
Review of the Department's
Requirements Definition & Testing Processes for the
Loan Origination and Loan Consolidation Systems

FINAL AUDIT REPORT



Audit Control Number 11-70010
March 1999

Our mission is to promote the efficient
and effective use of taxpayer dollars
in support of American education



U.S. Department of Education
Office of Inspector General
Washington D.C. Field Office

NOTICE

Statements that management practices need improvement, as well as other conclusions and recommendations in this report, represent the opinions of the Office of Inspector General. Determination of corrective action to be taken will be made by appropriate Department of Education officials. This report may be released to members of the press and general public under the Freedom of Information Act.

TABLE OF CONTENTS

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
INTRODUCTION	6
Background	6
Objectives, Scope and Methodology	7
Statement on Management Controls	7
AUDIT RESULTS.....	8
System Requirements for the Loan Origination and Loan Consolidation Systems Were Not Adequately Defined	8
System Specifications and Documentation Provided to EDS Were Incomplete and Outdated.....	12
Test Scenarios and Test Cases Did Not Ensure That the Loan Origination and Loan Consolidation Systems Met the Required Functionality.....	14
Overall Documentation Supporting the Loan Origination and Loan Consolidation System Testing Was Poorly Maintained.....	17
System Generated Management Information Reports Were Not Reviewed or Tested	21
Loan Origination System Interfaces Were Not Adequately Tested Prior to System Implementation.....	22
APPENDICES	
Appendix 1- Acronyms	
Appendix 2- Department Reply to Draft Report	
Appendix 3- OIG Response to Department Cover Letter Comments	

EXECUTIVE SUMMARY

Requirements definition is one of several phases of the development of a system. It is the articulation of required functional and data management capabilities at a very detailed level. These requirements serve as the basis for the detailed system design. The subsequently designed system is then tested to confirm that it actually meets the defined requirements.

Late in Fiscal Year 1995, the Department awarded a contract to Electronic Data Systems (EDS) to design and implement a loan origination subsystem that would include both loan origination and loan consolidation processes. This system had previously been under contract to Computer Data Systems, Inc. (CDSI). [CDSI has recently been acquired by Affiliated Computer Services, Inc. (ACS). For clarity in this report, we will continue to refer to the incumbent contractor as CDSI.] The EDS contract called for an original system start-up date of January 15, 1996. However, EDS did not begin operation of the loan consolidation system (LCS) or loan origination system (LOS) until September 1996 and March 1997, respectively.

Because of the difficulties associated with the development and start-up of these systems, the Office of Inspector General proceeded with plans to audit the processes associated with the Department's requirements definition and testing of the EDS developed systems. Specifically, our objectives were to determine whether the Department adequately defined its system requirements for the EDS LOS/LCS contract and whether these requirements were adequately tested prior to system start-up. Overall, our audit work revealed that LOS and LCS requirements were not adequately defined for EDS by the Department, and the system testing that took place prior to start-up was inadequate. These deficiencies subsequently contributed to system implementation delays, significant increases in contract costs and negative publicity to the Department.

The Request for Proposal (RFP) issued by the Department required the development or conversion and operation of a subsystem to originate Federal Direct Student Loans, together with all services, hardware, software and personnel necessary to operate the subsystem and originate loans effectively. The RFP stated that the software from the current system, operated by CDSI, would be provided to the successful bidder, for conversion or for use in the development of new software. The RFP also indicated that a sufficient amount of technical documentation was available and would be provided following contract award, to facilitate system development. Based upon the information presented, EDS proposed to convert the LOS and LCS to a new hardware and software environment.

However, some Department officials were aware that the previous loan origination contractor had built its system using proprietary software. In addition, CDSI had developed the LCS using commercial copyrighted software that required a significant amount of manual support. Actual available system specifications and documentation proved to be inaccurate and outdated. Therefore, EDS was unable to convert the source code from CDSI and was ultimately required to develop the systems from scratch.

Also, system test cases and scenarios did not provide assurance that processing requirements of the system would be met. Testing documentation did not provide sufficient evidence that all test procedures were successfully completed. Furthermore, system generated management information reports were not tested, parallel processing was not performed, and there was only limited stress testing of the systems.

We acknowledge the Department's current efforts to move towards a more **performance-based** or **outcomes-oriented** approach to system procurement. We support the use of performance-based contracting that will define **what** the system needs to do as opposed to **how** it needs to do it. However, functional requirements must still be defined in a manner that will adequately communicate the intended outcomes of the system. If not fully defined in the Statement of Work (SOW), then the Department must ensure that functional requirements are clearly communicated and understood by the selected contractor after award, throughout the development of the system. The results of our audit work indicate that requirements for the LOS/LCS were not adequately communicated under either methodology.

Detailed in the body of this report are findings specific to the LOS/LCS implementation. However, we believe that our recommendations can be used to improve the Department's systems development and implementation processes overall. Therefore, on the following page we have included a presentation of general control weaknesses noted, along with suggestions consisting of ways the Department can strengthen these processes for use in future system development efforts, to avoid the difficulties and delays encountered with the LOS/LCS.

To improve controls over...	We recommend that the Chief Operating Officer for the Office of Student Financial Assistance Programs (OSFAP)...
<i>Definition of system requirements...</i>	<ul style="list-style-type: none"> & Establish procedures and controls to ensure the requirements definition process is a collaborative process, with the appropriate functional offices having primary responsibility for defining and approving business/functional requirements; & Establish procedures and controls to ensure that PSS has primary responsibility for ensuring the feasibility of offerors- proposed technical solutions, including their alignment with Department-wide systems architecture and information technology (IT) strategic plans; and & Engage industry consultants, when necessary, to participate in the above noted processes.
<i>Providing accurate and up to date system specifications and documentation to contractors...</i>	<ul style="list-style-type: none"> & Improve procedures for evaluating contract deliverables, particularly in the area of system design documents and specifications, to ensure that documentation is prepared at a sufficient level of detail and that all required functionality is documented prior to production implementation, or at least by system transition; and & Provide detailed program information from the responsible program office when contractors are selected for development efforts, to ensure that the contractor has a solid understanding of the functional requirements necessary to meet the needs of the Department users.
<i>Preparation of test scenarios and test cases...</i>	<ul style="list-style-type: none"> & Ensure that test cases are prepared/reviewed by individuals with strong knowledge of the business functions the application is intended to support; & Ensure that there is a process in place to tie test cases to system requirements; and & Ensure conversion testing includes validation of data accuracy.
<i>Supporting documentation for system testing...</i>	<ul style="list-style-type: none"> & Establish testing guidelines at a high level for all Office of Student Financial Assistance Program systems; and & Establish controls which require the contractor to record error resolutions in an automated tracking system to be used as a reference tool.
<i>System production of usable management information reports...</i>	<ul style="list-style-type: none"> & Develop test cases that include validating application generated reports based on test data during Systems Integration Testing (SIT); & Ensure that Systems Acceptance Testing (SAT) includes the generation, validation, and acceptance of management reports by the intended users of the reports prior to system implementation; and & Ensure reports are produced during stress testing with production volumes of data.
<i>System interface testing...</i>	<ul style="list-style-type: none"> & Process production volumes of data through all applications during stress testing, prior to system implementation in the production environment; & Establish guidelines for certifying applications to exchange data; & Create a data dictionary for OSFAP which identifies standard data formats and validation criteria for all Student Financial Aid systems.

Department's Reply

On February 18, 1999, the Department provided a written response to our draft report. The Department agreed that improvements can be made in writing requests for proposals and that documentation and testing can always be improved. The Department also agreed with all of our recommendations and has stated they are in the process of being or have already been implemented.

However, the Department does not agree that system requirements were inadequately defined and that supporting documentation for testing was inadequate, although it is agreed that documentation was not maintained as well as it should have been. In addition, the significance of the report findings at this late date- four years after the request for proposal- is questioned.

The Department believes the report focuses narrowly on areas involving Department management and ignores problems with contractor project management. Concern is expressed over the fact that the draft report does not provide the reader with information on corrective or proactive measures that the Department undertook to correct problems with its contractor, including the Department's acceptance of oversight responsibility when the contractor was unable to process an unexpected number of loan consolidation requests by students, as well as contract modifications that included performance measures that ensure improved product quality and services. Concern was expressed that this final report would not reflect the revisions believed necessary to provide a balanced assessment of the Department's LO/LC systems conversion effort.

OIG Response

We have carefully considered the Department's comments to the report. We acknowledge and appreciate the Department's actions on several of our recommendations. Appropriate changes have been made where necessary, however, this final report remains substantially unchanged from the draft version.

