AUDIT REPORT

HUD INFORMATION TECHNOLOGY INVESTMENT PRACTICES

00-DP-166-0001

October 29, 1999

INFORMATION SYSTEMS AUDIT DIVISION
OFFICE OF AUDIT

TO: Saul Ramirez, Deputy Secretary, SD

FROM: Benjamin K. Hsiao, Director, Information Systems Audit Division, GAA

SUBJECT: Audit Report, HUD Information Technology Investment Practices

We have completed an audit of HUD's information technology (IT) investment practices. Our objective was to determine whether these practices are effective and include adequate controls to ensure that IT investments are maximized and risks are minimized. We also assessed the availability and reliability of performance measures which management should use to manage costs and progress of IT projects.

We found that HUD IT investment projects are below industry average in productivity and quality, management decisions are made based on incomplete cost and schedule data, and project plans. In addition, monitoring of contractor performance and project progress are inadequate. The conditions found are due to the absence of a consistent approach to managing and controlling IT investment projects and failure to use industry accepted project management practices. HUD has not established 'Project Management', as a core competency to manage system development efforts.

Our report contains specific recommendations to help HUD move beyond the current ad hoc approach of managing IT investments. Within 60 days, please provide us a status report on each recommendation in this report, stating: (1) action taken; (2) the proposed corrective action and the date to be completed; or (3) why action is considered unnecessary.

Thank you for the assistance provided to us by your staff during our review. Should you have any questions or require additional information, please contact me at (202) 708-3444, extension 149.

Attachment

Executive Summary

The Clinger-Cohen Act along with other recently issued legislative reforms emphasizes the need for federal agencies to significantly improve their management processes, including how they select and control IT investment projects. The Act also includes a provision that agency heads quantitatively benchmark performance of IT activities against comparable processes and organizations in the public or private sector.

We reviewed HUD's IT investment management practices to determine whether IT investments are properly managed and controlled in accordance with the requirements of the Clinger-Cohen Act. Our audit concluded that HUD IT investment projects are well below industry average in terms of productivity and quality, and suffer from persistent cost overruns and schedule delays. HUD's organizational structure and project management practices do not ensure the effective management of complex projects. Project managers are not held accountable for project results and critical resources are at risk due to inadequate project planning, unavailability of timely cost data, weak contractor controls and fragmented management oversight.

Six high profile IT investment projects were selected for review. The six projects accounted for approximately 20% of the $501 million expended on system development from 1992 to 1999. During that time, HUD's budget for IT development more than doubled from $35 to $95 million annually.

We engaged the services of a consulting firm, Software Productivity Research (SPR), to perform a quantitative project and organizational baseline assessment. For the six systems examined, we reviewed project documentation, analyzed cost and schedule variances, interviewed HUD program officials, and conducted surveys of user satisfaction, functional quality, and technical quality. We also performed a limited examination of the Financial Systems Integration (FSI) project, including an analysis of reported progress. FSI is the department's effort to implement a common consolidated financial management system.

Summary of Findings

The results of our review are as follows:

- Average productivity of the projects is 10 times less than industry average for similar projects.

- Projects did not follow HUD's system development guidelines and documentation requirements or industry accepted practices for project planning and risk assessments.

- Complete and reliable project performance data for measuring and controlling IT project progress is not available.

- IT capitol investment projects are at risk due to weak contracting controls and practices.

- Reporting of IT investment projects is inadequate and management oversight is fragmented.

Recommendations & Conclusions

HUD does not have a consistent approach for managing and controlling IT investment projects and project leaders do not use industry accepted project management practices. Further, management authority over IT resources is fragmented between the Office of Administration and the Chief Information Officer (CIO). Therefore, no one entity has overall responsibility to ensure projects are on track and to hold project leaders accountable for project results.

We have repeatedly expressed to the Secretary and his representatives that the CIO must have control over IT resources in order to improve overall management of IT operations. In doing so, the CIO would then be empowered to develop and implement a standardized project selection and control process. However, the Department has chosen not to follow our recommendation. The Assistant Secretary for Administration continues to have responsibility for day to day IT operations while the CIO role is limited to providing policy and guidance to agency leaders and components.

The 2020 Management Reform Plan relies on the successful development and implementation of new IT systems. However, HUD's long history of management weaknesses and lack of effective processes to plan and control IT investments may jeopardize these ambitious efforts. We have repeatedly reported instances where inadequate controls over HUD IT projects put departmental systems and data at risk. For example, HUD continues to experience cost overruns and schedule delays in its effort to improve financial management systems. Consequently, we consistently reported the need to complete these improvements as a material weakness every year since 1993, yet project costs continued to escalate.

Our report provides a number of recommendations to improve HUD IT investment processes. We recommend that HUD establish project management as a primary function within the CIO organization. The project management function should have the authority to implement and enforce project management policy, standards, and procedures including a disciplined, consistent procedure for system requirements management, quality assurance, configuration management, and project planning, tracking, and reporting. This organization should provide the necessary guidance and assistance HUD needs to complete projects successfully. Both government and private sector organizations have successfully adopted project management oversight functions to ensure a consistent approach toward managing IT capital investments.

The CIO’s office recently reorganized and added functions. Although the intent of the reorganization was to improve the efficiency and effectiveness of departmental programs and accomplish much needed reforms in IT management, many of the functions remain understaffed. If the efforts initiated by the CIO and the recommendations included in this report are to be

successful, HUD must provide the executive level support and resources needed to carry them out.

The General Accounting Office (GAO) reached similar conclusions about the Department's IT investment practices in its recently issued report, *HUD Information Systems: Improved Management Practices Needed to Control Integration Cost and Schedule*[1]. Implementation of both GAO and our recommendations will enable HUD to effectively select and control IT investment projects.

[1] HUD Information Systems: Improved Management Practices Needed to Control Integration Cost and Schedule, GAO/AIMD-99-25

TABLE OF CONTENTS

Introduction

When Congress passed the Clinger-Cohen Act, formerly known as the Information Technology Management Reform Act of 1996, the objective was to provide a framework for improving capital planning and control of Information Technology (IT) investments. The Clinger-Cohen Act requires agencies to design and develop a process for maximizing the value, assessing, and managing the risks of IT investments.

Many in the IT industry regard investments in systems development as one of the most risk-prone of all activities. Schedule delays and cost overruns tend to occur on more than 50 percent of all large projects. Cancellations of projects before completion or serious quality deficiencies are common. It is, therefore, imperative that there be a strong, disciplined and clearly defined approach to controlling performance, cost and schedule if management is to maximize the value of investments, while minimizing the risk of project failure.

We have repeatedly reported instances where inadequate controls over IT investments have put HUD systems and resulting data at risk. Since 1993, we have reported as a material weakness HUD's slow progress toward improving its financial management systems. We also identified significant control weaknesses, and inadequate cost accounting and contracting practices in our 1996 report on Software Maintenance[2]. Several of the deficiencies noted in the 1996 report remain uncorrected. Without strong controls over IT investments, HUD systems may not meet user or business needs, resulting in inaccurate and unreliable data, system failures, and excessive or wasted costs.

Under the Secretary's direct leadership, HUD is in the process of reinventing itself from the ground-up. A pivotal piece of the 2020 Management Reform Plan relies on the successful development and implementation of new IT solutions. However, HUD's long history of management weaknesses and lack of effective processes for planning and controlling its IT resources, may jeopardize these ambitious efforts and put IT investments at risk.

Audit Objectives

The audit objective was to determine whether HUD is fulfilling its responsibility for capitol planning, investment control and performance management as prescribed by the Clinger-Cohen Act.

Audit Scope and Methodology

We conducted the audit in accordance with generally accepted government auditing standards. We judgmentally selected six IT investment projects with operational components for our review. These systems were chosen because they: 1) were defined projects, 2) represented major

[2] Controls over Software Maintenance must be Significantly Strengthened, HUD/OIG 96-DP-166-0001, March 5, 1996.

information systems development efforts, and 3) had some components in production even if the development was not complete.

The six projects reviewed accounted for approximately 20%, or $98 million, of the $501 million budgeted for system development during the period of 1992-1997 (**Table 1**).

Annual Costs (in thousands)							
Project	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**Total Cost**
TRACS	$3,570	$ 7,146	$ 7,584	$ 5,560	$ 3,500	$ 4,602	$ 31,962
HUDCAPS	$1,109	$ 4,443	$ 3,376	$ 5,636	$ 4,765	$ 6,052	$ 25,381
PIH/SECTION 8			$ 5,468	$ 4,404	$ 1,340	$ 1,516	$ 12,728
IBS			$ 328	$ 2,321	$ 2,833	$ 4,379	$ 9,861
IDIS			$ 3,394	$ 3,276	$ 3,679	$ 3,725	$ 14,074
OASIS		$ 406	$ 908	$ 1,132	$ 1,177	$ 615	$ 4,238
Total Costs	$4,679	$11,995	$21,058	$22,329	$17,294	$20,889	$ 98,244

Table 1. Projects Reviewed

Below is a brief description of the six projects reviewed:

- **Housing Tenant Rental Assistance Certification System (TRACS)**
  TRACS addresses the information processing needs to support Section 8 and other project based assisted Housing programs. TRACS accomplishes these goals through the following efforts: Voucher Processing, Contracts Processing, and Budget Forecasting.

- **HUDCAPS Administration Accounting & HUDCAPS for PIH Section 8**
  HUDCAPS consists of two sub-systems: Administrative Accounting Systems Project and PIH Section 8 Systems. HUDCAPS standardizes the primary accounting functions (i.e., budget execution and funds control, accounts receivable and collections, accounts payable, and general ledger) and provides for a user-driven system that supports the financial aspects of the programs.

- **PIH Integrated Business System (IBS)**
  Phase I, implemented on June 24, 1996, supports the following business functionality: Housing Authorities Projects Demolition/Disposition, Lead-Based Paint, and Section 8 Occupancy. Phase II A, implemented on December 02, 1996, supports the annual Formula Characteristics Verification process of the Comprehensive Grant Program. Phase II B, implemented on May 30, 1997, added new Public Housing Management Assessment Program (PHMAP) and Risk Analysis for Delimitation of Allocation of Resources (RADAR) modules.

- **CPD Integrated Disbursement and Information System (IDIS)**
  IDIS supports CPD's consolidated planning, disbursement and reporting requirements for the entitlement grant programs (HOME, CDBG, ESG, and HOPWA). IDIS also simplifies the grant management process for all participants.

- **OIG Audit Support Investigation System (OASIS)**
  OASIS was designed to provide information on activities required to monitor or control audit and investigation assignments.

We interviewed and obtained project documentation from HUD program officials responsible for managing the system development efforts. Documentation obtained included deliverables defined by HUD's System Development Methodology (SDM). We evaluated the documentation using the SDM review guide.

We used Project and Resource Management System (PARMS) data in our analysis of cost and schedule variances commonly referred to as earned value analysis. We also conducted surveys of user satisfaction, functional quality, and technical quality for each of the systems reviewed. We engaged Software Productivity Research, Inc. (SPR) to perform a quantitative project and organizational baseline assessment. The baseline assessment incorporates questionnaires, interviews, and the use of a proprietary software product to assist in the analysis. We compared this data to a SPR database containing results from assessments of over 6,000 projects.

