The Customer Communications Project 2001 Release Was Deployed, But Testing Processes Did Not Ensure All Applications Were Working As Intended

March 2002

Reference Number: 2002-20-056

INSPECTOR GENERAL
for TAX
ADMINISTRATION

DEPARTMENT OF THE TREASURY
WASHINGTON, D.C. 20220

March 1, 2002

MEMORANDUM FOR DEPUTY COMMISSIONER FOR MODERNIZATION &
CHIEF INFORMATION OFFICER

FROM: Pamela J. Gardiner
Deputy Inspector General for Audit

SUBJECT: Final Audit Report - The Customer Communications Project 2001 Release Was Deployed, But Testing Processes Did Not Ensure All Applications Were Working As Intended (Audit # 200120033)

This report presents the results of our review of the Customer Communications Project Fiscal Year 2001 Release (CC 2001) deployment readiness and testing activities. This audit determined whether CC2001 deployment and testing activities followed approved plans to ensure intended project capabilities were delivered.

Although we followed *Government Auditing Standards,* we encountered scope limitations by not having access to sufficient, competent, relevant, and timely information to afford a reasonable basis to draw conclusions and meet the audit objective. The absence of timely and complete information impaired our ability to fully assess whether intended project capabilities were provided.

CC 2001 became operational in August 2001. The Business Systems Modernization Office (BSMO) reported that CC 2001 improved the Internal Revenue Service's (IRS) ability to receive, route, and respond to the more than 150 million taxpayer telephone calls received each year. Major system improvements include designs to use voice-activated programs that recognize English- or Spanish-speaking callers, a voice-activated program that taxpayers can use to find out the status of their refunds, and capabilities that more accurately route taxpayer calls to the most appropriate IRS personnel.

In summary, based on the information we were able to review, we found that the BSMO and the Computer Sciences Corporation (CSC) did not sufficiently test all CC 2001 project capabilities to ensure they were working as intended. Neither the BSMO nor the

CSC implemented adequate controls to ensure that testing of significant project requirements was documented and approved.

Also, there was a lack of documentation to show how problems or defects identified during the tests that were conducted were resolved. Without this documentation, the BSMO had no evidence to support how or if the problems or defects were corrected. Finally, the project deployment decision process did not consider all significant issues and document that systems performance criteria were met and problems resolved before the project was deployed.

Without adequate evidence that CC 2001 met the requirements it was designed to deliver, and that unresolved problems or defects were resolved prior to deployment, problems arising during and after deployment could negatively affect the services that CC 2001 was designed to deliver to taxpayers.

We recommend that, before future projects are deployed, the Deputy Commissioner for Modernization & Chief Information Officer strengthen processes for system testing, problem reporting and resolution, and for making project deployment "go/no-go" decisions.

Management's Response: Management agreed with our findings and five of the six recommendations presented in the report. They indicated that they have implemented four of the five agreed to recommendations. To ensure that systems requirements are adequately tested, the IRS Product Assurance function will conduct reviews of system requirements test plans, and will document non-compliance with the test plans. To ensure adequate configuration management procedures, the BSMO's Office of Configuration Management was assigned responsibility to conduct configuration management audits of IRS modernization projects. To improve the defect report resolution process, the CSC developed procedures for the defect report process flow, including actions to address, close, and document a defect. This process will also provide the CSC Defect Report Coordinator with the responsibility to ensure that all defect reports entered into the control database contain complete and accurate information. Finally, to provide sound "go/no-go" decisions prior to proceeding to deployment, the CSC is drafting procedures which detail specific review items and pass/fail criteria that project teams will follow. The procedures will also include mandatory signoff from all review parties to concur that criteria have been met prior to initiating deployment.

Management did not agree with our recommendation for the IRS to review and approve resolution and closure of all defect reports. Management cited that the high number of defect reports generated during the project testing would make such reviews difficult. Management's complete response to the draft report is included as Appendix VI.

Office of Audit Comment: While we agree that the extraordinarily high number of testing defects on this project presented a challenge, we believe that because there were such a high number of defects, management needs to have adequate assurance that all problems are either resolved or reduced to an acceptable level. Absence of BSMO input in all defect closure decisions increases the risk that the project will not meet

performance expectations because some defects may be closed without adequate resolution. While we still believe our recommendation is worthwhile, we do not intend to elevate our disagreement concerning it to the Department of Treasury for resolution. Future Treasury Inspector General for Tax Administration reviews of modernization project testing and deployment activities will include assessments of the resolution of defect reports and the need for the IRS' involvement in the defect report closures.