As we noted in our draft report, our findings are specific to the LOS/LCS implementation. However, our recommendations are geared towards general controls that need to be improved or implemented for use in future system development efforts, to avoid the difficulties and delays encountered with the LOS/LCS. While the Department notes that some of our recommendations have already been implemented, we are concerned that the responses/actions are specific to this particular contract/system. The Department must ensure that these recommendations are implemented at an organizational level, with appropriate management controls and policies and procedures in place to prevent the reoccurrence of these issues on future system development efforts.

Our audit scope and objectives were clearly stated to focus on the Department's requirements definition and testing processes, not the contractor's. Additional audit efforts are looking at other aspects of this particular contract and will present information on other contributing factors to problems encountered, as noted on page 8 of this report. However, while we acknowledge that it was not unreasonable for the Department to expect certain actions by their contractor, the Department is the system owner and in the end is ultimately responsible for ensuring the adequacy of its contractors' performance. In this regard,

the Department has the responsibility to provide the contractor any and all relevant information in its possession or under its control that is needed to properly develop the system. The Department must take steps to ensure that its internal controls are sufficient to mitigate problems created by contractors.

We previously included and acknowledged in our draft report actions taken to improve processes applicable to our audit scope, such as is noted with regard to testing processes/practices under Findings # 3 & 4. While we acknowledge the Department's corrective measures cited, they are not pertinent to the scope of our audit. Our objectives focused solely on the Department's processes for defining system requirements and system testing. The measures cited by the Department do not address actions that would improve upon these processes. Had the Department had adequate measures in place to define requirements and test the systems, there most likely would not have been a need for the cited corrective actions subsequent to system implementation. The specific improvements/measures cited by the Department in their response may be cited through other applicable audit work currently being performed under Audit Control Number 04-80008: "Review of the Department's Post Award Administration of the EDS Contract".

This report includes, after each finding, a summary of the Department's comments. We have addressed areas where we disagree with the comments. A copy of the complete text of the response is contained in Appendix 2. An OIG response to the Department's cover letter that accompanied the comments to the report findings is contained in Appendix 3.

INTRODUCTION

Background

Under the Direct Loan Program, the Federal Government provides loan capital directly to student and parent borrowers rather than through private lenders. Participating schools, acting on behalf of the government, deliver funds directly to eligible student and parent borrowers. The Department contracts with the private sector to provide origination, servicing and accounting systems and to perform related services.

The contractor for the Loan Origination Center (LOC) is responsible for Direct Lending activities up to loan repayment. These activities include promissory note and loan origination processing, estimation and drawdown, disbursement and loan changes. The LOC also processes requests for Direct Consolidation Loans. Through consolidation, borrowers may combine various types of federal education loans, including Direct Loans and loans made through the Federal Family Education Loan (FFEL) Program. Consolidation may extend a borrower's repayment period, provide an interest rate break in some cases, and eliminate dealing with multiple lenders.

The former LOC contractor, Computer Data Systems, Inc (CDSI), [recently acquired by Affiliated Computer Services, Inc.], had performed all loan origination functions as well as all loan servicing activities for the Direct Loan program since program inception. In order to separate Direct Loan functions and to take advantage of the competitive bid process, the Department issued a Request for Proposal (RFP) for a new LOC contractor. The contract was subsequently awarded to Electronic Data Systems (EDS) late in Fiscal Year 1995.

The EDS contract called for an original start-up date of January 15, 1996 for the combined loan origination subsystem, which included both loan origination and loan consolidation processes. This date was eventually extended to May 1996. After EDS was unable to meet the extended start-up date, the development effort for each process was split, with separate development schedules established for each.

The Department continued to use the systems operated by CDSI until EDS was able to implement its loan consolidation and loan origination systems (LCS/LOS). EDS began operation of the LCS in September 1996 and the LOS in March 1997.

Because of the difficulties associated with the development and start-up of these systems, the Office of Inspector General proceeded with plans to audit the processes associated with the Department's requirements definition and testing of the EDS developed systems.

Objectives, Scope and Methodology

The objectives of our audit were to:

- (1) Determine whether the Department adequately defined its system requirements for the EDS LOS/LCS contract; and
- (2) Determine whether requirements were adequately tested prior to system start-up.

To accomplish our objectives, we reviewed all test files for Systems Integration Testing (SIT), Systems Acceptance Testing (SAT), and First Live Batch Testing associated with each system. We assessed the adequacy of the test case scenarios, test case sign-off sheets and issue resolution process, as well as the documentation supporting the test results. We interviewed a total of 34 Department, EDS and Independent Quality Control Unit (IQCUC) officials and staff involved with the requirements definition and/or testing processes for the systems. We also reviewed relevant contract documentation, including the RFP, EDS Technical Proposal and any modifications and Task Orders associated with the contract.

Our audit covered the period beginning with LOS/LCS RFP development through systems start-up. Fieldwork was performed at the EDS Ballston, Virginia office and applicable Department of Education offices between September 1997 and March 1998. We met with Department officials in August and September 1998 to discuss the results of our audit. Our audit was performed in accordance with government auditing standards appropriate to the scope of the review described above.

Statement on Management Controls

As part of our audit, we assessed the management controls applicable to the Department's systems requirements definition and testing processes, including policies, procedures and practices applicable to the scope of the audit. Our assessment was performed to determine the level of control risk for determining the nature, extent and timing of our substantive tests to accomplish the audit objectives.

For the purpose of this report, we assessed and classified the significant controls into the following categories:

- system requirements definition;
- system testing

Because of inherent limitations, a study and evaluation made for the limited purposes described above would not necessarily disclose all material weaknesses in the above areas. However, we identified weaknesses and recommended improvements for future system development and testing efforts. These weaknesses are discussed in the Audit Results section of this report.

AUDIT RESULTS

The following is a presentation of our findings noted as a result of our audit work, accompanied by applicable recommendations. Overall, our audit work revealed that LOS/LCS system requirements were not adequately defined by the Department in the RFP and the system testing that took place prior to start-up was inadequate. These weaknesses subsequently contributed to a number of problems, including:

- < delays in implementing the EDS developed systems;
- < significant increases in contract costs to successfully implement the systems;
- < the eventual shutdown of the Loan Consolidation system due to the inability to timely and adequately process consolidation requests;
- < Congressional hearings on the deficiencies of the EDS Loan Consolidation system; and
- < the creation of a negative image of the Department's ability to manage an effective Direct Loan Program by the student aid community and borrowers.

[Additional contributing factors to the problems noted above will be addressed through audit work being completed under Audit Control Number 04-80008: *Review of the Department's Post-Award Administration of the EDS Contract*]

Detailed in the body of this report are findings specific to the LOS/LCS implementation. However, we believe that the recommendations presented can be used to improve the Department's future systems development and implementation processes overall, and thereby avoid the difficulties and delays encountered here.

Finding No. 1 System Requirements for the Loan Origination and Loan Consolidation Systems Were Not Adequately Defined

Loan Origination

The functionality of the LOS, originally developed by CDSI, was not adequately defined in the RFP issued by the Department. As noted in the Department's *System Life Cycle Management Manual*, requirements definition is one of several phases in the development of a system. It is during this phase that required data and data processing capabilities are defined in detail, and a detailed data dictionary capturing the data requirements is created. The requirements definition phase provides the detailed information needed for the design of the system.

We acknowledge the Department's awareness that the approach described above is somewhat outdated and that they are working to update the *System Life Cycle Management Manual* to reflect a more

A performance-based or outcomes-oriented approach to system procurement. We support the use of performance-based contracting that will define what the system needs to do as opposed to how it needs to do it. However, functional requirements must still be defined in a manner that will adequately communicate the intended outcomes of the system. If not fully defined in the SOW, then the Department must ensure that functional requirements are clearly communicated and understood by the selected contractor after award, throughout the development of the system. The results of our audit work indicate that requirements for the LOS/LCS were not adequately communicated under either methodology.

The RFP stated that the software from the current system, operated by CDSI, would be provided to the successful bidder, for conversion or for use in the development of new software. The RFP also indicated that a sufficient amount of technical documentation was available and would be provided following contract award, to facilitate system development. Based upon the information provided in the RFP, EDS proposed to convert the existing CDSI system to a new hardware and software environment.

Interviews with Department staff indicate that some key Department officials were aware that the LOS developed by CDSI interacted with and was dependent upon proprietary software used by CDSI to support their Direct Loan servicing and accounting (FARS) systems. Because the proprietary routines used by CDSI to process loan origination data were unavailable to EDS, EDS was unable to convert the CDSI program into a fully functional system. Furthermore, the actual available specifications and documentation for the CDSI system proved to be inaccurate and outdated. [See Finding 2]

Loan Consolidation

In addition to originating student loans, the RFP also required the successful bidder to develop an automated system to support the business of consolidating student loans. The Loan Consolidation System would combine existing multiple student loans, held by an individual borrower, into a single loan for repayment purposes. The functional requirements for loan consolidation were described at a very high level in the RFP. The CDSI loan consolidation application operated on a stand-alone, PC-based environment and required a significant amount of manual support. The business requirements for loan consolidation were never fully documented by either CDSI or the Department. In addition, requirements were continually changing. Therefore, the Department was unable to clearly define the required system functionality in the RFP.

