assembled a project team to begin developing the required information.

In our opinion, these and any other known future data processing requirements must be better defined and quantified before the Data Center can make an informed decision about the need for and timing of additional computer capacity. As we noted in our March 1986 report on the PERSPAY project, work-load projections made by PERSPAY officials several years ago for the Data Center's current computers were grossly miscalculated because of inadequate and largely judgmental information. This resulted in subsequent changes in equipment requirements. Since the optional computer will increase the Data Center's present memory capacity by one-third, it is important that a thorough requirements analysis be performed and that past forecasting deficiencies not be repeated.

Alternatives Not Considered

The Data Center has not adequately explored alternatives that might offer more cost-effective solutions to satisfying its future data processing needs. Besides being required by federal regulations, a thorough alternatives assessment is particularly important in this instance because of the planned PERSPAY II procurement in March 1990.

Federal Information Resources Management Regulation part 201-30 requires that consideration and cost comparisons be made of alternatives before procuring new or additional computers. The purpose of an alternatives analysis is to find the most cost-effective solution to meeting users' needs over the system's life. Alternatives listed in the regulation which are to be considered include, but are not limited to

- sharing the computer resources of other government agencies;
- using commercial data processing services;
- revising production schedules or job streams to improve productivity;
- changing work shifts to increase capacity; and
- using excess government-owned or leased computers.

The Data Center could also explore the possibility of reducing or restricting its test work loads which, according to Data Center utilization data, accounted for over 50 percent of its prime time computer work load in September 1986. Currently, the Data Center does not restrict application development testing on its three computers. If, in fact, the Data Center experiences work-load increases before PERSPAY II can meet these demands, the Data Center might be able to reduce demands and free computer capacity by restricting or prioritizing the significant amount of testing now being done on its computers.

A complementary alternative to this would be studying the merits of dedicating all test work loads to a single computer system. Currently, the Data Center has three computers—two operating as a multiprocessing system and another as a single processing system. The Data Center could explore the feasibility of restricting all test work loads to one or the other system to free capacity for potential increased production work load.

Our discussions with one Data Center manager indicated little attention had been given to alternatives to acquiring the additional computer. This official told us that a preliminary inquiry had been made to possibly re-use an excess computer that might be made available by another Navy activity, but, according to this official, the probability of that happening is remote. The Data Center manager said alternatives were not being seriously considered because the computer option in the original PERSPAY contract was the planned course of action for meeting future Data Center processing requirements.

Data Center Trying to Build a Better Capacity Planning Capability

Data Center officials acknowledged their need to obtain more and better data for capacity planning purposes and have several initiatives under way that they believe will improve their capabilities to perform requirements analyses and better forecast future capacity needs. Aside from a recent data call to determine changes in near-term processing requirements, most of these initiatives will take 1 to 2 years to complete.

In July 1986, the Data Center issued a strategic planning guide to provide a structured and orderly process for identifying and converting user-identified needs into data processing work-load requirements. The guide is a major step forward in bringing better organization and discipline to the Data Center's planning capability. It describes several management information systems, which will be developed at the Data Center to implement methodologies for quantifying work-load and other data, rather than relying on best-guess estimates of future requirements.

In January 1987, Data Center officials took an important step in implementing the planning guide when they sent out a data call to the functional/information systems managers of two Data Center customers, the Navy Finance Center and the Naval Military Personnel Command. The data call, which was in the form of a questionnaire, asked systems managers to estimate expected percentage increases or decreases in data processing requirements over the next 12 months for each of their respective application systems. Other information requested in the data call that affected capacity requirements included: the estimated number of users, the frequency of fourth generation language use, the changes in programming staff, and the anticipated increases in disk memory usage.

The Data Center was still accumulating the data call responses and had not analyzed the information by the close of our review in March 1987. According to the Commanding Officer, Navy Finance Center, the analysis of the data call information, which will provide input into the optional computer decision, was not expected to be completed before May 1987.

To more precisely measure and forecast work-load growth, the Data Center has recently contracted for the development of a performance and capacity management system. This effort, expected to be completed by October 1987, will aid the Data Center in developing work-load quantification calculations, identifying key variables, calculating expected values, tracking actual values, and developing action plans based on

expected versus actual values. In short, the project will assist in the performance of system engineering analyses in order to better match the Data Center's computer resources to data processing work loads.

In addition, the Data Center has also started development of a user chargeback system. This is consistent with Office of Management and Budget Circular A-130, which requires data processing facilities to account for the full cost of their operations. The accounting portion of the system, which is intended to record computer resource consumption by user, is planned for installation at the Data Center during fiscal year 1988. While Data Center users will not be charged for data processing services under the system, at least they will be informed of how much of the Center's computer resources they are using. The Data Center has not decided whether it will implement a cost-controlling feature that will actually charge users for data processing services.

Finally, in the next 2 years, the Data Center plans to extend its current limited coverage of a capacity planning tool known as the service level agreement that is designed to identify the data processing requirements of Data Center users. Data Center officials told us that service level agreements now cover only three or four major user groups. Although the Data Center has only two customers, there are many user groups within these customer organizations whose computer needs must be separately identified, defined, quantified, and validated. Currently, payroll and personnel application development programmers are not covered by these agreements. Together, these several hundred programmers account for over 50 percent of the Data Center's prime time computer usage. Because they are not bound by the service level agreements, they have virtually unlimited access to the computers. The Data Center plans to extend the coverage of service level agreements to all payroll user groups within the next year and to all personnel user groups within the next 2 years. Extending this coverage to all Data Center users is a necessary first step to begin comparing user requirements to system utilization. Then, the data obtained through the agreements can be used as input to predict future capacity needs.

If properly implemented, these initiatives should not only enhance the Data Center's capacity planning capability, but also enable the Center to more accurately forecast future data processing requirements.

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