We also performed a limited assessment of the Financial Systems Integration (FSI) project. FSI is the initiative to implement HUDCAPS as the Department's consolidated financial management system. We limited our assessment of the FSI project to identifying project management approach, tools, and techniques, and an analysis of reported progress.

Audit Period

We performed our fieldwork from July 1996 to March 1999 and evaluated project cost and progress data from the period October 1994 through December 1998.

Productivity and Quality of IT Investment Projects Well Below Industry Average

HUD does not manage its IT investment efforts in accordance with neither industry accepted project management practices nor internal and external regulations and guidelines. Consequently, the productivity and quality of the six projects reviewed were significantly below industry average. Low productivity and quality of IT investment projects are caused by the absence of a disciplined process and a consistent methodology for ensuring effective project management.

Productivity measurements refer to the completeness and use of effort, schedule, staff, and deliverable data collected about a project. Productivity measurements provide a quantifiable means to assess project performance, predict project difficulties, adjust progress and priorities, and identify areas for process improvement. The quality assurance process focuses on those activities and methods designed to ensure the quality of the project deliverables. Defect measurements are an integral component of a quality assurance process. Pre-test defect removal effectiveness and testing defect removal effectiveness refer to the project teams' perspective on how well they performed these activities. Essential productivity measurements include Earned Value Analysis and Function Point Counts. The quality measurement is the Defect Removal Efficiency.

Earned Value Analysis

We evaluated six IT investment projects to determine how HUD projects compare to industry standards in terms of productivity and quality. We also evaluated project productivity data for the FSI project. Software Productivity Research (SPR), Inc., a consulting firm specializing in measurement and modeling software development, was engaged to assist us in our review. We used industry accepted project management productivity and quality measurement techniques to gather and analyze both qualitative and quantitative data of the six projects, and then fed the results into a model developed by SPR.

Earned value is a productivity measurement of variances in project schedule and costs. It compares the *value* of work accomplished during a given period with the work scheduled for that period. By using the value of work accomplished as a basis for estimating the cost and time to complete, the earned value measurement should alert program managers to potential delays and cost overruns.

We attempted to calculate earned value for the six projects selected. However, we found that the data for five of the projects was neither readily available nor in a format suitable for matching plans to work completed. Therefore,

we were able to analyze earned value for only one of the six projects. Our analysis showed that this project was significantly behind schedule and over budget.

IBS Earned Value Analysis

We compared the project planning data and resource usage for Budgeted Cost of Work Scheduled (BCWS) and Actual Cost of Work Performed (ACWP). Since HUD lacks a system to track all costs at the project level, we had to use the Project and Resource Management System (PARMS), which only tracks contractor and IT employee labor costs. We also compared Budgeted Cost of Work Performed (BCWP) to actual costs (ACWP).

We applied fifty percent of the budgeted amount at the beginning of a planned task with the remaining fifty percent applied when the task is completed. Cumulative totals from the FY 1994-1996 PARMS data were compared to the December 1994 baseline budget for FY 1994-1998 (**Table 2).**

IBS Project	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998
BCWS – Dec94	$ 16,360	$ 43,215	$ 153,675	$ 209,966	$ 266,039
ACWP	$ 12,006	$ 56,951	$ 86,166		
BCWP	$ 4,868	$ 24,169	$ 24,169		

Table 2. IBS Project Data

We then calculated Cost and Schedule Variances using FY 1996 data. **Table 3** demonstrates the results of our calculations and the formulas used. The negative values for schedule variance and schedule variance percent indicate that the work completed is less than the work planned. The negative values for cost variance and cost variance percent indicate that the actual costs exceed planned costs for the work completed. **Chart 1** demonstrates graphically the relationship between planned, actual, and completed efforts used in determining earned value.

Schedule Variance = BCWP - BCWS	$ (129,506)
Schedule Variance Percentage = BCWP-BCWS/BCWS*100	-84%
Schedule Performance Index = BCWP/BCWS	0.16
Cost Variance = BCWP - ACWP	$ (61,997)
Cost Variance Percentage = BCWP-ACWP/BCWP*100	-257%
Cost Performance Index = BCWP/ACWP	0.28

Table 3. IBS FY 1996 Variance Measures

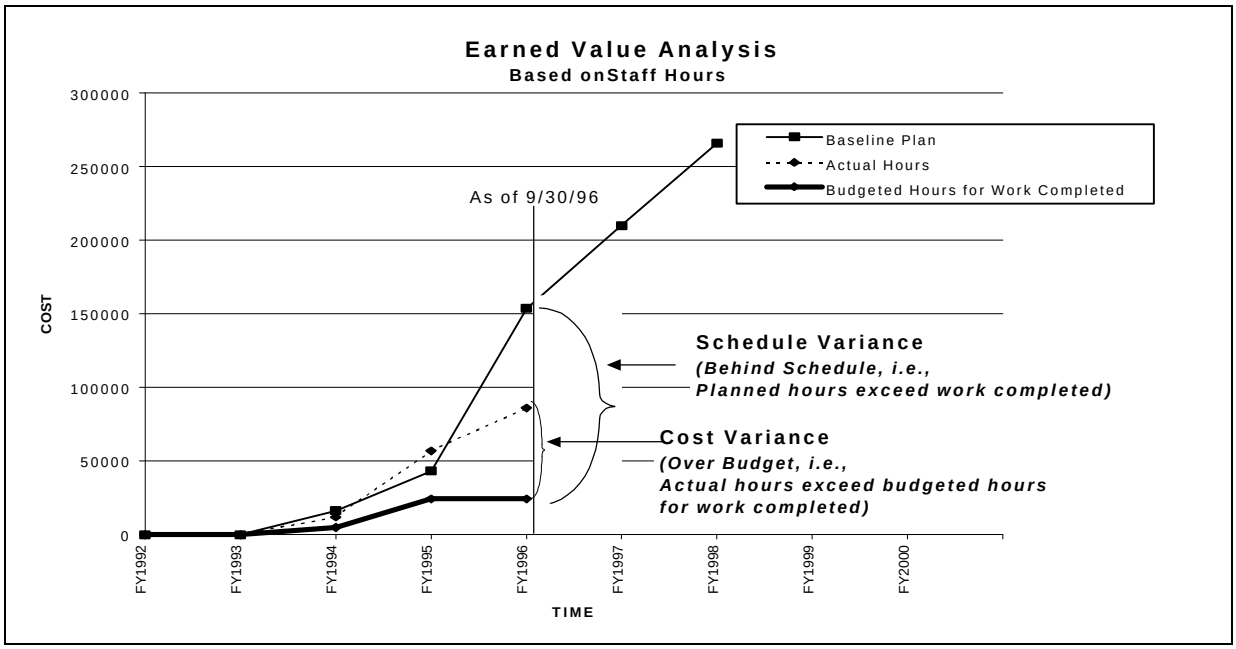

Chart 1. IBS Earned Value Analysis

At the end of FY 1996, the IBS project was significantly behind schedule, over budget, and accumulating costs more rapidly than accomplishments. The earned value analysis shows that the project was 84 percent behind schedule and 257 percent over budget.

The reason accomplishments for this project lagged so far behind costs was because FY 1995 and FY 1996 tasks that were identified and completed were not directly linked to the project plan. Consequently, these tasks do not earn value and we are unable to compare work planned against actual accomplishments.

FSI Earned Value Analysis

We also examined project progress reports provided by the FSI project team. In 1998, the FSI project team acquired an off-the-shelf project management software application with an integrated time tracking component. These tools enabled the FSI team to monitor project progress against plans and to generate earned value reports.

Our review disclosed that the FSI project is behind schedule and over budget. The project's actual versus planned variance increased steadily between June 1998 and September 1998. The earned value results for that period

are summarized in T**able 4**, and graphically depicted in **Chart 2.**

FSI Earned Value Analysis * Source: FSI Master Schedule Earned Value Reports	**As Of** **06/30/1998**	**07/25/1998**	**08/31/1998**	**09/30/1998**
BCWS	$ 1,927,105	$ 1,545,568	$ 3,068,384	$ 4,161,785
ACWP	$ 1,154,302	$ 1,737,825	$ 3,008,033	$ 3,845,981
BCWP	$ 1,727,244	$ 2,032,441	$ 2,489,965	$ 2,809,316
Schedule Variance = BCWP - BCWS	$ (199,861)	$ 486,873	$ (578,419)	$ (1,352,470)
Schedule Variance Percent = BCWP-BCWS/BCWS	-10%	32%	-19%	-32%
Schedule Performance Index = BCWP/BCWS	0.90	1.32	0.81	0.68
Cost Variance = BCWP - ACWP	$ 572,943	$ 294,616	$ (518,068)	$ (1,036,665)
Cost Variance Percent = BCWP-ACWP/BCWP	33%	14%	-21%	-37%
Cost Performance Index = BCWP/ACWP	1.50	1.17	0.83	0.73

Table 4. FSI Project Data & Measures of Variance

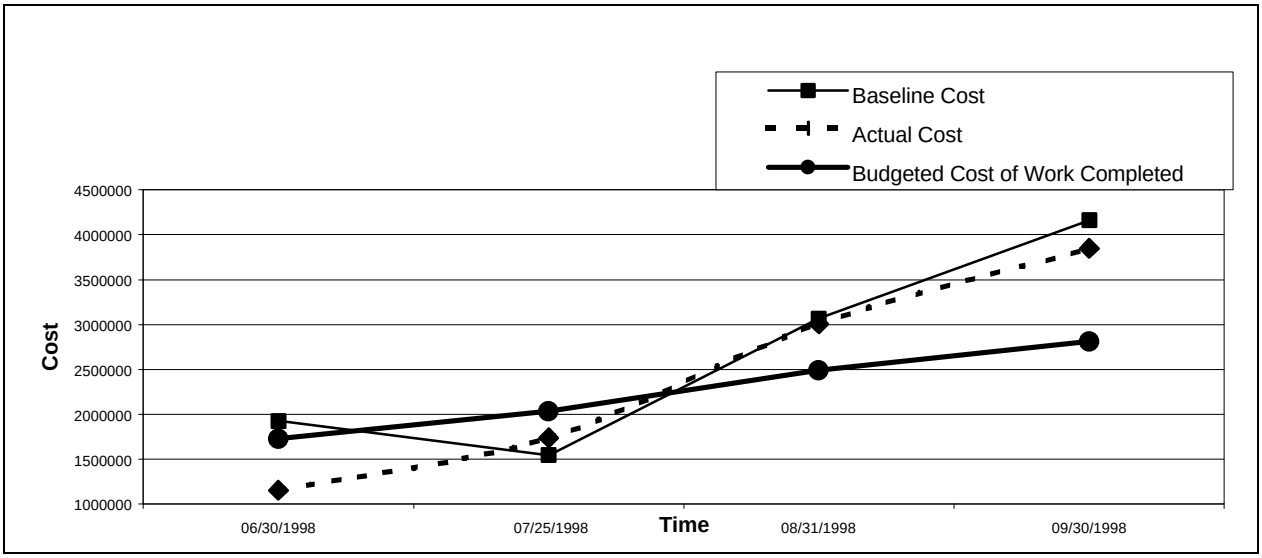

Chart 2. FSI Earned Value Analysis (6/98-9/98)

Like all other HUD IT investment projects, the FSI project is managed on a fiscal year basis rather than throughout the complete project life cycle. Therefore, at the beginning of each fiscal year, the project team develops new project schedules and costs estimates using a zeroed out baseline.