Lack of Technical Expertise & User Involvement

The team assembled by the Department to define the required features of the Loan Origination Subsystem in the Statement of Work (SOW) for the RFP was comprised predominantly of Program Systems Service (PSS) personnel, primarily individuals new to the Department of Education who did not have much Direct Loan Program knowledge. In addition, concerns were noted with regard to the level of technical expertise of the individuals involved. Specifically, one Department official stated that the Department could not have effectively reviewed and commented on the EDS proposal because they were unfamiliar with the proposed technology. A number of EDS officials noted that while the Department representatives had a strong business knowledge, they lacked systems/technical expertise.

Representatives from one of the key beneficiary/user offices of the Loan Origination and Loan Consolidation data- the Accounting and Financial Management Services (AFMS)- indicated they were not adequately involved in the SOW development prior to its release, citing inadequate timeframes provided for documentation review and the procurement team's failure to address issues raised by AFMS in some key functional areas. Lack of adequate involvement by this office in drafting the SOW failed to ensure that all procedures for interacting with Department systems were thoroughly addressed. All of the potential users of the application should be involved in all facets of developing the systems- business requirements before initiating system development efforts. Successfully capturing the business rules, at a detailed level, should be the responsibility of the organization most knowledgeable of the rules.

Recommendations

We recommend that the Chief Operating Officer:

- 1) Establish procedures and controls to ensure the requirements definition process is a collaborative process, with the appropriate functional offices having primary responsibility for defining and approving the *business/functional* requirements;
- 2) Establish procedures and controls to ensure that PSS has primary responsibility for ensuring the feasibility of the offeror's proposed technical solutions, and that the proposals are aligned with Department-wide systems architecture and information technology (IT) strategic plans; and
- 3) Engage industry consultants, when necessary, to assist in the above noted processes.

Department's Reply

The Department did not agree with this finding, noting that a detailed redefinition of the functional requirements was not required, as they were already more than adequately defined during their development at the original contractor, CDSI. It would be neither necessary nor cost efficient to go through a complete system development life cycle process each time a system is moved. However, the Department did acknowledge that documentation from CDSI regarding various data anomalies was not made available, thereby leaving EDS with requirements for processing of which they were unaware.

The Department concurs with the recommendations and is in the process of implementing them. It was noted that systems consultants have already been engaged during systems development, specifically during the original Direct Loan program implementation.

OIG Response

We have reviewed the Department's response and do not feel that the information provided warrants any revisions to our finding or recommendations, for the reasons noted in the finding as well as the following. Functional requirements should be defined in sufficient detail to allow a conversion to

proceed efficiently. Based upon the information presented in the above finding and Finding #2, it is reasonable to conclude that the absence of detailed requirements compromised that efficiency. A functional reassessment would have been an appropriate step to take in order to mitigate the risk that inadequate system documentation on the part of the incumbent contractor would compromise a migration to the new contractor. This is especially true when system specifications are in any way changed during actual implementation.

While we agree that it is neither cost efficient or necessary to go through a complete system development process each time a system is moved, we do not believe it is acceptable to bypass the need for a comprehensive and systematic review of critical controls based on a significant change to the operating environment. A move of a complex system from one "host" to another would be expected to be accompanied by a fairly well-defined effort to identify potential problems.

In addition to the deficiencies contained in the documentation provided to EDS (as noted in Finding #2), Year 3 software requirements continued to be refined as were the requirements for consolidation. EDS was also required to work with the Department to define requirements for the In-School Consolidation process, Origination levels 4 & 5 and interface with the Central Data System.

On March 13, 1996, a meeting was held between the Department and EDS concerning the on-going changes to the requirements. The Department conceded that many of the requirements had yet to be defined even though the system was scheduled for delivery in approximately 2 weeks. Therefore, we believe that system requirements were not adequately defined.

Also, the Department notes in response to one of the recommendations that outside consultants have been used on a previous procurement. While we are not in disagreement with this particular statement, no outside consultants were used on the EDS procurement. While some Department officials may have believed the Department employees assembled to write the SOW and evaluate offeror proposals had the appropriate knowledge and expertise to negate the need for outside consultants, the results of our analysis as well as follow-up discussions with some of these officials indicate that this may not have been the case. The Department must ensure that appropriate controls are in place at an organizational level so that outside consultants will be used whenever necessary on any system procurement. This issue is discussed in more detail in an OIG draft audit report recently issued on the Department's Acquisition Process for OSFAP Information Systems, ACN 11-80004.

Finding No. 2 System Specifications and Documentation Provided to EDS Were Incomplete and Outdated
--

Once the decision was made to allow EDS to proceed with their proposed conversion of CDSI's system, it was incumbent upon the Department to ensure that the CDSI system specifications and documentation

delivered to EDS define the LOS at a level which ensured that all required functionality would be included in the converted application. However, the documentation for the original subsystems was either in excess of a year old, or did not exist. In many cases, the initial documentation had not been updated to reflect enhancements made to the system. Upon receipt of the LOS documentation by the EDS technical team, concerns immediately surfaced regarding the quality and depth of the available information.

The dynamic nature of the Direct Loan Program during Years 1 & 2, required that CDSI focus on rapid development and modification to the system, rather than allocating sufficient effort to maintaining the system documentation. In addition, the Department staff assigned to review the system documentation appeared to review only for overall reasonableness- not at a detailed technical level. Subsequently, the available documentation did not contain a sufficient level of detail on which to base a new development effort.

Year 1 efforts to increase school participation in the program resulted in a focus on accommodating the processing needs of individual schools rather than ensuring continuity in handling incoming data.

Our audit disclosed that the Department and CDSI operated in a reactive, rather than a proactive mode, in defining and implementing the Loan Origination System for processing academic Years 1 and 2. For Year 1, the CDSI Loan Origination System processed information for 103 schools. This limited level of participation allowed the Department to define the Direct Loan Program requirements and to finalize the necessary functionality of the Loan Origination System as the program matured. This restricted level of participation allowed CDSI to react quickly to technical issues encountered as data was received from participating schools and to accommodate unique processing requirements for various schools.

Although responsiveness was critical in terms of establishing school participation in the program, it resulted in a high level of exception processing by CDSI for individual schools. These exceptions resulted in an inefficient development effort and a heavy reliance on manual processes to meet program requirements. The LOS production environment focused on the processing needs of individual schools rather than establishing policies and procedures that ensured continuity in handling data received from all of the participating schools.

Proprietary Software Used by CDSI was Unavailable to EDS

As noted previously, CDSI's LOS application was also interactive with, and dependent upon, proprietary software used to support their Direct Loan servicing and accounting systems. Because the proprietary routines used by CDSI to process loan origination data were unavailable to EDS, EDS was unable to convert the CDSI program into a fully functional Loan Origination System. When the government-

owned programs from the CDSI application were converted, recompiled, and executed by EDS, the application processing failed. EDS was then required to develop new application modules and subroutines to replace the proprietary functionality.

The lack of documented functional requirements, as well as EDS's lack of loan processing industry knowledge, created a significant burden for EDS in verifying the application conversion as well as developing the code required to support the functions which had been performed by the CDSI proprietary code. Additionally, the communication of business requirements was required to be provided to EDS through PSS, rather than directly from the functional offices. This potentially increases the risk of misinterpretation and confusion in defining the business rules. While it is recognized that individuals without contracting authority may not *direct* the contractor, preventing direct contractor access to designated key subject matter expert points of contact creates a significant disservice to effective system development and implementation.

Recommendations

We recommend that the Chief Operating Officer:

- 1) Improve procedures for evaluating contract deliverables, particularly in the area of system design documents and specifications. The Department should ensure that documentation is prepared at a sufficient level of detail and that all required functionality is documented prior to production implementation, or at the very least prior to system transition. Final payment under the contract should be withheld until satisfactory documentation is completed; and
- 2) Ensure that throughout the development process, the responsible program office provides detailed program/functional information to new contractors. Development should not be initiated without complete confidence that the contractor has a solid understanding of the functional requirements necessary to meet the needs of the Department users.

Department's Reply

The Department agreed that the former contractor's documentation was in some areas incomplete and out of date, but believes that EDS should have identified this limitation during its review of the documentation maintained in the RFP library. EDS should have posed many questions during the RFP process to clarify its understanding of system requirements.

While there is concurrence with our recommendations, the Department believes that the responsible program office was already providing program/functional information to EDS throughout the development process.