Management also indicated that three of its corrective actions were completed in July 2001. Since this was near the beginning of our audit, and prior to the completion of the CC 2001 testing, we question whether the completion dates provided are correct. If these actions were in fact taken before we raised the issues, we must conclude that the corrective actions were either incomplete or ineffective. We are also troubled that BSMO management did not provide us with documentation during our audit to support the actions taken.

Copies of this report are being sent to the IRS managers who are affected by the report recommendations. Please contact me at (202) 622-6510 if you have questions or Scott E. Wilson, Assistant Inspector General for Audit (Information Systems Programs), at (202) 622-8510.

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The Customer Communications Project 2001 Release Was Deployed, But Testing Processes Did Not Ensure All Applications Were Working As Intended

Background

The Customer Communications Project Fiscal Year 2001 Release (CC 2001) is intended to increase telephone and communication service levels to those of similar customer service operations in the private sector. The project's expectations can be traced back to May 1997, when the Internal Revenue Service (IRS) issued its *Modernization Blueprint* to define, direct, and control investments in modernized systems and related infrastructure.

The IRS created the Business Systems Modernization Office (BSMO) to oversee the modernization efforts and contracted with experienced information technology companies to design and build the various modernization projects, including the CC 2001 project. The PRIME Alliance is a group of leading companies brought together by the Computer Sciences Corporation (CSC) to provide the IRS with access to commercial best practices, guarantee access to viable alternative solutions, and streamline the systems acquisition process. One of the processes that the CSC created for the IRS is the Enterprise Life Cycle (ELC), which guides the planning, design, development, and deployment of modernization projects.

The ELC establishes a set of repeatable processes and a system of reviews, checkpoints, and milestones[1] that help ensure delivery of promised business results. The ELC provides specific guidelines in completing the testing phase of a project in preparation for deployment. To provide additional controls over project quality, the CSC and the BSMO developed a defect report process to resolve problems identified during testing. In addition, they developed a "go/no-go" procedure to control the decision to proceed through project deployment activities.

We conducted our audit from June through September 2001, at the BSMO facilities in New Carrollton, Maryland, and the IRS' National Headquarters in Washington, D.C. The review was conducted in accordance with *Government Auditing Standards,* except that we encountered scope

[1] A milestone is a significant event in the project, usually the completion of a major work product or service.

limitations by not having access to sufficient, competent, relevant, and timely information to afford a reasonable basis to draw conclusions and meet the audit objective. The absence of timely and complete information impaired our ability to fully assess whether intended project capabilities were provided. Detailed information on our audit objective, scope, and methodology is presented in Appendix I, and information related to the scope impairment is presented in Appendix IV. Major contributors to the report are listed in Appendix II.

The Customer Communications Project 2001 Release Was Deployed to Serve Taxpayers More Efficiently

The CC 2001 project became operational on August 2, 2001. The BSMO reported that the CC 2001 project has improved the IRS' ability to receive, route, and respond to the more than 150 million taxpayer telephone calls it receives each year. The cost to design, develop, test, and deploy the CC 2001 project was approximately $65 million.

Major system improvements include designs to use:

- Voice-activated programs that recognize English- or Spanish-speaking callers.
- A voice-activated program that taxpayers can use to find out the status of their refunds.
- Capabilities that more accurately route taxpayer calls to the most appropriate IRS resource.

One of the CC 2001 features is the use of automated voice recognition to screen and route callers to a customer service representative or to an automated program. The planned system capabilities allow taxpayers with simple questions to get answers quickly, while those with issues that are more complex are guided to a customer service representative. The voice response system starts if callers do not make a selection using their telephone keypads. Callers then hear a series of options and make their selections by speaking into the telephone.

Testing Processes Did Not Ensure That All Capabilities Were Working As Intended

The BSMO and CSC did not adequately create, maintain, or provide documents to support the successful testing and deployment of all intended CC 2001 project capabilities.

The CC 2001 project's pre-deployment plans included the development and execution of a series of rigorous testing processes. These plans called for application tests to ensure the individual components worked and met the business requirements, integration tests to ensure the components worked together as a whole, security tests to ensure the project was secure and met IRS security standards, and site readiness tests to ensure the project worked with existing IRS systems. The results of these various tests should have been documented and approved by the CSC and the BSMO, and copies of these documents should have been maintained by the BSMO to support that the project was working as intended when it was deployed.