In October 1998, the FSI project team initiated Phase IIB of the project. The team developed project progress reports using the new project budget and schedule. However, three

months into the fiscal year, the FSI project was again 142 percent over budget. The December 1998 FSI Master Schedule Earned Value Report indicates that in the first quarter of FY 1999, the FSI team expended $3 million for work expected to cost $1.3 million. This is a difference of $1.7 million. In addition to the cost overrun, progress on the project was 34 percent behind schedule. (See **Table 5** below).

FSI Earned Value Analysis FSI Master Schedule Earned Value Reports	12/31/1998
'S	$ 1,909,232
'P	$ 3,047,772
'P	$ 1,261,863
dule Variance = BCWP - BCWS	$ (647,369)
dule Variance Percent = BCWP-BCWS/BCWS	-34%
dule Performance Index = BCWP/BCWS	0.66
Variance = BCWP - ACWP	$ (1,785,908)
Variance Percent = BCWP-ACWP/BCWP	-142%
Performance Index = BCWP/ACWP	0.41

Table 5. First Quarter FY 1999 FSI Project Variance Data

Based on to the FY 1999 FSI master schedule, the team planned to complete conversion of data to HUDCAPS in the first quarter of FY 1999. However, there were delays in developing the interface software, and conversion activities continued well into the third quarter. As a result, the May 1999 FSI project cost variance increased to $3 million (from the December 1998 variance of $1.7 million) and the schedule variance percentage increased to 40 percent.

We discussed our concern about persistent FSI project cost overruns and schedule delays with the FSI project managers. After a review of late project tasks, we concluded that the schedule delays and cost overruns are the result of flawed planning and schedule estimation techniques.

In our FY 1998 Financial Statement report, we recommended the CFO establish an acceptable range of upper and lower control limits for earned value on the FSI project as a whole and for individual FSI tasks. We also recommended that the CFO and the HUD Technology Investment Board Executive Committee (TIBEC) closely monitor project progress using the specified control limits and performance.

Function Point Analysis

Function point analysis is the process of breaking data systems into smaller components to estimate time and effort necessary for project completion. By summarizing the representative projects' sizes in function points divided by the total effort expressed in staff months, the amount of productive work accomplished during a specific period can be quantified.

SPR assessed the productivity for the six projects selected. SPR used data supplied by HUD staff to count the function points. The productivity was then determined based on a 136 hours per staff month. The analysis disclosed that actual productivity of project performance at HUD is significantly below industry average and *Best in Class* (considered superior).

In **Table 6,** we summarized the results of our analysis. HUD's average actual productivity for the six projects is 0.81 Function Points per Staff Month (FP/SM). **Chart 3** graphically illustrates HUD's productivity for the six projects compared to the industry average and *Best in Class*. As indicated, HUD's average actual productivity of 0.81 function points per staff month is significantly below the industry average of eight to nine for mainframe projects. Further, the disparity is even greater when compared to *Best in Class* for mainframe projects of 44 function points per staff month.

Project	Project ID	Size (FP)	Actual Staff Months (SM)	Actual Prdctvty (FP/SM)
TRACS	A	1,125	3,876	0.29
HUDCAPS Section 8	B	618	468	1.32
HUDCAPS	C	583	1,144	0.51
HUD IDIS	D	758	405	1.87
HUD IBS	E	1,229	132	9.31
OASIS	F	1,062	576	1.84
Total		5,375	6,601	
Average		896	1100	0.81

Table 6. Function Point Analysis

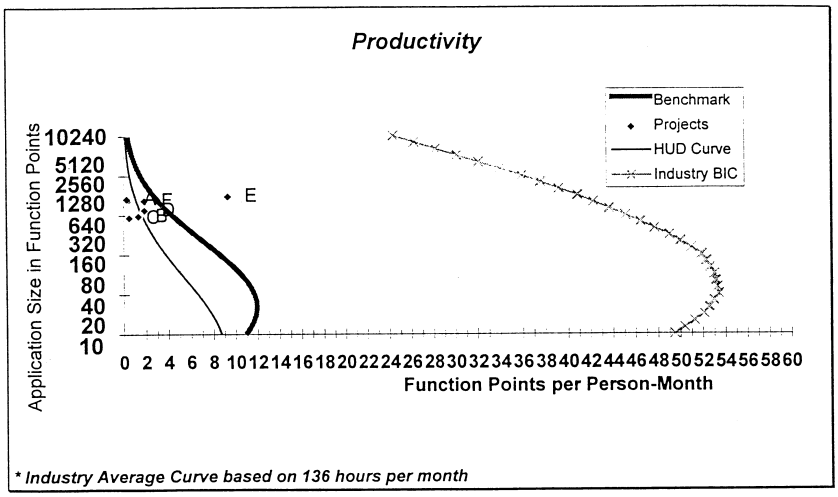

Chart 3. Project Productivity-Function Point

SPR consultants concluded that the low level of project productivity is due to the large level of effort spent on the projects. Level of effort is significantly higher than expected for projects of this size and type. In addition, headcount working on projects is higher than expected for four of the six projects examined with overage factors ranging from 4 to 12.

Software Defect Removal Measurement

Detecting, tracking, and fixing defects are critical activities in a quality assurance strategy. To make significant quality improvements, project teams must identify the defect cause and origin by tracking the number of defects introduced and removed in each phase of the development cycle. Total defects are determined by adding the defects found prior to implementation and the defects reported by the user in the first year of implementation. Defect removal rates are the percentage of the total defects for a project removed before implementation.

SPR attempted to perform an analysis of the defect efficiency rate for the six projects. Defect removal efficiency rates are normally determined by comparing actual defect data with predicted defect data based on project characteristics and attributes. However, only one HUD project provided SPR with usable defect data and therefore, they could not compare the predicted defect removal efficiency with actual defect data for HUD as a whole. Consequently, SPR was limited to using modeling

techniques on the defect rates based on the project characteristics and attributes.

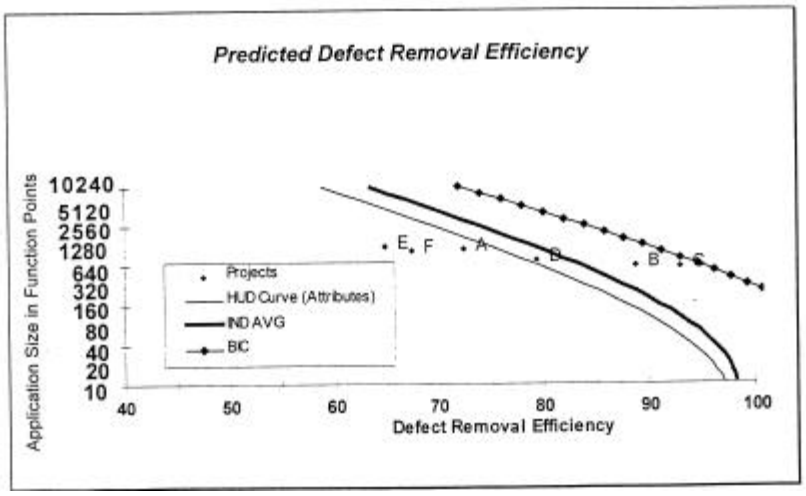

Chart 4. Predicted Defect Removal Efficiency

According to SPR's model, the average HUD defect removal efficiency rate is less than industry average, an indication that HUD's development processes need improvement. As noted in **Chart 4**, the modeled defect removal rate for the six projects ranged from 64.74 percent to 92.99 percent. The average HUD defect removal efficiency rate is 77.59 percent compared to an industry average of 85 percent. However, as previously noted, the chart only provides predicted defect removal efficiency based on subjective project characteristics and attributes with no comparison made with actual defect data. In addition, it has been SPR's experience that project teams often overstate attribute values for defect removal and testing activities. Accordingly, without actual usable defect data for comparison purposes, an objective assessment of defect removal activities cannot be made. Therefore, the above defect removal efficiency rates should be considered optimistic and may be overstated.

Factors Influencing Productivity and Quality

Using information from user and project team surveys, and interviews, SPR assessed the effectiveness of project management communications. SPR also assessed attribute data pertaining to personnel, technology, process, and environment - all factors that influence productivity and quality. These assessments disclosed some strengths including good project team morale, agreement on project goals, schedule and methods, and reasonable understanding of support software, debugging tools, and development and

delivery platforms. SPR also found that the users bring good knowledge of the business processes to the project teams.

However, SPR also noted several areas needing improvement:

- Lack of communication between the higher and lower levels of management. A disconnect exists between what higher and lower management perceive as enterprise software goals.

- Project structure is predominantly matrix and hierarchical, therefore project leaders often do not have direct control over staff resources resulting in poor communication and lower quality.

- Project team size tended to be very large, thus negatively affecting productivity.

- Experience with project management tools and methodologies were only average on four of the six teams. Inexperience can result in poor quality software because members are learning on the job.

- Pre-test defect removal experience tends to be only average, but testing experience is somewhat stronger. This disparate combination of experience encourages reliance on testing as the primary means of ensuring product quality, which is less effective without other quality process elements. Also, the earlier you detect the defects the less expensive they are to correct.

- HUD does not have a formal training program for technical design reviews, testing, and code inspections. Instead, HUD is relying on previous experience and on-the-job training for testing reviews, design reviews, and code inspections.

- Users are only somewhat involved in defining requirements, design reviews and acceptance testing.

A structured training program is necessary to develop project management skills and techniques for the inexperienced project manager as well as to retool or

reinforce tools, habits, and processes, in average and experienced project managers. Properly trained and experienced project managers are more likely to complete projects on time and within budget

Without a standardized project management methodology, project plans are likely to be incomplete. Project leaders who have not carefully laid out the project and identified the relationships of all the activities relative to each other have a more difficult time accurately identifying how long a project will take. Also, without a carefully laid out schedule, it is difficult to predict the impact of scope creep and to perform "what if" analyzes when project conditions change.

These situations combined with the average level of developer experience and an informal development process, impact system development efficiency and product quality. This ultimately affects the users, as developers may deliver software that does not meet user expectations. In fact, our survey found that 31.59 percent of users' responses indicated that they are either dissatisfied or very dissatisfied with aspects of the software they are using.

An independent quality assurance function and standard quality assurance process was absent on most teams. Instead, project teams take steps toward quality assurance in the absence of quality assurance guidance and procedures. Also, training in inspections, reviews, and testing was lacking which results in HUD relying heavily on the experience and conscientiousness of the individual staff member to perform inspections and testing of project deliverables.

Recommendations

We recommend that the Chief Information Officer (CIO) in coordination with the Assistant Secretary of Administration:

1A. Establish project management as a primary function within the CIO organization, with appropriate staffing and resources. The project management function should have the authority to implement and enforce project management policy, standards, and procedures including a disciplined, consistent procedure for system requirements management, quality assurance, configuration management, and project planning and tracking.

1B. Establish a corporate membership in the Project Management Institute. This allows HUD to provide individual memberships in a professional organization of project managers for fifteen managers.

1C. Enter partnerships with the Project Management Institute and the Performance Measurement Association to help develop a center of excellence in project management at HUD.

1D. Limit project scope and project work groups size to control the impact of hierarchical and matrix management structures. When possible, reduce the size of project teams by creating multiple projects thereby improving accountability for the work efforts.