OIG Response

We acknowledge that it was not unreasonable for the Department to expect EDS to have identified weaknesses in the documentation and pose questions during the RFP process. However, the Department still had primary responsibility for ensuring that weaknesses were identified and questions asked- especially in light of the fact that the Department admits its awareness that the documentation was incomplete and out of date in some areas.

In a letter dated 9/15/95 to the Department, EDS notes the condition of the items provided by CDSI and the documentation missing, noting the overall impact this would have on systems development. Some of the missing and/or outdated items included lack of functional requirements for reconciliation and consolidation; lack of a data dictionary for reconciliation; no proprietary modules for Origination, Consolidation and Reconciliation; and no updates to Loan Origination and Consolidation documents for at least 9 months. In a subsequent analysis performed by the Department's Contract Specialist on the status of system documentation provided by CDSI, the overall conclusion was that CDSI's documentation for the system was substandard and in no facet did it meet the requirements set forth in the SOW or the contractor's proposal.

The Department is the system owner and in the end is ultimately responsible for ensuring the adequacy of its contractors' performance. In this regard, the Department has the responsibility to provide the contractor any and all relevant information in its possession or under its control that is needed to properly develop the system. Our interviews with Department management and program officials suggest that this did not happen for this procurement, nor has the Department indicated in its response that a process is in place to ensure this happens in all future procurements. Therefore, our finding and corresponding recommendations will remain unchanged.

Finding No. 3	Test Scenarios and Test Cases Did Not Ensure That the Loan Origination and Loan Consolidation Systems Met the Required Functionality
----------------------	---

The test scenarios, comprised of a series of test cases and the associated expected results, did not provide adequate assurance that processing requirements of the LOS and LCS data would be met. As stated in the Department's *System Life Cycle Management Manual*, preliminary test plans are to be developed during the requirements definition phase. These plans are to include test scenarios the testing will use to confirm that the system meets the defined requirements. Failure to properly and sufficiently prepare test cases can contribute to post-production system problems.

Per interviews with EDS, IQCU and Department staff, test documents were developed by the EDS test team based on limited knowledge of the Loan Origination and Loan Consolidation business requirements, and reviewed by Department representatives. For the January 1996 Systems Integration Testing performed by EDS, no scenarios or test cases were created by either EDS or the Department. EDS was not prepared for this phase of testing. For subsequent Loan Origination and Loan Consolidation Systems test phases, IQCU and EDS staff noted that test scenarios and test cases were poorly defined, due to the absence of functional detail contained in the Requirements Traceability Matrix

(RTM). Required functions were not specifically identified and related to an individual test case for validation. The condition of the RTM forced the test teams to rely on verbal communication with the system engineers for clarification of the functional requirements and expected results used to create the test cases.

In addition, the data that was converted from the CDSI system was not adequately tested. EDS appeared to have focused on meeting testing milestones rather than the testing of the accuracy of the converted data. Furthermore, one EDS representative noted that the conversion program was run only to determine whether it would complete without error, and that no one from the Department reviewed the converted data for accuracy. It was also noted that the scope and definition of conversion testing requirements were not well defined in either the RFP or the EDS proposal. Failure to adequately test the data conversion effort subsequently resulted in processing errors when the LOS was placed into production.

Based upon limited observation and discussions with key EDS and Department officials, recent testing efforts appear to have improved. Year 5 testing of the LOS & LCS was noted as being much more formal- including more organization through the use of an automated database tool for tracking and monitoring test results, the consistent presentation of test results, and requirements in the RTM are now being mapped to specific test cases.

Recommendations

We recommend that the Chief Operating Officer:

- 1) Ensure that test cases are prepared by individuals with strong knowledge of the business functions the application is intended to support. If the contractor is new to the business, require the use of a consultant/subcontractor who is knowledgeable of the business or ensure that all test cases are reviewed by knowledgeable Department personnel;
- 2) Ensure there is a process in place that ties test cases to system requirements; and
- 3) Ensure conversion testing includes validation of data accuracy.

Department's Reply

The Department agreed that the initial testing effort was seriously flawed, but believes that the subsequent testing efforts for the September 1996 LC system implementations and the March 1997 LO system were properly performed. The Department believes that the subsequent LO and LC testing provided assurance that the processing requirements, as defined, were successfully met. In mid-1996, EDS began adding personnel who possessed significant education lending industry experience that were assigned to the requirements, development and testing groups.

The Department also notes that while there were significant problems with the data converted from the original loan origination database, there were significant conversion activities that were successful. Most of the data was converted successfully, evidenced by the fact that once production began, a majority of the data processed correctly on a daily basis. Many of the processing problems that occurred following implementation related to data anomalies inherited from the former contractor. Active intervention by the Department and EDS identified the cause(s) of problems when they occurred. Subsequent changes made to vendor and school-based software allowed data related problems to be reduced to a very small percentage of the data transmitted daily.

The Department agrees with our recommendations, noting that two of them, pertaining to the preparation of test cases by individuals with strong knowledge of the business functions the application is intended to support and assurance that a process is in place to tie test cases to systems requirements, have already been implemented.

OIG Response

We acknowledge that improvements have been made in later testing efforts and had previously noted them in our draft report. However, we have reviewed the Department's response and do not believe any revisions are necessary to our finding or recommendations. In addition to the information provided in the above finding, conversion of data was continuously noted as one of the biggest challenges in implementing the LO system by both EDS and Department management and staff. The reconciliation module experienced difficulties for over 2 months after the system was implemented due to significant data conversion problems.

While the Department notes that two of our recommendations have already been implemented, we are concerned that, with the exception of recommendation #3, the responses/actions are specific to this particular contract/system. The Department must ensure that these recommendations are implemented at an organizational level, with appropriate management controls and policies and procedures in place to prevent the reoccurrence of these issues on future system development efforts.

Finding No. 4	Overall Documentation Supporting the Loan Origination and Loan Consolidation System Testing Was Poorly Maintained
----------------------	--

Our review of the supporting documentation for the testing of LOS and LCS for Years 2/3/4 disclosed that the documentation was incomplete and did not provide sufficient support that all test procedures were successfully completed. The overall quality of the supporting documentation for the SIT and SAT testing of the Loan Origination and Loan Consolidation Systems was poor. The following table presents the percentage of test cases for which documentation was missing, at each level of testing reviewed.

[“Dashes” (---) indicate that 100% of the documentation was available- nothing was missing.]

	LO SIT Yrs 2/3	LO SIT Yrs 2/3/4	LO SAT	LC SIT	LC First Live Batch
<i>missing test scenarios</i>	27%	13%	---	15%	37%
<i>missing support for test results</i>	---	8%	33%	32%	55%
<i>missing evidence of resolution for noted testing errors</i>	35%	14%	7%	---	---
<i>missing sign-off sheets</i>	---	15%	---	---	---
<i>missing signatures on sign-off sheets</i>	ED-9% EDS-11% IQU-19%	---	---	ED-39% EDS-65% IQU-38%	---

Per interviews with IQU, EDS and Department representatives, it appears that no formal written policies and procedures for reviewing the results of individual test cases were established prior to initiating, or during, testing of the LOS and LCS. No central point of control was established for ensuring that the test case folders contained the required documentation, approval signatures, and support for error resolutions prior to retiring the test case. This condition resulted in a failure to consistently document issues and resolutions for future reference by EDS or the Department, eliminating the ability to identify recurring errors.

The deficiencies noted above also impacted the effectiveness of an EDS developed Central Tracking System (CTS) database. Errors identified during LOS and LCS testing were documented by EDS on a Central Tracking System (CTS) sheet and assigned a unique tracking number. The information from the CTS sheet was entered into the CTS database for tracking purposes. Although the CTS is no longer used by EDS, we were provided an electronic copy of the retired CTS application and its associated database to analyze during our audit. Our evaluation of the CTS database identified errors and issues which remained unresolved at the conclusion of the LOS and LCS testing. There was no evidence that unresolved CTS records were migrated to the Direct Loan System Modification Request (DMR) database at the time the Central Tracking System was retired. Additionally, the CTS database contained a high percentage of records with a status of *closed*.

However, these closed records did not contain a description of how the error was resolved or identify the individual responsible for approving the resolution.

As previously noted, based upon limited observation and discussions with key EDS and Department officials, recent testing efforts appear to have improved. Year 5 testing of the LOS & LCS was noted as being much more formal- including more organization through the use of an automated database tool for tracking and monitoring test results, the consistent presentation of test cases, and requirements in the RTM are now being mapped to specific test cases.