We judgmentally selected a sample of 27 system requirements that we considered the most critical of the 116 total system requirements for the CC 2001 project. Our review of testing plans and results for these 27 system requirements showed that:

- Thirteen system requirements did not have evidence of any testing.
- Three system requirements passed some planned testing activities but did not undergo all planned testing.
- Eight system requirements passed planned testing activities.
- Two system requirements were deferred to later CC project releases.
- One system requirement was cancelled.

Appendix V presents an analysis of the system requirements included in our audit sample.

Without evidence that critical system requirements were successfully tested, the BSMO does not have assurance that the project will deliver all expected capabilities. The absence of testing activity documents was due, in part, to inadequate controls to trace and document system requirements to testing activities, and to maintain appropriate control over the various versions of the testing documents (known as configuration management).

Tracing and documenting system requirements to testing activities

The absence of support that testing activities addressed the CC 2001 project's system requirements is attributable to shortcomings in tracing tests to specific requirements (traceability). The BSMO did not ensure that the CSC traced system requirements to the test cases[2] used to control the testing processes. The CC 2001 project has over 100 individual system requirements, yet the CSC developed only 11 test cases to determine whether project capabilities met system requirements. Incomplete traceability of the system requirements to the test cases means that system requirements are difficult, if not impossible, to verify through the testing process.

The Customer Communications Project System Requirements Report states that traceability is one of the major activities of managing system requirements. Traceability provides the linkage between systems requirements and all phases of project development, and provides the ability to discover the history of each system feature. It links the lifecycle of a requirement both forward and backward, from origin to implementation. Traceability ensures that every requirement has been met because it is known which system components address each requirement.

[2] A test case is a high-level description of conditions to be tested in order to verify compliance with one or more specific requirements.

To illustrate the difficulties we experienced in obtaining support that systems requirements were tested, the CSC stated that several system requirements could not be tested during the integration tests due to testing and system constraints. The Integration End of Test Report indicated that although the requirements could not be tested during integration, they were all thoroughly tested during the individual application tests. However, neither the BSMO nor CSC provided documents confirming these requirements were actually tested (see Appendix V for details).

Requirements traceability is an investment that increases the chances of delivering a system that satisfies all the stated customer requirements and is easier to maintain.

Maintaining appropriate configuration management practices

The absence of support that testing activities addressed the CC 2001 project's system requirements is also attributable to shortcomings in meeting configuration management guidance. Guidance for proper configuration management is contained in the ELC, but the CSC and BSMO had not fully implemented this guidance.

Configuration management is the process of keeping formal project documents, software code, and other key products safe from inadvertent changes. Changes to products and documents are expected, but need to be controlled. Changes are made to correct errors, provide enhancements, or simply reflect the evolutionary refinement of product definition. Proper configuration management processes keep the changes under control to eliminate the confusion and error brought about by the existence of different versions of the project's products and documents. Configuration management also helps provide direct traceability between the projects developed by the CSC and the systems deployed to support IRS operations.

Examples of difficulties experienced from the inadequacies in configuration management included the following:

- The CSC cataloged system requirements using a number. Two systems requirement numbers were changed without any support for the change.
- Three system requirements were moved to a later release of the project without documentation indicating IRS management approval or control over the reassignment of the requirements.

Without a well-enforced configuration management process, project team members could unintentionally use different versions of products or documents, or individuals could create versions of products or documents without the proper authority. These changes could affect the validity of performance requirements and measurements, which could prevent the IRS from being assured that the systems will have the intended functionality.

Recommendations

To assure intended system capabilities are delivered in line with business requirements, the Deputy Commissioner for Modernization & Chief Information Officer should direct the BSMO to:

1. Ensure that requirements management meets established ELC practices. Specifically, the BSMO should perform reviews to ensure documentation is received from the CSC showing that project system requirements are traced to use cases, test cases and test procedures.

Management's Response: The IRS Product Assurance function will conduct reviews of requirements traceability, and document non-compliance for all test plans from the CSC.

Office of Audit Comment: Management's response shows this action was completed in July 2001. We question whether that date is accurate, since we raised this issue after that date and were not provided information regarding corrective actions. If this corrective action was taken before

we identified the issue, then we must conclude that the actions taken were either incomplete or ineffective.

2. Assign responsibility for configuration management inspections to monitor the adequacy of the implementation and execution of the configuration management procedures.