1E. Establish a structured training program to enhance knowledge of project management practices and techniques among agency project managers. Encourage completion of the Project Management Institute certification program.

1F. Ensure that project personnel are trained in pre-test defect removal techniques as part of the project management training and education program recommended in 1E.

1G. Ensure that system development personnel are trained in technical design review, testing and code inspection.

1H. Actively involve users in the project during requirement definition, design reviews, and acceptance testing.

1I. Ensure project plans are complete and scheduled tasks are accurately defined to minimize the variance between planned and actual accomplishments. By placing more emphasis on project initiation activities (planning, scheduling, etc.), project leaders can better control project results.

1J. Conduct periodic project productivity reviews and develop strategies to affect corrective action when necessary.

1K. Prescribe a consistent set of productivity measures for IT investment projects. Suggested measures include, but are not limited to: (1) schedule performance, (2) effort expended, (3) productivity (function points per staff month), (4) defect removal efficiency, (5) defects delivered, and (6) process compliance.

1L. Establish procedures for implementing formal pre-test defect removal techniques for all key deliverables.

1M. Implement a project estimation process and supporting tools set. Use industry accepted project management measurement techniques, such as function points, as part of this benchmark analysis.

1N. Develop and maintain a repository of historical project performance data for use in planning future projects. Such a repository will also help future project teams to identify potential problem areas and help to manage risk of project failure.

1O. Publish the statistics of project performance and overall HUD performance so that project team members develop an appreciation and understanding of the importance that HUD places on productivity and process compliance.

Inadequate and Incomplete Project Planning Increases Project Risk

HUD IT investment project plans and supporting plans do not meet the department's System Development Methodology (SDM) requirements or project management best practices. Several of the project plans and the required supporting plans reviewed were either incomplete or not available. In addition, risk assessments were not prepared. HUD has not established processes and procedures to ensure compliance with SDM recommendations and industry accepted practices. Although HUD's SDM suggests a quality assurance group participate in the system development process, HUD has not defined who has responsibility for performing this function and ensuring projects comply with SDM guidelines. During the project planning phase, project risk and uncertainty is highest, hence the probability of successfully finishing the project is lowest. Unless project plans are complete and accurate, managers can not establish accountability, control costs and measure progress.

Project planning provides a focused phase by phase direction, detailing expected results and milestones for measuring progress. Performed properly, project planning can ensure most critical issues are anticipated and provide a measure against which project managers can be held accountable. The planning phase includes the project, scope, task definition; estimation of task duration and development of project schedules; cost estimation and budgeting; and plan integration. Plan integration involves the consolidation of work completed during the other stages into an overall project plan that includes an integrated schedule, supporting plans, and the project Work Breakdown Structure (WBS).

Inadequate & Incomplete Plans

We requested all available project plans and supporting management plans for the six IT investment projects. We received project plans for the six projects selected, however only four of the six projects had supporting plans. We reviewed the project plans and available supporting management plans to determine if they met HUD's SDM. We also assessed whether the plans met industry accepted project management best practices issued by the Project Management Institute (PMI)[3] and Capers Jones[4], a leading expert on performance measures.

We found that the project plans and the supporting management plans provided did not meet HUD's SDM requirements or industry accepted project management best practices.

[3] A Guide to the Project Management Body of Knowledge. 1996. Upper Darby, PA: Project Management Institute.
[4] Caspers, Jones.. Assessment and Control of Software Risks. 1994. Upper Saddle River, NJ: PTR Prentice Hall Inc.

HUD's System Development Methodology describes the project plan as a crucial document of the system life cycle. Developed early in the system life cycle, the project plan should be modified, updated, and refined continuously throughout the project lifecycle. The plan should discuss project scheduling, staffing, resources, adjustments to the life cycle structure, selection of tools and techniques, identification of applicable reviews and approvals, configuration management methods, and other related topics.

HUD's SDM states that the project plan should:

- Identify the strategy for managing the development effort;

- Be developed to the level of detail, necessary to reflect the specific task and activities required of all project related personnel, as well as the time constraints under which these tasks are to be accomplished;

- Identify goals and activities for all phases and sub-phases, and include milestones dates and resource estimates; and

- Include supporting plans (i.e., system security, system support, and configuration management) prepared by the project manager and/or project support personnel.

The project plans reviewed provided a broad management strategy. However, they did not address in a detailed manner the specific task and activities required of the project team members, nor did they specify the time constraints to accomplish these tasks. We also noted that although the plans provided milestone dates and resource estimates, they did not properly identify goals and activities for all phases.

The most comprehensive project plan of the six reviewed defined forty-six tasks in eight business areas, and two supporting categories. However, the project plan spanned five years and was at too high a level of abstraction to be useful for project management as most business area tasks are planned for two years.

We also reviewed the same project plan to determine whether it met the recommendations of the PMI. We found that the plan did not address scope management, schedule management, cost management, risk management, quality management and procurement management as suggested by the PMI model. Additionally, the project plan did not address project execution and control issues. We also found that the project work plan for subsequent years:

- did not follow the work breakdown structure in the performance measurement baseline;
- did not link work plan tasks to the project plan;
- did not develop an intermediate schedule or a detailed schedule linked back to the master schedule defined in the project plan; and
- tasks were added to the project plan during subsequent fiscal years that represented work on other systems.

During our Fiscal Year 1998 Financial Statement Audit, we also reported that project plans for the FSI project were incomplete. Although HUD documented an integration strategy in the 1991 FSI Project Plan, the CFO's office has not updated the plan to reflect the latest approach. Until HUD completes its FSI project strategy and details this strategy in an implementation plan, management accountability and oversight are difficult to establish. Consequently, the FSI project continues to be prone to further schedule delays and cost overruns.

Missing Project Supporting Plans

Although HUD's SDM requires three project supporting management plans (system security, system support, and configuration management), some were not available. One plan was missing a sub-plan and two others did not include two of the required sub-plans. In addition, several of the supporting plans provided did not meet either HUD's SDM or PMI guidelines.

Sub-plans provide a means for identifying and documenting critical issues and potential problems. In addition, sub-plans provide measures to improve project accountability and

predictability, thereby increasing the chances of project success.

Incomplete Project Risks Assessments

Risk management is essential to increase the likelihood of project success. Project risk management is concerned with identifying, analyzing, and responding to project risk. The purpose is to maximize the results of positive events and minimize the consequences of adverse events. We reviewed risk assessment documents for the five projects for which we received risk assessments. We found that the five plans did not meet HUD's SDM requirements for risk analysis documentation or industry accepted practices for risk management.

HUD's SDM requires the performance of a risk analysis for every system development project. The risk analysis should identify whether:

1) the developer reached an understanding of the proposed project risks;
2) an assessment was made of the project's probability of success;
3) potential problem areas exist;
4) an assessment was made on technological expertise required to complete the project, and its availability within the organization;
5) the security controls for the protection of data meet the requirements of the Privacy Act of 1974;
6) the appropriate procedures for the disposition of sensitive material have been identified; and
7) alternate operating procedures are identified should the system fail.

We reviewed the five risk assessment documents provided and found that they did not fully meet HUD's risk analysis requirements as specified in its SDM. Specifically, we found that:

1) although program risks were identified, project risks were not addressed;
2) the risk assessments did not assess the probability of project success or failure, the technological expertise required, and its availability within the organization;
3) one of the risk assessments did not include an assessment of the security controls for the protection of

data as required by Privacy Act of 1974, but assumed that the current technical architecture utilized by HUD would meet the minimum baseline security requirements;
4) the risk assessments did not discuss whether the appropriate procedures for the disposition of sensitive material have been identified; and
5) the risk assessments did not identify alternate operating procedures should the system fail.

Risk Identification & Quantification Needed

According to the PMI Model for Project Management, risk identification consists of determining which risks are likely to affect the project and documenting the characteristics of each. Risk quantification involves evaluating risks and risk interactions to assess the range of possible outcomes or events and determining what risk events warrant a response. Risk response development involves defining enhancement opportunities and responses to threats. These responses include risk avoidance, mitigation, and acceptance. Capers Jones identifies several of the more common risk events in a management information system software project, such as creeping user requirements, excessive schedule pressure, low quality, cost overruns, and inadequate configuration control.

The outputs from risk response development include risk management and contingency plans. Risk management plans, should describe strategies and procedures to manage risk throughout the project and are a part of the overall project plan. Contingency plans are pre-defined action steps to be taken if an identified risk event should occur and are generally a part of the risk management plan.

In our review of the five risk assessment documents, we found that none of the documents identified or quantified the types of risks likely to affect the project. In addition, the assessments did not address which risk events warrant a threat response and which risks are avoided, mitigated, or accepted. Risk management plans and contingency plans were not prepared for any of the six projects.

Neither the SDM nor the SDM Documentation Standards (HUD Handbook 2400.15) address the need for identifying and quantifying the types of risks and responses required to avoid or mitigate these risks. Further, HUD's SDM guidelines and documentation standards do not require risk

management and contingency plans. Without a project risk strategy that identifies and quantifies project risks, management cannot adequately anticipate, respond to, and manage risk throughout the life of the project.

Recommendations

We recommend that the Deputy Secretary in coordination with the TIBEC:

2A. Do not approve funding of new IT investment projects that have not completed all project plans and sub-plans as required by HUD's SDM and recommended by the PMI. Limit future funding of existing projects if they have not completed the required project plans.

We recommend that the CIO in coordination with the Assistant Secretary of Administration:

2B. Ensure project plans, sub-plans, and risk assessments comply with HUD's SDM. The project management function area established under recommendation 1A should be responsible for enforcing compliance.

2C. Require periodic updates to project plans and risk plans especially when the project undergoes a significant change in project approach and/or scope.

2D. Update HUD's SDM to include a requirement that project managers prepare project risk management and contingency plans.

Accurate and Complete Data Needed to Control Costs and Schedule

HUD cannot adequately measure cost and schedule performance for IT investment projects. Performance data based on costs is either not collected or too fragmented to compute measures of efficiency and productivity. This condition exists because the Department lacks a project cost accounting system. Without reliable cost data, HUD managers lack adequate information to make informed decisions about allocating resources, controlling scope of project, and evaluating project performance.

The purpose of a cost accounting system is to uniformly and consistently accumulate, bill, and report costs to system managers and users. The Federal Accounting Standards Advisory Board (FASAB) Statement Number 4, established managerial cost accounting standards that are aimed at providing reliable and timely information on the full cost of federal programs, their activities, and their outputs. The statement also indicates that managerial cost accounting should be a fundamental part of the financial management system and where practicable, integrated with other parts of the system. Establishing an integrated project cost accounting system in conformance with FASAB Statement Number 4 will greatly assist project managers and IT resource managers in controlling IT investment projects.

The PMI describes project cost management as primarily concerned with the cost of the resources needed to complete project activities. Project cost management refers to the processes required to ensure that the project is completed within the approved budget including resource planning, cost estimating, cost budgeting, and cost control. Resource planning determines what resources and what quantities of each should be used to perform project activities. Cost estimating entails estimating the resources needed to complete project activities. Cost budgeting is the allocation of the overall cost estimate to individual work items. Cost control is controlling changes to the project budget.