Recommendations

We recommend that the Chief Operating Officer:

- 1) Establish testing guidelines to be used for all Department systems;
- 2) Implement controls to ensure that once agreed upon, test procedures are strictly adhered to by contractor and Department staff;
- 3) Monitor the status of each test case and any errors identified during testing; and
- 4) Establish controls which require the contractor to record error resolutions in an automated tracking system to be used as a reference tool.

Department's Reply

The Department believes the supporting documentation used to manage and report the acceptance testing process for Years 2, 3 and 4 testing was adequate. The Department's opinion is that the OIG did not expend sufficient audit resources to obtain the testing documentation reported as missing. Included with the response are the results of the Department's own review of the testing documentation in comparison with the testing documentation reported missing by the OIG, noting that in most instances the number of documents identified by the OIG as missing was either inflated or erroneous.

The Department concurred with all of our recommendations and noted that they are in the process of being implemented.

OIG Response

We strongly disagree with the Department's statement that we did not expend sufficient audit resources to obtain the testing documentation reported missing. We believe that we exercised due professional care in performing the documentation review and in evaluating and reporting the subsequent results, as follows. All testing documentation was initially requested from the appropriate Department management official, who referred us to EDS's Ballston, VA facility, where

the documentation was kept. Upon starting fieldwork at the Ballston facility in September 1997, we were assigned an EDS contact person and Departmental contact person for needed documentation/information, who were both provided with a copy of our documentation request.

Testing documentation was subsequently obtained in November 1997 from EDS's testing manager for the Loan Origination/Loan Consolidation system. After our review of 100% of the documentation provided, it was apparent that the documentation provided was incomplete. We conveyed this information to the testing manager and subsequently to the EDS Project Manager in a meeting in January 1998. We also spoke to the Department's on-site monitor, our Departmental contact, in January 1998, about the testing documentation.

Between January and March 1998, we asked several interviewees from ED, EDS and the IQCU about the testing process and how testing documentation was organized. It was consistently stated that test data was kept organized in folders, which included not only test case scenarios but also additional documentation such as the resulting outputs and tracking sheets that would show the status of any open testing issues. It was also noted that all test teams worked from a single sign-off sheet and that these were placed in the test folder.

Upon completion of our site work at EDS's Ballston facility and subsequent completion of our preliminary analysis of our results, we conducted a pre-exit conference meeting with Department officials, where we presented the preliminary results of our review, providing another opportunity for information to be presented that would lead us to believe that our facts were misrepresentative before placing them into a draft report. While there was some initial surprise over the missing documentation, it was only requested that we include the percentages of missing information in our report, as there was thought that the initial testing effort would probably prove to be more problematic than subsequent efforts.

In addition, it appears that the Department has mistaken some of the information presented in our report. The "dashes" used in the table noting the percentages of documentation missing were meant to indicate that 100% of the documentation was found- none was missing. It appears it was misread as meaning none or 0% of the documentation was found. This misunderstanding significantly impacts the results of the Department's analysis. Additional comments from the Department's analysis do not materially affect the outcome of this finding. In several places it is cited that documentation was available elsewhere and it is noted that it may be difficult to locate without assistance as it was not kept in the test folders. We made repeated requests for the documentation we were missing, as noted previously. Not once did anyone allude to the missing documentation being anywhere else other than the test folders maintained by the testing manager. In addition, the majority of the documentation was kept in the test folders in these instances. It seems unreasonable to believe that a small percentage would have been kept separately.

We performed some additional follow-up work with regard to the Department's analysis and spoke with the testing manager from EDS who actually prepared the analysis. Our conversations with her revealed that there was no review performed that adequately identified the specific documentation we reported as missing. In some instances, percentages of the various types of information that was

missing, per our review, were compared with what was found after reviewing the test files on hand. [i.e.- For test scenarios, if the files on hand showed that each file had a test scenario in it, this was considered to mean that 100% of the documentation was available. There was no confirmation that all test files were accounted for or if test scenarios were in fact the correct test scenario for that file.]

In some cases, random samples were taken, as the testing manager noted that it was not possible for a 100% review to be performed on what we reported as missing. In support of some of the missing documentation, copies of summary test reports were referred to with the conclusion that the Department and IQCU signed-off on them, indicating that all errors must therefore have been corrected. EDS has noted in a written response to the Department provided along with their analysis that supporting documentation for pre-implementation testing of the LOS and LCS was not fully in order, but that measures have since been taken for post-implementation testing efforts to insure that test documentation is preserved long term.

We were also informed that no Department representatives reviewed the analysis prepared by EDS for adequacy or accuracy, and that all hardcopy documentation from the test phases we reviewed had been boxed up and archived in a storage warehouse back in December 1998.

While the Department concurs with our recommendations, we remain concerned once again that some of the responses/actions are specific to this particular contract/system. The Department must ensure that these recommendations are implemented at an organizational level, with appropriate management controls and policies and procedures in place to prevent the reoccurrence of this issue on future system development efforts.

Our finding will remain as stated, however we have modified the title to present the issue more clearly. We have also added an explanation to the table with regard to what the "dashes" represent.

Finding No. 5 System Generated Management Information Reports Were Not Reviewed or Tested

During our review, we identified no test cases for validating management reports generated by the LOS and LCS. The RFP issued by the Department required EDS to test the adequacy and accuracy of the production and format of system outputs, including reports, during Systems Integration Testing. Testing was defined to include the presentation of data, accuracy of the data, and completeness of the data reflected on the reports. EDS, in its proposal, stated that it would be able to provide all management reports currently available to the Department. However, EDS did not

appear to have tested the reports and was unable to provide management reports after the LOS was placed into production.

Our audit disclosed examples of application generated management reports included in some of the test case folders. These reports were determined by the OIG auditors to be incomplete, inaccurate, and unusable by the Department in managing the Direct Loan Program. The reports contained errors ranging from incorrect totals to reflecting records dated outside of the user specified date parameters. Errors contained in the reports were not documented or noted in any of the test case folders by the test team. The test team appeared to have focused not on the quality or accuracy of the reports, but on whether the print routine completed without error.

Incomplete testing of the management reports subsequently limited the usefulness of the application to its intended users. Limited management reports were available to the program offices when the application was placed into production, and the reports that were available were of questionable integrity. The lack of useful management reports hindered the Department's ability to monitor the Direct Loan program.

Recommendations

We recommend that the Chief Operating Officer:

- 1) Develop test cases that include validating application generated reports based on test data during SIT;
- 2) Ensure that SAT includes the generation, validation, and acceptance of management reports by the intended users of the reports prior to system implementation; and
- 3) Ensure reports are produced during testing with production volumes of data.

Department's Reply

The Department concurs with the finding, noting that during implementation MIS report testing was minimal and no contract deliverables were required. The Department also noted concurrence with the accompanying recommendations, stating that they have already been implemented or are in the process of being implemented.

OIG Response

While we appreciate the Department's quick action on several of these recommendations, we remain

concerned once again that the responses/actions are specific to this particular contract/system. The Department must ensure that these recommendations are implemented at an organizational level, with appropriate management controls and policies and procedures in place to prevent the reoccurrence of this issue on future system development efforts.

Finding No. 6 Loan Origination System Interfaces Were Not Adequately Tested Prior to System Implementation

Our review disclosed weaknesses in testing the required interfaces to the Loan Origination System. The LOS electronically exchanges data with several Department of Education systems. For example, financial accounting transaction data is transmitted to, and received from, the Central Data System on a daily basis. The interface with the Title IV WAN allows the LOS to retrieve from, and send information to, participating schools. The ability to interface with these systems was critical to the successful testing and implementation of the LOS. However, these interfaces were not sufficiently tested before implementing the LOS.

The EDS proposal states that *ÆDS will establish external interfaces and test them early in the conversion process to ensure that they support LOS testing.*⁶ The proposal also identifies parallel testing as a major activity in the Department's *System Life Cycle Management Manual* and called for a System Certification Review to ensure that the system was ready for production release. When EDS requested authorization to perform parallel processing as called for in the proposal, the Department did not authorize this phase of testing. Department representatives we interviewed stated that the volume of production data received from the schools, in conjunction with differences in processing environments between CDSI and EDS was prohibitive to parallel testing. Other factors noted for eliminating this test phase included pressure to implement the EDS systems and funding limitations.

EDS was able to complete limited stress testing at the conclusion of System Acceptance Testing. Stress testing was based on EDS created data. However, when production processing was initiated, it became evident the test data was not representative of the production environment, due to the fact that, a significant number of data errors occurred during production when EDS processed incoming files from the schools, particularly with schools operating on mainframe platforms. Inadequate testing also contributed to jeopardizing the participating schools' satisfaction with the new Loan Origination System.

Recommendations

We recommend that the Chief Operating Officer:

- 1) Process production volumes of data through all applications prior to implementation of the system in the production environment;
- 2) Establish guidelines for certifying applications to exchange data;
- 3) Create a data dictionary for the Office of Student Financial Assistance Programs which identifies standard data formats and validation criteria for all Student Financial Aid (SFA) systems.