Management's Response: The BSMO's Office of Configuration Management was assigned responsibility to conduct configuration management audits of IRS modernization projects. Also, the BSMO has contracted with the MITRE Corporation to assist it in defining configuration management procedures.

The Resolution of Problems Identified During Testing Was Not Clearly Documented

Problems, also known as defects, may be found in software, hardware, documents, or other controlled products. Typically, defects are identified during testing or by the end user of a product. The CSC and the BSMO adopted procedures for identifying, reporting and resolving defects. The procedures provide that any person in the program may originate a defect report and submit it to the Defect Report Administrator, who reviews the defect report for completeness and assigns it a number. The information is supposed to be entered into a database (*ClearQuest)* that is used by the CSC to capture and manage the defect reports.

We identified 1,160 defect reports generated from the various testing phases. We found that defect report information was not always input to the *ClearQuest* database and the documentation supporting the resolution was not always maintained. Additionally, support was not always maintained showing BSMO approval for defect report closure or changes in defect severity ratings.

The *ClearQuest* database and Defect Report Record documentation were not always complete

The CSC's draft *ClearQuest* User's Guide identifies the "Resolution," "Actions Taken to Resolve Defect," and "Final Severity" as required information for the *ClearQuest* database and supporting records. The CSC did not always complete the required fields in the database and/or document the solutions to defect reports.

- The "Final Severity" field was not completed in 72 of the 1,160 records on the database. This field is important because each defect is given a severity rating to help set the priority for resolutions (see next section for more details). Since the database is used to control the identification and resolution of the defects, the absence of a severity rating could allow critical defects to remain open while lesser severity defects are being worked.
- The "Resolution" or the "Actions Taken to Resolve Defect" fields were not completed on 23 of the 34 sample defect report records we reviewed.[3] Of the 11 records that did contain resolution information, 7 did not adequately describe how the action resolved the identified defect. The status of the defects and details on the actions taken to resolve defects are needed to ensure the actions were appropriate, and for reference in resolving future occurrences of the same or similar problems.

Support was not always maintained showing the IRS' approval for changes in defect severity ratings

Defect reports are given severity ratings that are used to determine the urgency in correcting the defects. There are four levels of priority to identify the severity of a defect report: Critical, High, Medium, and Low. Defect reports with a Critical or High severity are more serious and require immediate attention. The CSC and the BSMO agreed that Critical and High severity defects would be resolved before the CSC delivered the system to the IRS. They also agreed that Medium and Low severity defects would be resolved before the CSC completed its work on the project and the IRS accepted the system.

[3] Because the *ClearQuest* database was not provided to us until the very end of the audit, we selected a sample of 34 records from the database and reviewed the supporting defect reports. See Appendix I for more details on our sample.

Of the 34 sampled defect reports identified above, 3 had the severity ratings changed on the database without any indication of approval by the CSC or the BSMO. One was changed from Critical to High, one from High to Medium, and one from Medium to High.

Significant defects that were not sufficiently resolved prior to deployment could cause problems during and after deployment that could negatively affect service to taxpayers.

Support was not always maintained showing the IRS' approval for defect report closure

At the time of the project's deployment phase, the CSC and the BSMO created a Defect Review Board to review and approve solutions to defect reports. The Defect Review Board is made up of CSC, BSMO, and other IRS personnel. Prior to this time, solutions to defects required the project management's approval. Of the 1,160 defects included on the *ClearQuest* database, the CSC project management unilaterally closed 935 defects prior to deployment. The IRS Product Assurance Staff approved the closure of an additional 24 defects identified during the IRS' systems acceptability testing. The remaining 201 defects had not been resolved at the time of project deployment.

The BSMO and Defect Review Board did not provide input for approving resolution of the 935 defects closed prior to deployment because the defect reporting process did not require the BSMO's input for defect closure. The absence of the BSMO's input in all defect closure decisions could allow defects to be closed without adequate resolution. The BSMO's participation in the approval process would provide the IRS assurance that the system meets performance expectations.

For example, one of the defects reported closed by the CSC prior to deployment was referred to as the "Say 4" defect because the system was not recognizing a voice response of "four." The CSC closed the defect as resolved on June 1, 2001. However, as of September 13, 2001, the IRS

Product Assurance Staff was still awaiting documentation supporting adequate resolution of the defect from the CSC.