Cost & Schedule Controls

We reviewed six IT investment projects to determine whether costs are properly managed and controlled. We also attempted to determine if project cost and schedule performance measures are available and analyzed. We found that project cost and schedule performance measures are not produced because reliable data is either not available or not in a usable format to compute most measures of efficiency or productivity. HUD lacks an integrated system to track and allocate costs.

PMI's Model for Project Management states that cost control includes monitoring cost performance to detect variances in the project plan and determining the cause of both positive and negative variances. Inappropriate

responses to cost variances can result in quality or schedule problems or produce an unacceptable level of risk.

Performance measurement techniques, such as cost and schedule variance analyses and earned value analysis, enable managers to assess the magnitude of any variations that occur. Earned value analysis is especially useful for cost control. Earned value goes beyond the two-dimensional approach of comparing budgeted costs to actual accomplishments. It compares the value of work accomplished during a given period with the work scheduled for that period. By using the value of work completed as a basis for estimating the cost and time to complete, the earned value concept should alert program managers to potential problems sooner than tracking expenditures alone can.

As indicated in **Finding 1**, we attempted to compute performance measures for the six projects reviewed. However, we were able to compute earned value for only one of the six projects. Cost information for the other five projects is either not available or in a format unsuitable for matching plans to work completed. In addition, even on the one project where we were able to estimate the earned values, we had to make an extensive amount of assumptions, data conversion, and reconstruction to compute the cost and schedule variances.

Cost Accounting System

During our discussions with project managers and Office of IT staff, we found that they also have difficulty monitoring and controlling project costs and computing performance measures such as earned value. Although the PARMS is the official project management system of the Systems Engineering Group (SEG), the system tracks and reports direct project labor costs only. Several of the project managers we spoke with found it necessary to develop their own informal cuff systems to collect and organize project cost data.

The PARMS provides a formal method of recording, monitoring, and managing ADP systems work performed by SEG staff and contractors. Three functions of the PARMS is to: 1) help managers oversee the process of building and maintaining automated systems; 2) generate time charge information that can be used to "charge back" system costs

to users for budget purposes; and 3) collect SEG budget information and track work efforts as they draw against the budget.

Designed primarily to track and charge back salary costs and contractor billings for services and products provided to internal customers, the PARMS is not an effective tool for tracking costs of project activities. In addition, data from the PARMS is not suitable for use with the project management software being used by the project managers we contacted (e.g., Project Workbench, Microsoft Project, or Timeline).

In our report on Software Maintenance[5] (Report No. 96-DP-166-0001), we reported that HUD does not have a project cost accounting system to uniformly and consistently accumulate, bill, and report costs to system users. As a result, we recommended that HUD implement a project cost accounting system.

The Department missed the target date, September 30, 1997, to complete the Project Cost Accounting System (PCAS). In a memo dated February 17, 1998, the Chief Financial Officer (CFO) stated they do not view cost information at this time as being extremely helpful in assessing program performance for this agency. The CFO's plan is for all program areas to identify the cost information required based on the Government Performance and Results Act (GPRA) and make an assessment later.

However, an integrated project cost accounting system will greatly assist project managers and IT resource managers to monitor and control costs and ensure compliance with FASAB Statement Number 4. FASAB Statement No. 4, effective for fiscal years beginning after September 30, 1996, establishes managerial cost accounting standards aimed at providing reliable and timely information on the full cost of federal programs, their activities, and their outputs. The statement recommends further that managerial cost accounting should be a fundamental part of the financial management system and, to every extent practicable, integrated with other parts of the system.

[5] Controls Over Software Maintenance Must be Significantly Strengthened, HUD/OIG 96-DP-166-0001

In January 1999, HUD acquired a 15,000-seat license for an integrated suite of project management and time reporting software reportedly costing $1 million. HUD officials anticipate the software will help managers plan, schedule, budget, and monitor projects.

The new suite of project management software with an integrated time-keeping application may improve the timeliness and accuracy of the project data available to project managers. However, HUD still lacks a cost accounting system that provides information on the full cost of federal programs, activities, and outputs. HUD project cost data will still be incomplete since labor costs will continue to be the only project resource tracked and reported at the project level. In addition, the project management software will not be an integrated part of the financial management system.

Recommendations

We recommend that the Chief Financial Officer:

3A. Expedite the implementation of a Project Cost Accounting System.

Contracting Practices and Weak Contractor Controls Put IT Investments at Risk

Contract statements of work and task orders lack sufficient detail and are too broad in nature to ensure proper authorization of contractor work efforts and to gage quality of performance. Also, HUD officials do not routinely review the quality and productivity of contractors and a significant number of contract deliverables were either missing or did not meet HUD's guidelines and documentation requirements. Imprecise contractor specifications and weak controls over contractor performance increases the risk that products and services delivered will not meet user requirements.

HUD Handbook 2210.3 requires Government Technical Representatives (GTR) to monitor contract awards through the review, analysis, and the evaluation of periodic progress and financial reports. In addition, HUD's SDM identifies quality assurance reviews that project managers should perform on project documents and deliverables. However, the section on Quality Assurance is still not complete, almost two years after issuance.

The PMI also identifies four project management processes as part the project's contract administration effort: (1) Project plan execution which authorizes the contractor's work at the appropriate time; (2) Performance reporting which includes monitoring contractor cost, schedule and technical performance; (3) Quality control which is the inspection and verification of the adequacy of the contractor's product; and (4) Change control that ensures changes are properly approved and communicated to all applicable parties.

Statements of Work & Task Orders

We reviewed the six IT investment projects to determine whether HUD's contracting practices met project management best practices and conformed to HUD and Federal procurement regulations. To determine whether HUD properly authorizes and assigns contractors defined tasks, we selected a representative project to evaluate in detail. We obtained the task orders and billing information for four contracts used on the project selected.

We found that the task orders and billing information for the four contracts were too general and broad in nature. Consequently, we were not able to link the work performed to specific tasks and responsibilities or to determine whether the work performed was properly authorized. Unless specific tasks and responsibilities are defined, contractors cannot be held accountable for the delivery of products and services and HUD GTR's cannot ensure that the tasks and deliverables were completed and met contractual requirements.

In addition, the GTR's did not adequately document and track contractor productivity and quality of work. Although contract-monitoring forms were available and are part of HUD's procurement monitoring process, the GTR's did not use them.

HUD Handbook 2210.3 requires that, for proposed completion or indefinite delivery type contracts expected to exceed $500,000, the contractor is required to prepare forms HUD-441.1, Project Management System Baseline Plan, and HUD-661.1, Project Management System Report. The requirement to use these forms may be waived by the Contracting Officer (CO) if the statement of work or the contractor's proposal is specific enough or another acceptable means for project management and contractor performance evaluation is substituted.

We determined that the CO waived the use of the procurement monitoring forms for all six of the projects reviewed. Officials in the Office of Procurement and Contracts stated that this requirement is routinely waived for IT contracts because IT is using PARMS to monitor contractor performance.

PARMS is the official project management system for managing IT contracts. Its purpose is to provide a formal means to record and monitor contractor and SEG staff hours spent on IT systems. However, PARMS does not provide the periodic progress and financial information necessary for project managers and GTR's to monitor contract performance as intended by HUD's procurement regulations. The system soon to replace PARMS, Project Office Express has the same limitation.

SDM Deliverables

We requested 12 SDM deliverables for the six projects to determine whether they were available and met HUD or the PMI documentation standards for IT investment projects. Without these deliverables, management cannot ensure the contractor will deliver products or services provided on schedule, within budget, while still meeting user and mission related requirements.

We found a significant number of the required deliverables were either missing or did not meet HUD's documentation

standards. As noted in **Table 5**, 26 of the 72 SDM deliverables and their applicable quality review checklists (36%) were not available. We examined the 46 deliverables available and found that 38 (83%) did not meet HUD standards and all 6 project plans failed to meet PMI standards.

HUD Handbook 2400.15, HUD SDM Documentation Standards, describes the documentation deliverables required for the various phases of the system development life cycle, as well as guidelines for reviewing these deliverables. The PMI has also issued guidelines and checklists for evaluating overall project performance to ensure quality standards are followed.

SDM DELIVERABLE	Met HUD Standards	Did Not Meet HUD Standards	Did Not Meet PMI Standards	Not Available
Project Plan		6	6	
Needs Statement	2	4		
Feasibility Study	2	3		1
Cost Benefit Analysis	2	4		
Risk Analysis		5		1
System Decision Paper	2	3		1
Functional Requirements Document		4		2
System/Subsystem Specifications		2		4
Test Plan		3		3
User's Manual		2		4
Operations Manual		1		5
Test Results		1		5
Totals	8	38	6	26

Table 5. Evaluation Results for SDM Deliverables

As indicated in **Table 5**, project plans for all six projects did not meet either HUD or PMI standards. According to HUD's SDM and PMI standards, the project plan should identify the strategy for managing the development effort, summarize the goals and activities for all phases, and detail the milestone dates and resources required. We found that although the six plans identified assumptions and provided milestones and resource estimates, they did not address management strategy or the goals and activities for all the phases. In addition, as reported in **Finding 2**, the project

plans did not include all of the supporting management plans recommended by the PMI.

Recommendations

We recommend that the Chief Procurement Officer:

4A. Discontinue the practice of routinely waiving the requirement to use HUD forms 441.1 and 661.1 and ensure that the GTR's utilize these forms to monitor and report contractor performance in accordance with HUD Handbook 2210.3, Procurement Policies and Procedures.

4B. Ensure contract tasks orders clearly define tasks and responsibilities for contractors.

We recommend that the Chief Information Officer:

4C. Ensure the performance of periodic reviews to determine whether projects are meeting the requirements of HUD's System Development Methodology (SDM) and HUD Handbook 2400.15, HUD SDM Documentation Standards.

We recommend that the Assistant Secretary for Administration:

4D. Ensure that the Quality Assurance Guidelines (Appendix C) section of the SDM is completed.

Inadequate Reporting of Project Progress Hampers Investment Decision-making

IT investment project reports contain varying levels of detail and lack information on actual versus planned performance. In addition, project managers must prepare multiple project reports for different oversight groups within HUD. The Department has not established reporting requirements or developed a communication plan that prevents duplicate reporting of project progress. Management authority and oversight responsibility is fragmented between the Office of Administration and the CIO. As a result, HUD's ability to keep IT investment projects on track and to hold project leaders accountable for project results is weakened. Additionally, there is no assurance that IT investment decisions are made in an informed, efficient and effective manner.

According to the PMI, successful communication management is necessary for project success. A major process involved in communication management is performance reporting. Performance reporting should provide information on scope, schedule, cost, and quality. Key elements of the performance reporting process are status and progress reporting describing where the project currently stands and what the project team has accomplished. The PMI recommends the use of performance reporting techniques such as variance, trend, and earned value analyses to assess project status and progress.

Project Progress Reporting

We reviewed progress reports for five of the projects. Our objective was to determine whether progress reporting provided information needed by HUD's TIBEC and boards to make informed IT investment funding decisions.

Presently, HUD's Assistant Secretary for Administration has control over IT resources while the CIO provides oversight and policy. IT project managers are required to report progress to representatives of both organizations as well as the TIBEC. However, the oversight roles and responsibilities of these two organizations appear to overlap since little distinction has been made as to the objective and reporting requirements of project reviews held by each.