Department's Reply

The Department noted that the LOS was subjected to two interface test periods with EDEXpress (the Department's school-based software), Title IV Wide Area Network, the Central Database and Payment Management System. LCS compatibility was tested with the Central Database, Compass Bank and the print center. Earlier testing insured that the communication protocols were fully functional between EDS and its trading partners. Later efforts, subsequent to systems acceptance testing enabled them to identify differences in key data fields.

The Department concurs with all of our recommendations and notes they are in the process of being implemented.

OIG Response

We agree that there was some interface testing performed. However, as the finding notes, key tests were either insufficient or not performed at all, as detailed in the finding. One key Department management official noted that this was a lesson learned and that parallel processing and stress testing would now be included in all test schedules. Our finding will therefore remain as originally presented.

Appendix 1

ACRONYMS

CDS	Central Database System
CDSI	Computer Data Systems, Incorporated
CTS	Central Tracking System
DMR	Direct Loan System Modification Request

EDS	Electronic Data Systems
IQCU	Independent Quality Control Unit
LCS	Loan Consolidation System
LCSAT	Loan Consolidation Systems Acceptance Testing
LCSIT	Loan Consolidation Systems Integration Testing
LOS	Loan Origination System
LOSAT	Loan Origination Systems Acceptance Testing
LOSIT	Loan Origination Systems Integration Testing
PSS	Program Systems Service
RFP	Request For Proposal
RTM	Requirements Traceability Matrix
SAT	Systems Acceptance Test
SIT	Systems Integration Test
SOW	Statement of Work



UNITED STATES DEPARTMENT OF EDUCATION

WASHINGTON, D.C. 20202- _____

FEB 12 1999

Mr. James Cornell
Area Manager
Office of Inspector General
Washington, D.C. 20202-1510

Dear Mr. Cornell:

Thank you for the opportunity to review and comment on your draft audit report *Review of the Department's Requirements Definition & Testing Processes for the Loan Origination and Loan Consolidation Systems*. The objectives of your audit, as stated in your draft report, were to determine whether the Department adequately defined and tested its systems requirements for the 1995 loan origination and loan consolidation systems (LO/LCS) contract awarded to Electronic Data Systems (EDS).

We met with your staff in September 1998, to discuss issues included in a preliminary draft report. We agreed that improvements can be made in writing requests for proposals, and that documentation and testing can always be improved.

We also discussed our concerns about the overall strength and soundness of the preliminary draft report. We were concerned that the report was not properly balanced and we questioned the significance of the report findings for the policy makers in the Department at this late date (four years after the request for proposal). Also, we expressed concern that some of the conclusions reached during the audit were based on anecdotal material. We pointed out that the Department had already implemented many of the changes you recommended and that other initiatives were underway to modernize our systems acquisition process. We find it troublesome that the issues we identified during our discussion were not reflected in your draft audit report. We remain concerned that your final audit report will not undergo the revisions we believe are necessary to provide a balanced assessment of the Department's LO/LCS systems conversion effort.

We have acknowledged publicly that the Department experienced problems relating to the award of this contract. However, we find it disturbing that your draft report focuses narrowly on those areas involving Department management and ignores problems with contractor project management. This presentation leads the reader to believe that the entire responsibility for problems with the contract rests with Departmental management. This is simply not true. Many of the problems that occurred were the result of ineffective contractor project management and contract pricing which allowed only a certain level of services to be provided if the contractor were to make a profit. At one point the contractor was forced to remove the entire project management team due to the lack of managerial and technical expertise. Unfortunately, the Department experienced the general difficulty government agencies have in holding contractors accountable.

Page 2 - Mr. James Cornell

The draft audit report does not provide the reader with information on corrective or proactive measures that the Department undertook to correct problems with its contractor. For example, the Department accepted oversight responsibility when the contractor was unable to process an unexpected number of loan consolidation requests by students under the William D. Ford Federal Direct Loan Program (FDLP). Over the past year, we took new steps to improve the process and the quality of service provided. These steps included a more coordinated internal approach to working with and monitoring our contractor and contract revisions that emphasized payment based on performance.

In fact, the November, 1998 General Accounting Office (GAO) report *Student Loans: Improvements in the Direct Loan Consolidation Process* stated that the Department's consolidation process has improved. GAO attributes these improvements to several initiatives the Department took primarily in the area of performance-based contracting with EDS. The Department modified its contract with EDS to include performance measures that ensure improved products, quality, and services. Current data show that EDS continues to meet or exceed the performance standards. Recent customer service satisfaction responses from borrowers also indicate borrower satisfaction has dramatically improved since December 1997.

We do not concur with your audit conclusion that a detailed redefinition of the functional requirements was required for the LO/LCS systems conversion contract. The requirements for these systems were already more than adequately defined during their development at our original contractor, Affiliated Computer Services, Inc. (formerly, Computer Data Systems, Inc.), and had not changed. However, we know that documentation from ACS regarding various data anomalies was not made available, thereby leaving EDS with requirements for processing of which they were unaware. The initial systems development was conducted in accordance with system development life cycle methodology. This process included developing a complete requirements definition, general and detailed design, and coding and testing. The movement of these LO/LCS operating systems, already in production, to a new contractor should not entail a redefinition of system requirements. It is neither necessary nor cost efficient to go through a complete system development life cycle process each time a system is moved.

Also, we do not concur with your audit conclusion that supporting documentation for the LO/LCS testing was inadequate, although we do agree that testing documentation was not maintained as well as it should have been. We have since taken measures to correct this problem. We reviewed the testing documentation cited in the draft report as being inadequate and found that in most instances the number of documents identified as missing was either inflated or erroneous. We believe that the auditors did not make a sufficient effort to request assistance from Department staff in locating missing documentation during the audit. We have included the results of our own study of the sufficiency of testing documentation in the Appendix to this memorandum.

The underlying evidence for two of the findings included in your draft audit report is based primarily on anecdotal material. Specifically, much of the underlying information and analysis

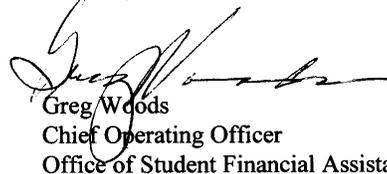
Page 3 - Mr. James Cornell

work supporting the conclusions that systems requirements for the LO/LOS conversion were inadequately defined and there was not sufficient user involvement was based on "interviews with Department staff." Because these interviews took place some three or four years after the events occurred, there is, understandably, some disagreement over the elements of certain events. In fact, not all pertinent Department staff were included in the audit interview process and, as a result, key information was missed.

As you are aware, *Standards & Guidelines for Information Systems Auditing* (1998 Revision) promulgated by the Information Systems Audit and Control Association & Foundation requires that where audit evidence obtained in the form of oral representations is critical to an audit conclusion, the auditor should obtain documentary confirmation, either on paper or through other media. We are not aware that this procedure was followed during this review. Consequently, we believe that the conclusions that were reached based on anecdotal material should not be included in the final audit report.

Again, we appreciate the opportunity to review and comment on the draft report. The enclosure provides detailed responses to each audit finding and accompanying recommendation(s) included in the draft report.

Sincerely,



Greg Woods
Chief Operating Officer
Office of Student Financial Assistance Programs

Enclosure

cc: Mike Smith

APPENDIX

Finding One - System Requirements for the Loan Origination and Loan Consolidation Systems Were Not Adequately Defined

Although we agree with the recommendations, we do not concur with this finding as written for the reasons stated earlier in our response.

Recommendation - Establish procedures and controls to ensure the requirements definition process is a collaborative process, with the appropriate functional offices having primary responsibility for defining and approving the business/functional requirements.

Response - We concur with this recommendation and are implementing it.

Recommendation - Establish procedures and controls to ensure that PSS has primary responsibility for ensuring the feasibility of the offeror's proposed technical solutions, and that the proposals are aligned with Department-wide systems architecture and information technology (IT) strategic plans.

Response - We concur with this recommendation. OSFAP's Program Systems Service plans to improve our information technology software acquisition processes by implementing an integrated process software application that will standardize the way in which PSS acquires its IT software and supporting services. This standardized acquisition method will also ensure that acquisitions are more measurable, reliable, and successful for all participants.

Recommendation - Engage industry consultants, when necessary, to assist in the above noted processes.

Response - We concur with this recommendation and have already implemented it. We agree that industry consultants should be engaged, as appropriate, during systems development. As such, the Department engaged individuals from private industry as part of the original direct loan implementation team. Later, the Department hired several of those individuals in order to retain and learn from their private industry experience.