We found seven other defect reports with the same "Say 4" problem that the CSC reported and closed in the *ClearQuest* database. One of the defect reports for the "Say 4" problem included a notation of the resolution; however, the other six defect reports did not contain any resolution information. The first of these seven defect reports was generated during application testing in February 2001, and the last was generated during the deployment phase in June 2001. The last defect report contained the notation "Held open at Jun-26 DRB [Defect Review Board] per Business request," yet the defect was closed the same day with no further notation.

The "Say 4" appeared as a continuing problem throughout the project's testing. If the resolution fields had been completed, it may have assisted future developers in identifying a fix to the problem. However, based on the available *ClearQuest* database information, it is unclear what action was taken to resolve the issue. Since the problem continued, it is questionable if the defect was resolved.

In another example, a defect report was opened during deployment testing that indicated "Spanish calls do not route correctly." There was no indication how, or if, this defect was actually resolved. If it was not resolved, Spanish-speaking callers may not be routed correctly and may have to call back repeatedly until they are routed to a Spanish-speaking assistor.

In a final example, a defect report was opened during integration testing that indicated "Multiple Refund Calls cannot get to CSRs (Customer Service Representatives) because the threshold in the required system is NOT allowing any calls to sit in the queue." Only the first call would get through to a CSR and subsequent callers would receive a "Technical Difficulties" message. There was no indication how, or if, this defect was actually resolved. If it was not resolved, the system may be limited in the number of calls it can handle where a CSR's assistance is required in

providing refund information. The number of refund calls answered would only be the same as the number of assistors available at a given time.

Without adequate documentation of defect resolution actions, the CSC and the BSMO have no evidence to support whether or how a problem was corrected. Also, the solutions would not be available for the same or similar problems in the future. Taxpayers could become quite frustrated if the types of problems noted above were not resolved before the system was deployed.

Recommendations

To help ensure adequate control over defect reporting, resolution, and closure for future modernization projects, the Deputy Commissioner for Modernization & Chief Information Officer should direct the BSMO to ensure:

3. Details are developed for the procedures to manage the defect identification, evaluation, reporting, and resolution processes.

Management's Response: The CSC developed procedures for the defect report process flow, including actions to address, close, and document a defect.

Office of Audit Comment: Management's response shows this action was completed in July 2001, which was prior to the time we identified this issue. Management did not provide us with any documentation during our audit to support this corrective action.

4. Responsibility is assigned for ensuring that the *ClearQuest* database includes accurate and complete information to document identified defects, the defect resolutions, and approval of closures.

Management's Response: The CSC Defect Report Coordinator now has responsibility to ensure that all defect reports entered into the *ClearQuest* database contain complete and accurate information.

Office of Audit Comment: Management's response shows this action was completed in July 2001, which was prior to the time we identified this issue. Management did not provide us with any documentation during our audit to support this corrective action.

5. Procedures are developed for the IRS to review and approve resolution and closure of all defect reports.

Management's Response: Management did not agree with this recommendation, citing that the high number of defect reports generated during the project testing would make such reviews difficult.

Office of Audit Comment: While we agree that the extraordinarily high number of testing defects on this one project presented a challenge, we believe that management needs to have adequate assurance that problems are either resolved or reduced to an acceptable level on each project. Otherwise, glitches could occur after projects are deployed, which could significantly impact IRS operations and/or service to taxpayers.

The Project Deployment Decision Process Did Not Consider All Relevant Information

Project deployment plans include instructions for performing a "go/no-go" review to assess the project's ability to perform at full production levels. The criteria used in this review are contained in the Deployment Site Acceptance Review Plan. A Deployment Executive Board, made up of representatives from the CSC and the IRS, reviews the results of testing and recommends whether to proceed with deployment at the go/no-go review.

The Deployment Executive Board made a unanimous decision to go forward with the deployment of the CC 2001 project on July 26, 2001. However, we were not provided documentation showing any review by the Board to verify that the go/no-go criteria, detailed in the Deployment Site Acceptance Review Plan, was met.

The meeting minutes for the go/no-go review indicated that the Board relied on verbal assurance from CSC employees that the criteria for deployment were satisfied. When we requested evidence that the Board reviewed documentation to show that the criteria were met, the BSMO replied that

they did not have this information and referred us to the CSC. The CSC responded that we could obtain the documents from the BSMO to show that the criteria were satisfied, not with evidence that the Board reviewed the documents. In addition, two of the documents that the CSC referred us to were deliverables that would not have been completed at the time of the go/no-go review.

We identified two additional issues that should have been considered in the go/no-go review process. Although the BSMO noted these issues, it did not require their resolution in making the go/no-go decision.