Early in FY 1999, HUD established the Project Management Review Board (PMRB). Although the PMRB is chaired by the Assistant Secretary, the CIO as co-chair leads and reports on project reviews. The purpose of the PMRB is to reinforce and add to the Department's ability to oversee and manage its IT projects as investments. Around the same time period, the Office of Information Technology, under the Office of Administration, initiated technical reviews of IT projects. However, neither the PMRB nor the

Office of Administration has established specific project reporting requirements nor identified performance measures for use in assessing and monitoring project progress.

Project progress reporting to both oversight groups should be coordinated to minimize duplicate reporting of performance data. Without a clear distinction between the two groups and better coordination of project progress reporting, project personnel will continue to be diverted away from project related tasks to prepare ad hoc project status reports.

Our review of available project progress reports found that project managers report project progress in different formats and at varying levels of detail. Many of the project progress reports lack sufficient information on actual versus planned performance. Project managers individually establish content and format for project progress reports. In the absence of performance measures and reporting criteria, there is no assurance that project managers are adequately controlling projects and that management has adequate information to make informed investment decisions.

Recommendations

We recommend that the CIO in coordination with the Assistant Secretary for Administration:

5A. Update or prepare charters for all IT investment oversight groups that clearly identify the roles and responsibilities of each.

5B. Establish standard reporting requirements and processes for reporting project progress information at all project management reporting levels.

5C. Coordinate project progress reporting to the CIO and the Office of Administration to reduce duplication and minimize drain on project resources.

5D. Define performance measures for monitoring the progress of IT investment projects.

Auditee Comments

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
THE DEPUTY SECRETARY
WASHINGTON, D.C. 20410-0050

September 30, 1999

MEMORANDUM FOR: Kathryn M. Kuhl-Inclan, Assistant Inspector General, Office of Audit, GA

FROM: Saul N. Ramirez, Jr., Deputy Secretary, SD

SUBJECT: Draft Audit Report - HUD Information Technology Investment Practices

This is in response to Benjamin K. Hsiao's correspondence dated August 27, 1999, concerning the Draft Audit Report - HUD Information Technology Investment Practices. We have reviewed the draft audit report and are providing general comments as well as specific comments.

See OIG Comment 1

In general, we agree with the findings about the six systems reviewed as part of this audit. However, we take issue with the overall strategy used by the Office of Inspector General (OIG) to look at Information Technology (IT) investment practices, which primarily focused on the control process of IT capital planning. Further, we question why OIG would choose a methodology that only looked at the control piece of IT capital planning, when both the Office of Management and Budget (OMB) and the General Accounting Office (GAO)-recommended model elements of a sound IT capital planning and investment control process includes select, control, and evaluate.

See OIG Comment 2

We know that OIG is well aware, as is OMB and GAO, that we are underway with improvements to HUD's IT Capital Planning and Investment Control Process and, in fact, OIG staff agreed to acknowledge these improvements in this audit. We were surprised to find the report lacking these particular acknowledgments. I think it is important to recognize that the Office of the Chief Information Officer (OCIO), in coordination with the Office of the Chief Financial Officer (CFO) and the Assistant Secretary for Administration, as well as the Program Offices, is establishing and implementing policies and procedures to ensure that HUD plans, acquires, and manages information technology in the most efficient and effective manner.

See OIG Comment 3

After reviewing the six high profile IT investment projects, the audit concluded "that HUD IT investment projects are well below industry average in terms of productivity and quality, and suffer from persistent cost overruns and schedule delays." We generally agree with this finding. However, you state that "the reported deficiencies are due to the absence of a consistent approach to managing and controlling IT investment projects and failure to use industry accepted project management practices." We disagree with this assessment. While this may have been true in the past, it is no longer the case.

We now have a consistent approach, policies, and procedures, for managing and controlling our investments. Further, I now chair the Project Management Review Board (PMRB), which has been established to evaluate IT project management capabilities, identify needed improvements and new business needs, and offer management support to ensure project success. The PMRB's rigorous reviews, along with other reviews, will ensure: (1) that projects remain tightly linked to HUD's strategic goals and objectives, and (2) IT development projects are assessed to compare actual versus planned cost and milestone performance data, and completed projects are assessed to determine the actual realization of benefits and costs. While we now have a consistent approach in place for managing and controlling our IT investments, we recognize that it will take some time to institutionalize improved project management in the Department and see the results. Again, OIG failed to acknowledge the improvements in this important area.

The implementation of HUD's enhanced IT Capital Planning and Investment Control Process is resulting in more stringent IT investment selection and project management (control and evaluation) practices. This is evident in the Selection Process employed this year in which three independent, multi-disciplinary Certification and Scoring Teams reviewed each of the 252 proposed FY 2000-2001 IT initiatives for: (1) life cycle costs; (2) project performance, development, technology, and acquisition risks, including whether the performance measures are strong and closely linked to expected outcomes; and (3) linkages between the benefits of proposed investments and HUD's Strategic Business Goals.

The multi-disciplinary Team reviews will result in funding and management recommendations that will ensure the approval of a balanced IT investment portfolio that better supports the Department's mission and programs. Further, the results of this Selection Process will form the baseline of our Control and Evaluation Process. OCIO staff provided a member of the OIG audit team with an in-depth explanation of the improvements to HUD's IT Capital Planning and Investment Control Process, which included a tour of our facilities while this process was underway to see it in action. Again, there was no acknowledgment of these improved efforts in the draft audit, thus resulting in an inaccurate and

misleading portrayal of HUD's current "Information Technology Investment Practices."

See OIG Comment 4

You state that 'HUD has not established 'Project Management' as a core competency to manage system development efforts." We disagree. In FY 1999, HUD placed greater emphasis on the importance of following good project management practices, conducted training on the subject, and is implementing new, enhanced tools to provide improved tracking and feedback of project control information. These tools—Microsoft Project 98, in combination with Project Office, a front-end Commercial Off-The-Shelf (COTS) product, provide a uniform way of presenting project data for tracking progress and managing projects. Further, we are using stringent industry-based standards for project management. The High Level Summary of Data Requirements (see Attachment A) outlines the core process for determining proposed IT project viability.

See OIG Comment 5

You recommended "that HUD establish a function responsible for providing guidance and leadership in the area of project management. This function should be carried out by the Chief Information Officer (CIO) with the authority to implement and enforce project management policy, standards, and procedures." We agree, and this has happened. Also, we agree that many of the OCIO functions remain understaffed, and efforts are underway to resolve this matter. As you are aware, HUD created the Office of IT Reform, within the OCIO, earlier this year, and this Office is providing guidance and leadership in the area of project management. Further, although IT operations is under the Assistant Secretary for Administration, the OCIO has the authority to implement and enforce IT project management policy, standards, and procedures.

See OIG Comment 6

In conclusion, we believe that the report is an inaccurate portrayal of the Department's Information Technology Investment Practices, especially when OIG is aware of the Department's many improvements in this area. We request that you revise the audit report to reflect more accurate and timely information. In addition to the above comments, we have also provided a more detailed response to the findings and recommendations in Attachment B. If you have any questions, please contact Debra Stouffer on 708-2374.

Attachments

Attachment A

HIGH LEVEL SUMMARY OF DATA REQUIREMENTS

New and Ongoing Projects	Maintenance Projects
Define the Business Need: Why is the project necessary? This includes: --Establishing linkage to the HUD 2020 Management Reform --Establishing linkage to HUD's Annual Performance Plan --Define performance gaps --Define functional requirements to address the gap	Description of Maintenance Procedures
Define the Technical Solution: What is the technical solution to meet the business need and why is it the best solution? --What is the status quo? --Make or buy? --What is the technical solution/requirements? --Should this be outsourced?	
Conduct an Economic Analysis: High risk projects will require a full Cost Benefit Analysis that should be consistent with the SDM. Low risk projects will require a life cycle cost analysis, for which a template and guidance will be provided.	Cost Justification
Conduct a Risk Analysis: --Identify the key risks (project management, technological, operational, etc.) --Define the potential implications of the risks --Develop strategies for mitigating the risks	
Acquisition Strategy: --Determine program management & acquisition alternatives --Compare Alternatives	
Technical Profile: Once a technical solution has been identified, identify: --System Design --System Interdependencies --Data Documentation	
Project Plan using the Departmental WBS: Detailed cost estimates through the third level of the WBS will be required for FY 2000 funded projects. Less detail will be required for proposed FY 2001 projects. This information will be entered via Project Office and Project 98. The Plan should also include: --Assumptions/dependencies --Potential risks --Project review schedules --Resources	

Attachment B

RESPONSE TO DRAFT AUDIT - IT INVESTMENT PRACTICES FINDINGS, RECOMMENDATIONS, AND CONCLUSIONS

DRAFT EXECUTIVE SUMMARY

OIG FINDINGS:

1. "Our audit concluded that HUD IT investment projects are well below industry average in terms of productivity and quality, and suffer from persistent cost overruns and schedule delays."

    - "Average productivity of the projects is 10 times less than industry average for similar projects."
    - "Projects did not follow HUD's system development guidelines and documentation requirements or industry accepted practices for project planning and risk assessments."
    - "Complete and reliable project performance data for measuring and controlling IT project progress is not available."
    - "IT capital investment projects are at risk due to weak contracting controls and practices."
    - "Reporting of IT investment projects is inadequate and management oversight is fragmented."

    RESPONSE: We generally agree, and we are in the process of collecting more complete and reliable project performance data for measuring and controlling IT project progress that will be reported to the appropriate level(s) of HUD management. HUD requires all projects to have, in the Information Technology Investment Portfolio System (I-TIPS), the automated tool supporting HUD's IT Capital Planning and Investment Control Process, many standard management tools, such as life cycle costs, work breakdown structures, project plans, cost/benefit analyses, risk assessment and mitigation plans, etc. HUD has made significant strides in developing and using defined processes for estimating costs for all projects. The Department has adopted a Work Breakdown Structure (WBS) that provides a standard process for estimating costs, and the use of the WBS is being mandated in this year's IT Capital Planning and Investment Control Process, as a prerequisite to funding for all IT projects in the FY 2000

See OIG Comment 7

budget cycle. It will be utilized for tracking approved funding in FY 2000 and beyond. In future years, the data captured from the WBS will be used to provide better breakdowns of how costs are incurred across individual life cycle activities. The WBS provides a standardized way to estimate, track, schedule, and cost performance. Further, HUD is implementing new, enhanced tools to provide tracking and feedback of project control information. These tools, Microsoft Project 98 and Project Office, provide a uniform way of presenting project data for tracking progress and managing projects. These improved management processes will provide HUD management with up-to-date, reliable information on projects that will allow managers to rapidly verify project status against estimates and highlight any cost or schedule overruns early enough to correct major deficiencies and make recommendations for improvements.

2. "HUD's organizational structure and project management practices do not ensure the effective management of complex projects."

   RESPONSE: While this may have been true in the past, this is no longer the case. The current year's more stringent selection process ensures, through grading based on the quality of program management tools and processes, such as risk assessments, work breakdown structures, performance plans, etc., that project managers demonstrate their ability to effectively manage their projects.

See OIG Comment 7

3. "Project managers are not held accountable for project results and critical resources are at risk due to inadequate project planning, unavailability of timely cost data, weak contractor controls and fragmented management oversight."