Finding Two - System Specifications and Documentation Provided to EDS were Incomplete and Outdated.

We agree that the former contractor's documentation was in some areas incomplete and out of date. However, we believe that EDS should have identified this limitation during its review of the documentation maintained in the request for proposal (RFP) library. Based on this review, EDS should have posed many questions during the RFP process to clarify its understanding of the system requirements. EDS also lost many other opportunities to discuss system requirements with appropriate Department staff.

Recommendation - Improve procedures for evaluating contract deliverables, particularly in the area of system design documents and specifications. The Department should ensure that documentation is prepared to a sufficient level of detail that all required functionality is documented prior to production implementation, or at the very least prior to system transition. Final payment under the contract should be withheld until satisfactory documentation is completed.

Response - We concur with this recommendation and are implementing it.

Recommendation - Ensure that throughout the development process, the responsible program office provides program/functional information to new contractors.

Response: We concur with this recommendation and are implementing it. However, we believe that the Department followed this process during the EDS contract implementation effort.

Finding 3 - Test Scenarios and Test Cases Did Not Ensure that the Loan Origination and Loan Consolidation Systems Met the Required Functionality

Many of the statements in this section of the draft audit report are generalizations and it is not clear to which of the two distinct EDS testing efforts the comments apply. We agree that the initial testing effort was seriously flawed. However, we believe that the subsequent testing efforts for the September 1996 LC system implementations and the March 1997 LO system were properly performed. The following comments pertain to the second, successful, implementation effort by EDS and the associated testing of LC and LO.

We believe that the structured LC and LO testing provided assurance that the processing requirements, as defined, were successfully met. A process was in place and was followed. Test plans, including test scenarios structured to meet defined processing functions, were developed by EDS and submitted to the Department. Prior to each submission to the Department, test plans were reviewed by the Independent Quality Control Unit (IQCUC) and changes made based on IQCUC comments. Following submission, Department representatives, contractor staff, and IQCUC reviewed the test scenarios and cases and made further adjustments, as needed. As a matter of fact, between October 1996 and February 1997, the LO system was rigorously tested six times by disparate testing groups.

In mid-1996, EDS began adding personnel who possessed significant education lending industry experience. These personnel, working with Department counterparts, were assigned to the requirements, development, and testing groups. As a result, later LOS requirements were generally more detailed. Test scenarios and cases were developed based on available functional detail and likely real-life processing and operational scenarios. As a result, LOS testing provided assurance that known processing requirements were met.

While there were significant problems with the data converted from the original loan origination database, there were significant conversion activities that were successful. EDS successfully mapped equivalent data fields on the EDS LOS system and delivered the Database Requirements Manual to the Department in October 1995. Data mapping included detailed analysis to confirm the definitional equivalents of identified fields. A Data Conversion Plan, including the types of tests to be run, was submitted to the Department in November 1996. This plan detailed the process by which the original loan data was converted to the new LOS database.

The EDS team tested conversion source code using data from the original contractor's production systems to insure that the code would execute correctly. Testing enabled EDS and the Department to verify that data fields were moved correctly, as well as verifying that restarts were correctly picking up processing when stoppages occurred. EDS also ran test cycles using a sample of production data provided by the original contractor.

During systems conversion testing all stoppages were thoroughly researched and corrected. During conversion code testing neither EDS nor the Department were aware that any problems were the result of data anomalies. The reason for this was that each change to the source code allowed the conversion code to continue processing without further problems whether errors occurred or not. EDS, IQCUC and Department representatives assumed that the sole reason for stoppages was conversion source code problems or problems in the initial data mapping.

We converted most of the data, successfully. This was evidenced by the fact that, once production began, a majority of data processed correctly on a daily basis. Many of the processing problems that occurred following implementation of the LOS related to data anomalies inherited from the former contractor. Active intervention by the Department and EDS identified the cause(s) of problems when they occurred. Subsequent changes made to vendor and school-based software allowed us to reduce data related problems to a very small percentage of the data transmitted daily.

Recommendation - Ensure that test cases are prepared by individuals with strong knowledge of the business functions the application is intended to support.

Response - We concur with this recommendation and have already implemented it. As stated above, in 1996 EDS hired personnel with prior industry experience for its development, testing, and operations areas. As a result, in the

fall of 1998 LO software changes were executed seamlessly.

Recommendation - Ensure that there is a place that ties test cases to system requirements.

Response - We concur with this recommendation and have already implemented it. The Department implemented this process during system start-up. The statement of work (SOW 4.5.2) requires a requirements traceability matrix (RTM). EDS developed the RTM during start-up and used it to tie test cases to the system and functional requirements. The requirement to trace testing scenarios to the RTM requirements was adhered to during the servicing start-up and this activity was also performed prior to LO start-up in March 1997.

Further, the Department's EDS testing team developed an access software application that enables it to demonstrate the link between requirements and tests. This application was used successfully for Year 5 LOS system testing and Year 2000 LCS system testing. It will continue to be used in all future major release testing.

Recommendation - Ensure that conversion includes validation of data accuracy.

Response - We concur with this recommendation. Validation of data accuracy will be part of all data conversion contracts and any future data conversion LO/LCS contract.

Finding 4 - Overall Supporting Documentation for the Loan Origination and Loan Consolidation System Testing was Inadequate

As discussed earlier, we believe that the supporting documentation used to manage and report the acceptance testing process for Years 2, 3, and 4 testing was adequate. It is our opinion that the OIG did not expend sufficient audit resources to obtain the testing documentation reported missing in the draft report.

The following charts illustrate the results of OSFAP's review of the testing documentation in comparison with the testing documentation reported missing by the OIG. Documentation is available on request.

LOS Systems Integration Testing (SIT) - Years 2/3		
Missing Documentation	IG Finding	EDS Comment
Support for test results		100 % of the 158 test folders are available. Folders contained full test documentation, including screen-prints and copies of input files, as appropriate to the test.
Resolution of noted testing errors	35% missing	Error resolution documentation was not readily available, but documentation addressing test issues was available.
Signatures	ED - 9% missing IQUU - 11% missing EDS - 19% missing	100% ED signatures found 9% IQUU missing 3% EDS missing
Sign-off sheets	Not available	100% included in test folders
Test scenarios	27% not available	100% included in test folders
EDS Support: Documentation is available upon request.		

LOS SIT - Years 2/3/4		
Missing Documentation	IG Finding	EDS Comment
<i>Support for test results</i>	8% missing	See comments regarding test documentation in preceding paragraphs. Existing test documentation may be difficult to locate without assistance, because some of it was included in test folders, while other documentation was still in notebooks used during testing to retain important test results
<i>Resolution of noted testing errors</i>	14% missing	Daily test reports track testing issues and their status. Paper copies of test issues are available in the library or in test file folders, including resolution documentation. Because of space resources, documentation is not maintained for software applications that are no longer used.
<i>Signatures</i>	Not available	See comments regarding test documentation in preceding paragraphs. Sign-off sheets were retained centrally rather than in the test file themselves; available sign off sheets contain signatures.
<i>Sign-off sheets</i>	15% missing	See above
<i>Test scenarios</i>	13% missing	See comments regarding test documentation in preceding paragraphs.
EDS Support: Documentation is available upon request.		

LOS Systems Acceptance Testing (SAT) - Years 2/3		
Missing Documentation	IG Finding	EDS Comment
<i>Support for test results</i>	33% missing	Much of the documentation was retained at the LOC. This may account for the missing documentation.
<i>Resolution of noted testing errors</i>	7% missing	Currently, daily SAT reports accurately track status of test issues. Older resolution and testing issue documentation has been archived, but is available.
<i>Signatures</i>	Not Available	Sign-off sheets with required signatures for all test conducted are centrally located and are contained in the System Operations Test Report (SOTR), Appendix B delivered to the Department after review by IQCU.
<i>Sign-off sheets</i>	Not Available	Included in the SOTR, Appendix B
<i>Test scenarios</i>	Not Available	Included in the SOTR, Appendix B
EDS Support: Documentation is available upon request.		

LCS SIT		
Missing Documentation	IG Finding	EDS Comment
<i>Support for test results</i>	32% missing	No comment
<i>Resolution of noted testing errors</i>	Not available	Not easy to discern, although retest folders that addressed test issues were in the test documentation.
<i>Signatures</i>	ED - 39% missing IQUU - 38% missing EDS - 65% missing	Review of test files indicates that OIG findings are probably correct. However, tests where there are no signatures may have been canceled and the changes to test plan not documented in the file.
<i>Sign-off sheets</i>	Not available	Signatures appeared on sign-off sheets
<i>Test scenarios</i>	15% missing	Test scenarios are available in test review notebooks. These notebooks were maintained during the test.
EDS Support: Documentation is available upon request.		