One issue involved the IRS' executive committee responsible for overseeing the CC 2001 project. The Customer Relationship Management Sub-Executive Steering Committee approved the CC 2001 project's deployment as long as five conditions were resolved in an expeditious and aggressive manner prior to full deployment. Two of these conditions were not satisfied prior to the Board's go/no-go review on July 26, 2001, as follows:

- "Resolve two open systems acceptability testing defects and receive Product Assurance[4] approval." Neither of these defects was approved by Product Assurance prior to the go/no-go decision.
- "Resolve three Intelligent Call Management script discrepancies." Two of the three discrepancies were not closed prior to the go/no-go decision, although both were resolved within the following week.

The second issue not considered in the go/no-go decision involved the CC 2001 project's contingency plan. In a deployment meeting in April 2001, the Joint Operations

[4] The Product Assurance organization works to continually improve the quality of IRS information systems, products, and services; it independently assesses the quality of the applications software by testing a system's production readiness.

Center[5] management stated that it would not concur with or accept deployment of the CC 2001 release until the contingency plan was approved and implemented. There was no documentation available to show that the contingency plan was approved or implemented prior to the go/no-go decision.

The BSMO and the CSC did not develop a complete process to make the go/no-go decision. The Deployment Site Acceptance Review Plan did not include procedures for the Board to use as guidance as to what documentation it should review to ensure that the go/no-go criteria were met. Also, the process did not ensure that all issues identified during testing were included for review by the Board. Including these issues would allow the Board to make a more informed decision regarding the adequacy of the system for deployment.

Significant issues that were not sufficiently resolved prior to deployment could cause problems during and after deployment that could negatively affect service to taxpayers.

Recommendation

To help ensure that informed and appropriate go/no-go decisions are made on future modernization projects, the Deputy Commissioner for Modernization & Chief Information Officer should direct the BSMO to ensure:

6. Specific procedures are developed for use by the Deployment Executive Board that include:

    - Identifying issues or conditions that are raised by the various groups involved in the project deployment activities for inclusion as a criteria to be met and reviewed by the Deployment Executive Board prior to making the go/no-go decision.

[5] The Joint Operations Center (JOC) is a unit within the IRS' Information Technology Section. The JOC supports and maintains the telephone system with which CC 2001 is being merged.

- Maintaining documentation about the satisfaction of go/no-go criteria for the Deployment Executive Board's go/no-go review.

Management's Response: The CSC is drafting procedures which detail specific review items and pass/fail criteria that project teams will follow in all deployment activities. The procedures will also include mandatory signoff from all review parties to concur that criteria have been met prior to initiating deployment.

Appendix I

Detailed Objective, Scope, and Methodology

The overall objective of this audit was to determine whether the Customer Communications Project Fiscal Year 2001 Release (CC 2001) deployment readiness activities followed testing and pre-deployment plans to ensure intended capabilities were delivered. We performed this audit as part of our planned audit coverage of the Internal Revenue Service's (IRS) modernization efforts.

Although we followed *Government Auditing Standards,* the auditors encountered scope limitations by not having access to sufficient, competent, relevant, and timely information to afford a reasonable basis to draw conclusions and meet the audit objective. The absence of timely and complete information did not allow the auditors to fully assess whether intended project capabilities were provided. Appendix IV presents a list of the information requested by the Treasury Inspector General for Tax Administration auditors but not provided for their review.

We performed the following reviews and analyses.

I. Analyzed deployment readiness by reviewing the various testing activities to determine whether the Enterprise Life Cycle[1] (ELC) guidelines, industry standards, and the Internal Revenue Manual were addressed.
   A. To determine whether the Application Qualification Test[2] (AQT) plan and its execution met guidelines and standards, we:
      1. Reviewed ELC requirements for the AQT.
      2. Compared the AQT plan to ELC requirements to identify any significant discrepancies, unusual constraints, or scope impairments.
      3. Reviewed the AQT test results, completed April 3, 2001, to determine if all tests were conducted, results analyzed, and defects adequately resolved.
      4. Determined whether the entire completion criteria for AQT were satisfied, including approval by the IRS to permit transition into System Integration Testing[3] (SIT).

[1] The Enterprise Life Cycle (ELC) is a systems development process which guides the planning, design, and implementation of modernization projects. The ELC establishes a set of repeatable processes and a system of reviews, checkpoints, and milestones that enable delivery of promised business results.