   RESPONSE: Again, while this may have been true in the past, major improvements are now being made to HUD's IT Capital Planning and Investment Control Process which will ensure change in this important area. The current year's selection process dovetails with project control by identifying contingent actions that are required before additional funding is made available.

See OIG Comment 7

OIG RECOMMENDATIONS & CONCLUSIONS:

1. "HUD does not have a consistent approach for managing and controlling IT investment projects and project leaders do not use industry accepted project management practices."

   RESPONSE: We disagree. HUD's IT Capital Planning and Investment Control Process provides the Department with a consistent

2

See OIG Comment 7

approach for managing and controlling IT investment projects. It is based on the GAO and OMB model for good IT capital planning and investment control, which includes **select, control,** and **evaluate** processes. This year, the **select** process was enhanced and made more rigorous, and we have begun to implement **control** and **evaluation** processes. In the area of **control**, formal project technical reviews were established on a recurring cycle beginning in February, 1999. Further, funding contingencies suggested by the Certification and Scoring Teams will be a primary control mechanism to ensure that project managers achieve the goals they set. In addition, the planned integrated Project Management Training Program will teach and develop the tools for managing projects and will, at the same time, improve documentation for next year's selection process. Finally, the Project Management Review Board will periodically review projects to gauge their progress, and the Technology Investment Board Executive Committee (TIBEC) is provided the status of major IT investments at their monthly meetings and may call for more in-depth reviews and evaluations, whenever necessary, to ensure that projects remain on track. In the area of **evaluation**, post project reviews and gathering of lessons learned from all affected groups will help to improve HUD's IT Capital Planning Process and to train managers. The first evaluation was completed in June, 1999. An independent vendor performed an assessment of ten critical systems. The improved select process in place this year is the foundation for creating a baseline against which improvement can be measured.

2. "...management authority over IT resources is fragmented between the Office of Administration and the Chief Information Officer (CIO). As a result, no one entity has overall responsibility to ensure projects are on track and to hold project leaders accountable for project results."

See OIG Comment 7

RESPONSE: We disagree with this conclusion. While no one organization has the overall responsibility in this area, the OCIO clearly has the mandate to control and manage the Department's IT investments. As indicated in our covering memorandum, the OCIO has made enhancements to this year's IT Capital Planning and Investment Control Process to make it more rigorous and is underway with additional improvement efforts to ensure projects are on track and to hold project leaders accountable for project results. The current year's **selection** process, along with training programs and regular, periodic and mid-year reviews, are the beginning of fulfilling the OCIO mandate to **control** and manage the Department's IT Investment Portfolio and hold project leaders accountable for project results.

3

See OIG Comment 5

3. "...We recommend that HUD establish project management as a primary function within the CIO organization."

   RESPONSE: The CIO has already done this. The Office of IT Reform, within the Office of the CIO, was established and has project management oversight as one of its primary responsibilities, with the authority to implement and enforce project management policy, standards, and procedures. In addition, we have established the Project Management Review Board, which is chaired by me, to evaluate IT project management capabilities, identify needed improvements and new business needs, and offer management support to ensure project success. In this regard, reviews have already been conducted on HUDCAPS and the Departmental Grants Management System, and recommendations have been made for improving these projects. Under the Office of Administration reorganization, effective in July, 1999, a System Engineering, Oversight and Performance Management Division was created to reinforce HUD's commitment to improving the system development methodology, project management practices and oversight, and role out of a performance management process. In addition, project management training and tools were provided in FY 1999, and project management skills will be assessed to determine where additional training is needed throughout the Department.

4. "...The CIO's office recently received approval for a reorganization.... many of the functions remain understaffed."

   RESPONSE: We agree that many of the OCIO functions remain understaffed, and efforts are underway to resolve this matter.

DRAFT REPORT

This audit is structured into five (5) major findings with supporting information taken from a set of six (6) major IT investment projects. The findings are:

1. Productivity and quality of IT investment projects well below industry average.
2. Inadequate and incomplete project planning increases project risk.
3. Accurate and complete data needed to control costs and schedule.
4. Contracting practices and weak contractor controls put IT investments at risk.
5. Inadequate reporting of project progress hampers investment decision-making.

4

The six projects selected span at least eight I-TIPS initiatives. Unfortunately, the six are noted in the introduction and never specifically referenced again. This makes it impossible to compare the project and assessment scoring information to the audit report. All of the discrepancies noted appear in at least one project, but the information is incomplete and was gathered several months after the data gathering activity for the audit was complete.

Many of the recommendations noted for each finding are good, and several are already being addressed through the current efforts and plans of the OCIO. There are however, several comments and questions about the methods used in the audit.

FINDING: Productivity and Quality of IT Investment Projects Well Below Industry Average

Page 5, last para., under Earned Value Analysis Sweeping judgments about the quality of program management are being made from a sample of one. "We attempted to calculate earned value for the six projects selected. However, we found that the data for five of the projects was either not readily available or not in a format suitable for matching plans to work completed. Therefore, we were able to analyze earned value for only one of the six projects." On page 25, 2nd full para., OIG's methods are described further, "...even on the one project where we were able to estimate the earned values, we had to make an extensive amount of assumptions, data conversions, and reconstruction to compute the cost and schedule variances."

Page 10, last para., under Function Point Analysis The discussion about function point analysis notes "...HUD's average actual productivity of 0.81 function points per staff month is significantly below the industry average of eight to nine for mainframe projects. Further, the disparity is even greater when compared to *Best in Class* for mainframe projects of 44 function points per staff month."

See OIG Comment 8

RESPONSE: It is unclear why HUD's productivity should be compared to the best in class and not the industry benchmark. Chart 3 (page 11), shows that for projects of similar size the average productivity is 3.5 – 4.

Page 11, 1st para. The OIG evaluated projects with the help of Software Productivity Research (SPR), Inc., a consulting firm specializing in measurement and modeling software development. "SPR consultants

5

See OIG Comment 9

concluded that the low level of project productivity is due to the large level of effort spent on the projects." What does this sentence mean?

Page 12 The discussion on 'predicted defect removal efficiency' seems questionable. Again, only one project had the required data. The audit attempted to calculate a percentage defect removal rate. This is calculated by:

$$\frac{\text{Total defects removed prior to implementation}}{\text{Total defects}}$$

See OIG Comment 10

Due to the lack of data, SPR used "modeling techniques on the defect rates based on the project characteristics and attributes." This modeling appears to predict the above percentage without one or possibly both numbers. This seems to be increasingly speculative and does not consider the magnitude of the number – even the "modeled" numbers. For example, Project "A" might remove 2 of 4 total defects prior to implementation giving it a score of 50%. Project "B", of similar size and complexity, removes 900 of 1,000 defects prior to implementation giving it a score of 90%. Would Project B really be considered of higher quality?

Page 13, 2nd full para. under Factors Influencing Productivity and Quality The audit notes several areas needing improvement. Among them:

- "Project structure is predominantly matrix and hierarchical, therefore project leaders often do not have direct control over staff resources resulting in poor communication and lower quality."
- "Project team size tended to be very large, thus negatively affecting productivity."

See OIG Comment 11

RESPONSE: While it may be true that the matrix organization causes inefficiency, the first bullet is a conclusion that does not follow from any of the proceeding discussion and analysis. Further, it is too vague to be of use. What is "poor communication and lower quality."? The second bullet is a statement similar to one noted previously describing a direct link between project team size and productivity. This is unsupported.

Page 14 The first paragraph recommends a structured training program to develop program manager skills.

RESPONSE: This is envisioned by the OCIO. The OIG report does not mention the delivery of Project Management training and

6

See OIG Comment 12

supporting software tools, including training in the use of these tools, by the Office of Information Technology (OIT).

The last paragraph notes, "... training in inspections, reviews and testing was lacking which results in HUD relying heavily on the experience and conscientiousness of the individual staff members to perform inspections and testing of project deliverables." On page 13, last para. (bullet), the audit notes, "Pre-test defect removal experience tends to be only average, but testing experience is somewhat stronger." Is testing strong or not?

Page 15 Recommendation 1A "Establish project management as a primary function within the CIO organization, with appropriate staffing and resources. The project management function should have the authority to implement and enforce project management policy, standards, and procedures including a disciplined, consistent procedure for system requirements management, quality assurance, configuration management, and project planning and tracking."

RESPONSE: This is a good recommendation. However, the OCIO wants to emphasize that their approach is not all enforcement but, rather, a more comprehensive solution including coordinated training, improved communication, and partnership.

See OIG Comment 13

Page 15-16 Recommendations 1F, "Ensure that project personnel are trained in pre-test defect removal techniques as part of the project management training and education program recommended in 1E." and 1L, "Establish procedures for implementing formal pre-test defect removal techniques for all key deliverables." are closely related. Also, Recommendations 1I, "Ensure project plans are complete and scheduled tasks are accurately defined to minimize the variance between planned and actual accomplishments. By placing more emphasis on project initiation activities (planning, scheduling, etc.), project leaders can better control project results." and 1M, "Implement a project estimation process and supporting tools set. Use industry accepted project management measurement techniques, such as function points, as part of this benchmark analysis." are basically the same. You may want to combine these.

Page 17 Recommendation 1O, "Publish the statistics of project performance and overall HUD performance so that project team members develop an appreciation and understanding of the importance that HUD places on productivity and process compliance." should be qualified. Earned value is a management tool. Variance is allowed as long as it is fully understood and risk reduction measures are in place to minimize the impact. The statistics should not be looked at in a vacuum.

7

FINDING: Accurate and Complete Data Needed to Control Costs and Schedule

Page 25, 1st para., under Cost Accounting System "...informal cuff systems..." What does this mean?

Page 27, Recommendation 3A, "Expedite the implementation of a Project Cost Accounting System."

See OIG Comment 14

RESPONSE: HUD is implementing the Project Cost Accounting (PCAS) and Cost Allocation (CA) Subsystems of HUDCAPS by September 30, 1999, to manage HUD's Working Capital Fund (WCF) (86X4586). HUDCAPS is HUD's implementation of American Management Systems' Federal Financial Systems (FFS).

PCAS/CA will provide:

- The ability to trace the WCF's estimated reimbursements back to the source documents that created the spending authority;
- An audit trail in the general ledger that ties expenses recorded by the WCF to costs billed to customers; and
- A reduction in the number of manual steps needed to consolidate the costs and to bill customers.

The implementation plan has included the requirements analysis to establish interfaces, as necessary, with other business functional areas such as travel (SATO Travel and the HUD Travel Management System (HTMS)), Credit Card (VISA), Payroll (the National Finance Center (NFC)), and procurement (the HUD Procurement System (HPS)).

Fully functional reports are required against production data no later than October 25, 1999 for the first period month-end reporting.

Page 27, Recommendation 3B, "Establish cost accounting standards in conformance with Federal Accounting Standards Advisory Board (FASAB) Statement Number 4 with the purpose of providing reliable and timely information on the full cost of federal programs, activities and outputs."

See OIG Comment 15

RESPONSE: Statement of Federal Financial Accounting Standards (SFFAS) Number 4 was effective beginning with FY 1998. For FY 1998, the Department developed a costing methodology which allocated all salary and expense (S&E) costs to our responsibility

8

See OIG Comment 15

segments and major programs. SFFAS #4 does not require a formal "cost accounting system" but instead allows for other methods to be used, such as cost finding techniques and cost studies and analyses.