LCS First Live Batch		
Missing Documentation	IG Finding	EDS Comment
<i>Support for test results</i>	55% missing	No comment
<i>Resolution of noted testing errors</i>	Not available	Since this is not a formal test period, errors are resolved by the re-validation process, and other means. Sign off indicates usually that any errors/issues were resolved.
<i>Signatures</i>	Not available	No comment
<i>Sign-off sheets</i>	Not available	No comment
<i>Test scenarios</i>	37% missing	There are no pro forma industry type test scenarios recommended for use.

During the period in question, our test procedures required that all documentation be available for presentation and review by IQUU and Department representatives. Documentation to be used for test validation was identified in the test plans submitted to the Department. Folders for test periods after the LOS Year 2/3 SIT did not contain large amounts of documentation by design. Test validation included viewing of on-line screens and a single set of inputs and outputs. This was done deliberately to increase focus on school batch-level processes. In certain test cases, the Department or IQUU may have requested that screen prints or copies of single pages in the batch inputs and outputs be retained. The Department's sign-off indicates that the test conditions had been satisfied for the period in question, as required. IQUU sign-off was desirable but not required.

Testing issues were documented, tracked or resolved. The Department and IQUU reviewed copies of the daily test reports. Revised reports were issued if the initial report distributed was inaccurate or in cases where Department and IQUU representatives asked that particular facts related to testing be noted for the test records.

Recommendation - Establish testing guidelines at a high level for all Department systems.

Response - We concur with this recommendation and are implementing it. Although we are not responsible for "all" Department systems, we agree that high level guidelines should be set and that OSFAP should clearly communicate such guidelines, as well as other testing expectations, to the contractor's testing organization. The Department's

representatives and the contractor should have flexibility to adjust guidelines at a detailed level to ensure that testing is appropriate and clearly communicated to all interested parties.

Recommendation - Implement controls to ensure that once agreed upon, test procedures are strictly adhered to by contractor and Department staff.

Response - We concur with this recommendation and are implementing it. Test procedures were described in the Test Plan and were subject to discussion during test readiness reviews where Department, IQCU and EDS staff reviewed testing details just prior to the beginning of a test. However, changes to the procedures were frequently documented in the daily test reports. In the future, daily test reports will more thoroughly document where test procedures were not followed and the plan for correction, as appropriate.

Recommendation - Monitor the status of each test case and any errors identified during testing.

Response - We concur with this recommendation and are implementing it. Beginning in November 1996 daily test reports provided detail on the status of testing errors as well as the status of each test case, which had been reported regularly in prior testing.

Recommendation - Establish controls that require the contractor to record error resolutions in an automated tracking system to be used as a reference tool.

Response - We concur with this recommendation and are implementing it. EDS has automated tools in place to record and track errors. In addition, paper documentation that supports the automated tracking is retained and available for review.

Finding Five - System Generated Management Information Reports Were not Reviewed or Tested

We concur with this finding. During implementation management information system (MIS) reports testing was minimal and no contract deliverables were required. However, we believe we are currently in compliance with the recommendations accompanying this finding at this time.

Recommendation - Develop test cases that include validating application generated reports based on test data during SIT.

Response - We implemented this recommendation prior to the issue of the draft audit report. MIS reports were tested during systems integration testing and systems acceptance testing for all major releases occurring during the last year.

Recommendation - Ensure that SAT includes generation, validation, and acceptance of management reports by the intended users of the reports prior to system implementation.

Response - We implemented this recommendation prior to the issue of the draft audit report. MIS reports were tested during systems integration testing and systems acceptance testing for all major releases occurring during the last year.

Recommendation - Ensure reports are produced during testing with production volumes of data.

Response - We concur with this recommendation and are implementing it. We conducted testing for production volume data. MIS reports were fully validated and reviewed by EDS, IQCU and Department personnel after the initial production runs. We further refined the process to address the data anomalies in the converted data, as well as tailored for more precise reporting based on the new types information made available on the EDS LOS system.

Finding Six - Loan Origination System Interfaces Were Not Adequately Tested Prior to System Implementation.

Rigorous testing of the LOS was conducted during the implementation period prior to March 1997. LOS was

subjected to two interface test periods with EDEExpress (the Department's school-based software), Title IV Wide Area Network (TIVWAN), the Central Database, and Payment Management System. For example, LCS compatibility was tested with the Central Database, Compass Bank, and the print center. Earlier testing insured that the communications protocols were fully functional between EDS and its trading partners. Later efforts, subsequent to systems acceptance testing enabled us to identify differences in definitions of key data fields. Test reports issued during the LOS test periods documented the status of testing and the issues identified.

LOS currently carries out school interface testing with all schools entering the Direct Loan Program and upon request with participating schools. Test scripts approved by the Department are provided to schools to follow to insure that school software meets core functional requirements and can communicate with the LOS via TIVWAN properly. A copy of the 1997-98 version of the test script is available, upon request.

Recommendation - Process production volumes of data through all applications prior to implementation of the system in the production environment.

Response - We concur with this recommendation and are implementing it, when advisable.

Recommendation - Establish guidelines for certifying applications to exchange data.

Response - We concur with this recommendation and are implementing it.

Recommendation - Create a data dictionary for the Office of Postsecondary Education which identifies standard data formats and validation criteria for all Student Financial Aid (SFA) systems.

Response - We concur with this recommendation. OSFAP (formerly, the Office of Postsecondary Education) is implementing Project EASI--Easy Access for Students and Institutions. EASI envisions the creation of a standardized data dictionary and integrated systems for all student financial assistance programs. Decisions regarding the implementation of Project EASI will be made by the new Chief Operating Officer for OSFAP.

Appendix 3

OIG Response To Department Cover Letter Comments

The following addresses comments provided by the Department in the cover letter that accompanied their response to the report findings and recommendations. These comments were unable to be incorporated into and addressed elsewhere in our report.

- *The Department expressed concern over the belief that some of the conclusions included in our report were reached based on anecdotal material and should not be included in the final report- specifically, much of the underlying information and analysis work supporting the conclusions that system requirements were inadequately defined and there was not sufficient user involvement. The Department believes that interviews upon which the conclusions were based took place some three or four years after the events occurred and that not all pertinent Department staff were included in the audit interview process. In addition, the Department does not believe we followed audit standards that cite, where audit evidence obtained in the form of oral representations is critical to an audit conclusion, the auditor should obtain documentary confirmation, either on paper or through other media.*

The standards quoted in the Department's response indicate that "the IS auditor should consider obtaining documentary confirmation of the representations" made orally. It is, however, up to the auditor to determine whether the evidence provided satisfies the criteria of "relevance, reliability, sufficiency and usefulness." Documentary support is considered more reliable than oral evidence alone, but in the absence of documentation, supportable conclusions may be based on the oral evidence provided. If the auditor received the same or similar representations of events from multiple interviewees, these may be considered reliable to support an audit conclusion, in the absence of documentary evidence. We strongly believe that the conclusions presented are well supported through both oral and documentary evidence that is relevant, reliable and sufficient, as noted below.

With regard to system requirements definition, evidence supporting our conclusions consisted of information provided through interviews with the COTR for the LOS contract, two of the applicable division directors within PSS, as well as documents prepared by the contracting office. Evidence was also provided through our review of the SOW and EDS's proposal, as well as the Department's own evaluation report prepared under contract entitled "*Direct Loan Evaluation Assessment of Department of Education Administration: Academic Year 1995-96 & 1996-97*", issued in final in 1998 through the Office of the Undersecretary.

With regard to lack of user involvement, evidence was obtained through interviews with Program (User) office heads, the LOS COTR, a PSS division director and, again, reported in the Department's own evaluation report prepared under contract entitled "*Direct Loan Evaluation Assessment of Department of Education Administration: Academic Year 1995-96 & 1996-97*", issued in final in 1998 through the Office of the Undersecretary.

In addition, there is no need for “all pertinent staff” to have been interviewed, any more than for documentary evidence to be considered a precondition for drawing a conclusion. If it were that simple, auditees could avoid audit findings by simply not keeping records, and ensuring that staff were not available for interviewing. We performed a total of 18 interviews with key ED employees. Interviewees were identified through a review of contract and testing documentation, as well as referrals made during interviews. All applicable PSS Division Directors were interviewed, applicable Program Office heads, the LOS Contracting Officer’s Technical Representative, Department on-site monitors, testing participants/leads, as well as one of the key writers of the SOW and chairperson of the evaluation panel. To ensure that all pertinent staff were interviewed, we even interviewed a key individual that was no longer employed by the Department but had a key role in the system development and proposal evaluation. We requested a listing of pertinent staff that the Department felt we had “missed”. As of the issuance of this report, we had only been provided with the name of one individual who would not have materially impacted the results of this audit.