[2] Application Qualification Testing (AQT) verifies that all system requirements are met within test environment constraints and that problems encountered are documented, verified, and corrected.

[3] System Integration Testing (SIT) includes end-to-end testing of all components to check system readiness to pass the project's release on to the next major stage of deployment.

B. To determine whether the SIT plan and its execution met guidelines and standards, we:
   1. Reviewed ELC and Software Engineering Institute requirements for the SIT.
   2. Compared the SIT plan to ELC requirements to identify any significant discrepancies, unusual constraints, or scope impairments.
   3. Reviewed the SIT test results, completed May 31, 2001, to determine if all tests were conducted, results analyzed, and defects adequately resolved.
   4. Determined whether the entire completion criteria for SIT were satisfied, including approval by the IRS to permit transition into Deployment Site Readiness.[4]

C. To determine whether the System Acceptability Test[5] (SAT) plan and its execution met guidelines and standards, we:
   1. Reviewed SAT requirements and standards from the Internal Revenue Manual and industry standards from the Software Engineering Institute.
   2. Compared the SAT plan to SAT requirements to identify any significant discrepancies, unusual constraints, or scope impairments.
   3. Reviewed the SAT test results, completed May 21, 2001, to determine if all tests were conducted, results analyzed, and defects adequately resolved.
   4. Determined whether the entire completion criteria for SAT testing were satisfied, including approval by the IRS to permit transition into Deployment Site Readiness.

D. To determine whether the Deployment Site Acceptance Review Plan/Deployment Site Readiness Test Plan met guidelines and standards, we:
   1. Reviewed Deployment Site Acceptance Review Plan/Deployment Site Readiness Test Plan requirements and standards from the Internal Revenue Manual and procedure documents, as well as industry standards from the Software Engineering Institute.
   2. Compared the Deployment Site Acceptance Review Plan/Deployment Site Readiness Test Plan to requirements to identify any significant discrepancies, unusual constraints, or scope impairments.

      Note: We were not provided Deployment Site Acceptance Review/Deployment Site Readiness Test results to be able to assess the adequacy of the review and test plan execution. Without this information, our ability to determine the adequacy of the deployment of intended CC 2001 project capabilities was impaired.

[4] Deployment Site Readiness testing assesses whether the system as installed is working well enough to support enterprise-wide business use.

[5] System Acceptability Testing (SAT) is an independent IRS acceptance activity that assesses whether products meet customer requirements and whether specified deliverables conform to approved standards.

E. To determine if the Security Test and Evaluation[6] (ST&E) Plan and its execution met guidelines and standards, we:

1. Compared the ST&E Plan to guidelines and standards to determine whether the plan adequately followed the criteria necessary to effectively test and evaluate the security controls. The security criteria included the ELC certification and accreditation process requirements and the *Information Systems Security Procedural Guide* (Document 9627).

2. Compared the ST&E Plan with the Customer Communications Risk Assessment Report to determine whether the plan adequately tested those risks warranting attention.

3. Interviewed the Security Oversight and Management staff to assess their responsibilities in the preparation and execution of the ST&E Plan.

4. Reviewed the ST&E test results to determine if the security was adequate to ensure the CC 2001 project met the requirements for security accreditation.

II. Analyzed the support available from deployment testing activities that demonstrated the project met planned system requirements. To accomplish this, we:

A. Judgmentally selected a sample of 27 CC 2001 project system requirements from the Systems Requirement Report dated May 8, 2000. We considered these 27 system requirements as the most critical of the Systems Requirement Report's 116 total system requirements. These system requirements were selected to emphasize auditors' conclusions.

B. Requested documentation and artifacts from the PRIME[7] and the IRS presenting the test activities and results (AQT, SIT, SAT, and Deployment Site Readiness) for the 27 system requirements in our sample. The sample was subsequently reduced to 24 requirements because 2 of the requirements had been deferred to later CC releases and 1 was cancelled. The IRS approved the elimination of these three requirements from the CC 2001 release.

III. Reviewed the process to identify, control, report, and resolve project defects in all testing phases. Our reviews determined if the defects were adequately reported, tracked, and resolved, when necessary, prior to proceeding to the next phase of testing and prior to project deployment. To assess the adequacy of controls to manage the reporting and resolution of defects we:

[6] Security Testing and Evaluation (ST&E) involves the planning and execution of security tests and the evaluation and analysis of the test results.

[7] In December 1998, the IRS selected the Computer Sciences Corporation (CSC) to serve as the PRIME contractor for the Business Systems Modernization program.