For the FY 1998 consolidated financial statements, the Department analyzed the various components of its S&E costs (the WCF, OIG costs, and salary and administrative costs), and then allocated these amounts to the responsibility segments and major programs included in our Statement of Net Cost, as required by the SFFAS. A Full-Time Equivalent (FTE) survey was conducted during FY 1998 to help in allocating these costs. The FTE survey was not used to allocate WCF costs since these costs bear no relationship to HUD's FTEs. Instead, an analysis of the specific WCF costs was performed and used to allocate these costs. This analysis was based on the WCF billing to the Department in October, 1998 (the Office of Information Technology Summary Invoice), and OIT's Statement of Services for September, 1998. The Project Cost Accounting System, when operational, will greatly facilitate the allocation of the WCF costs.

We can share with the OIG Systems Office the work papers used in accumulating and allocating costs for the FY 1998 consolidated financial statements. We believe that we meet the requirements for the SFFAS and request that this audit recommendation be closed.

FINDING: Contracting Practices and Weak Contractor Controls Put IT Investments at Risk

Page 31, Recommendation 4A, "Discontinue the practice of routinely waiving the requirement to use HUD forms 441.1 and 661.1 and ensure that GTRs utilize these forms to monitor and report contractor performance in accordance with HUD Handbook 2210.3, Procurement Policies and Procedures."

See OIG Comment 16

RESPONSE: We strongly disagree with this finding. Under the HUDAR Subpart 2442.1107 contract clause, the Department may substitute another acceptable method for project management. The Department is not waiving this requirement, but substituting an acceptable method for project management, as cited in the HUDAR. Contractors currently submit project work plans in hard copy, and OIT is implementing new enhanced tools to provide improved tracking and feedback of project control information. These tools, such as Microsoft Project 98, in combination with Project Office, a front-end Commercial Off-The-Shelf (COTS) product, provide a uniform way of presenting project data for tracking progress and managing projects. Further,

OIT is using stringent industry-based standards for project management. PARMS is not being used for this purpose.

Page 31, Recommendation 4B, "Ensure contract task orders clearly define tasks and responsibilities for contractors."

RESPONSE: We concur. The CPO will work with the CIO, and OIT to strengthen management controls regarding the issuance/monitoring of task orders. We are also attempting to deal with this finding/recommendation by using performance-based type task orders, where possible.

Page 31, Recommendation 4C, "Periodically review projects to ensure that project deliverables are meeting the requirements of HUD's Systems Development Methodology (SDM) and HUD Handbook 2400.15, HUD SDM Documentation Standards."

See OIG Comment 17

RESPONSE: We do not envision that the Chief Information Officer will "Periodically review projects..." for conformance with HUD's SDM and Documentation Standards. As part of the Department's PMRB reviews, and OIT project reviews, projects will be reviewed for compliance with the requirements of HUD's SDM and Documentation Standards.

CONCLUSION

See OIG Comment 18

In conclusion, the findings and observations/comments in the audit are generally correct, although they were based on a very small sample of projects, which may be misleading. Anecdotal evidence and specific instances abound. While this report appears to be an accumulation of data gathered over several years and the findings of a consulting team, significant enhancements to HUD's IT Capital Planning and Investment Control Process, over the past six months, have not been recognized and acknowledged in the report. Given the very limited number of projects reviewed, on which findings are based, and the failure to acknowledge recent improvements in HUD's IT investment practices, the report appears to be based on a less than rigorous evaluation process that has resulted in some misleading, out-of-date findings and conclusions. In view of the number of exceptions and caveats noted in the audit process, it seems a better set of projects might have been chosen to improve the reliability of the report.

10

Response To Auditee Comments

We are encouraged that the Department, in general, agrees with the findings of our audit. Implementation of the recommendations in this report will further enhance HUD's ongoing effort to improve the selection, control and monitoring of IT investment projects. Below are our responses to the Department's comments.

1. The Department expressed concern that our report focussed primarily on the control element of the Office of Management and Budget (OMB) and General Accounting Office (GAO) recommended model for sound IT capital planning and investment control. As stated in both our cover memorandum and the executive summary, the objective of our audit was to determine whether IT investments are properly managed and controlled. We reported the specific conditions found during our review and, where appropriate, noted efforts by the Department to improve management of IT investments.

2. The Department's response implies that the current efforts to improve the investment selection process are adequate to rectify the longstanding and systemic weaknesses identified in this report. We disagree. Much more will be needed if the productivity and quality of IT investment projects are to meet industry standards and to curtail persistent cost overruns and schedule delays. In addition, the Department's initiatives described in the response, although notable, have only recently been announced. It is premature to conclude that these actions are effective solutions to the identified problems.

3. We disagree with the Department's response. The establishment of a Project Management Review Board (PMRB) does not constitute a "consistent approach, policies, and procedures, for managing and controlling our investments". The PMRB has yet to develop and disseminate guidance or policy on project review procedures or criteria. In the absence of this criteria, the oversight process remains undefined and ad hoc.

4. We are encouraged that our ongoing dialogue with the Department during the course of this review resulted in HUD taking steps to improve project management. However, the establishment of a staff of skilled project managers requires a more aggressive approach. The training referred to in the response was limited and did not go as far as we would recommend. Further, project management is much more than the implementation of an automated tool. A significant sustained investment in training coupled with practical experience in managing complex projects is required to establish project management as a core discipline.

5. The Department agrees that a project management function is necessary and indicated that the CIO's Office of IT Reform is providing guidance and leadership in the area of project management. However, the response did not specify the CIO's role, responsibilities and accountability in this area. Current indications are that the Office of Information Technology is still leading this effort.

6. The Department's response in this area contradicts paragraph 2, page 1, of the response. The assertion that our report is an inaccurate portrayal of the Department's IT investment practices is without merit. Although efforts to improve the investment selection process are in progress, that in no way invalidates the conditions noted in this report, nor the conclusions reached. The six projects selected for review are representative of projects undertaken by the Department during the period of our audit. We cannot ignore the conditions noted, or the implications these findings have as to HUD's failure to control IT investment projects.

7. The CIO has the difficult position of working to improve known management weaknesses while simultaneously addressing criticisms of practices outside of its control. We are encouraged with the recent changes in that office and remain hopeful that with time, the control and authority of the CIO will increase. We noted several instances in the response to our draft report that did not appear germane to the issues being discussed in the audit report. Where appropriate, we have clarified ambiguous language or incorporated comments in our report. However, if in need of further clarification, we invite HUD personnel to engage in direct dialogue on individual areas of the report or recommendations.

8. In the discussion on function point analysis, HUD's productivity measured at 0.81 is compared to both industry average (8.0 to 9.0) and best in class (44.0).

9. The sentence following the statement, "low level of project productivity is due to the large level of effort spent on the projects" refers to the relationship between productivity measured in terms of the level of effort expended to accomplish a task. The level of effort (expressed in staff months – see Table 6: Function Point Analysis) for the projects reviewed is significantly higher than expected for projects of their size and type. Therefore, the productivity measurement, the amount of productive work accomplished during a specific period, is low.

10. We disagree that the Department's statement that the "predicted defect removal efficiency" conducted by the contractor SPR is questionable. SPR is a highly regarded software engineering research and development firm that specializes in measurement, distributed data, and modeling software development. In the draft report comments, the Department confuses the calculation of defect removal rates with the calculation of defect removal efficiency. Defect removal efficiency rates are normally determined by comparing actual defect data with predicted defect data. However, HUD provided usable (actual) defect data for only one project making it necessary to rely on modeling techniques. SPR arrived at an average HUD defect removal efficiency by inputting the data provided for this one project, the characteristics and attributes for the remaining projects, and a database containing results from assessments of over 6,000 projects. As stated in our report, defect measurements are an in integral part of the quality assurance process.

11. These conclusions were reached by SPR after conducting a series of user and project team surveys and interviews. We disagree with the Department's assertion that there is no direct link between project team size and productivity (See OIG Comment 9).

12. The first statement references the amount of "training" provided in testing techniques, while the latter statement, refers to the level of "experience" in testing.

13. These recommendations should remain separate because the establishment of procedures is not the same as the providing the needed training.

14. We are encouraged that the Department has chosen to implement the Project Cost Accounting and Cost Allocation subsystem of HUDCAPS for HUD's Working Capital Fund. The Department has agreed to brief us on the progress of this implementation.

15. After further review, we decided to eliminate this recommendation.

16. We agree that the HUDAR allows the Department to substitute another acceptable method for project management. However, we disagree with the assertion that use of tools such as Microsoft Project 98 in combination with Project Office constitutes an acceptable alternative for monitoring and reporting on contractor performance as required by HUD Procurement Policies and Procedures. These tools can facilitate the automated tracking of delivery dates and labor hours charged to the project. However, the Department has provided no evidence to support the claim that the tools will facilitate the collection of data on contractor performance at the same level of detail available when Form 661.1 was used. For example, Form 661.1 ensures the reporting of earned value performance data at the contractor and task order level. If consistently applied, the generation and collection of this type of detailed project data will assist project managers to control cost and schedule.

17. After further review, we have modified this recommendation.

18. The Department states that the projects reviewed constitute a very small sample. However, as indicated in the Introduction, the six projects accounted for approximately 20%, or $98 million, of the $501 budgeted for IT capital investments during a six year period. This amount is a significant portion of IT investment dollars.

Distribution

Chief of Staff, S, (Room 10000)
Acting Assistant Secretary for Administration, A (Room 10110)
Assistant Secretary for Public and Indian Housing, P (Room 4100)
Assistant Secretary for Community Planning and Development, C (Room 7100)
Assistant Secretary for Housing-Federal Housing Commissioner, H (Room 9100)
Acting Assistant Secretary for Public Affairs, W (Room 10132)
Assistant Secretary for Congressional & Intergovernmental Relations, J (Room 10120)
Assistant Deputy Secretary for Field Policy and Management, SDF (Room 7108)
Counselor to the Secretary, S (Room 10234)
Deputy of Chief of Staff, S (Room 10226)
General Counsel, C (Room 10214)
Deputy General Counsel, CB (Room 10220)
Deputy Chief of Staff or Programs and Policy, S (Room 10226)
Deputy Assistant Secretary for Public Affairs, W (Room 10222)
Government National Mortgage Association, T (Room 6100)
Chief Information Officer, Q (Room P8204)
Chief Procurement Officer, N (Room 5184)
Director, Office of Information Technology, AMI (Room 4160)
Chief Financial Officer, F (Room 2202)
Acquisitions Librarian, Library, AS (Room 8141)
Audit Liaison Officer, A (Room 10110)
Audit Liaison Officer, CFO (Room3216)
Director, Enforcement Center, V, 200 Portal Building
Director, X, Real Estate Assessment Center , 1280 Maryland Avenue, SW., Suite 800
Inspector General, G (Room 8256)
Deputy Inspector General, G (8256)
Assistant Inspector General for Audit, GA (8286)
Deputy Assistant Inspector General for Audit, GA (8286)
Director, Program Research and Planning Division, GAP (Room 8180)
Director, Financial Audits Division, GAF (Room 8286)
Central Records, GF (Room 8256)
Semi-Annual Report Coordinator, GF (Room 8254)
Dir., Housing & Community Development Issue Area, US General Accounting Office, 441 G Street, NW., Room 2474, Washington, DC 20548
Attn: Judy England-Joseph