A. Reviewed the CSC defect report procedure.

B. Obtained an extract from the CSC's *ClearQuest* database of defect report information accumulated between January 25, 2001, and August 1, 2001. The 1,160 defect reports on this database were generated during AQT, SIT, SAT, and Deployment Site Readiness.

C. Reviewed the CSC's draft *ClearQuest* User's Guide to determine the method used to manage reported defects on the database.

D. Reviewed a judgmental sample of 34 defect report records from the population of 1,160 defect reports to determine the accuracy and completeness of the defect report records, the adequacy of the defect resolutions, and whether the defect resolution was approved. The defect reports were selected to find examples to emphasize auditors' conclusions. The sample consisted of 11 AQT defect reports that were not closed prior to the end of AQT testing, 11 defect reports that related to the "Say 4"[8] SAT issue, 9 defect reports that the auditors interpreted as significant based on the defect report titles, and 3 defect reports that did not include a severity classification.

IV. Analyzed the decision process, referred to as "go/no-go", used by the CSC and the IRS managers to proceed with deployment of the CC 2001 project. Two go/no-go decisions were made during the CC 2001 project deployment -- the Go/No-Go Review and the Deployment Site Acceptance Review. To assess the adequacy of controls to manage and execute this process, we:

A. Reviewed criteria in the Deployment Site Acceptance Review Plan used by the Deployment Executive Board to assess the adequacy of project development to proceed with its deployment and active operation.

B. Reviewed meeting minutes in which management reviewed deployment activities to identify issues for consideration in the go/no-go decision by the Deployment Executive Board.

C. Analyzed the status of defect resolutions to determine whether any significant defects remained unresolved after a "Go" decision by the Deployment Executive Board.

D. Analyzed the documentation used by the Deployment Executive Board to make the go/no-go decision.

[8] The defect reports referred to as the "Say 4" defect is a condition of the voice recognition response not recognizing a voice response of "4."

Appendix II

Major Contributors to This Report

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Appendix III

Report Distribution List

Commissioner N:C
Deputy Commissioner N:DC
Deputy Associate Commissioner, Program Management M:B
Deputy Associate Commissioner, Systems Integration M:B
Chief Counsel CC
National Taxpayer Advocate TA
Director, Legislative Affairs CL:LA
Director, Office of Program Evaluation and Risk Analysis N:ADC:R:O
Office of Management Controls N:CFO:F:M
Audit Liaison:
Associate Commissioner, Business Systems Modernization M:B

Appendix IV

Information Requested and Not Provided to Treasury Inspector General for Tax Administration Auditors

DATE REQUESTED	INFORMATION NOT PROVIDED
July 24, 2001	Documentation of resolution of the Application Qualification Testing (AQT) team-generated list of issues directly related to the use cases (these issues were referred to in the AQT End of Test Report, dated April 13, 2001, page 11, "Constraints" section, last bullet).
August 9, 2001	Documentation showing that the contingency plan was approved and implemented (Change Request #22).
August 9, 2001	Documentation showing support for completion of Milestone 4 exit conditions - Action Item #2 – Business and Product Assurance sign-off on one of two defect reports requested.
August 16, 2001	Complete responses from the Computer Sciences Corporation (CSC) to auditor questions regarding additional support documenting actual system requirements capabilities.
August 16, 2001	Complete responses from the CSC about auditor questions regarding defect reports, Go/No-Go decision processes and documentation, Milestone 4 exit, and AQT constraints.
August 23, 2001	Copies of Configuration Inspection AQT test results procedures identified in Scenario #1 and Scenario #2 and Verification Cases 0004 through 0024 as discussed in the Customer Communication Project's System Verification and Validation Plan.
August 29, 2001	Complete documentation for sampled defect reports.
August 29, 2001	Complete answers to questions about the CSC's defect report summary.
September 5, 2001	AQT sub-phase Process Flow and Work Product Dependency Diagrams.
September 5, 2001	Internal Revenue Service approval for requirements moved to a later release for requirements 40.0370 and 40.0260.
September 5, 2001	Documentation and clarification for test procedure 13.20.01.19.
September 5, 2001	System Integration Testing documentation supporting testing of 24 requirements in the Security Testing & Evaluation test objectives.

Appendix V

Analysis of System Requirements Testing and Test Results

System Requirement	Planned Testing*	Test Support
40.0020: The Modernized System shall accept taxpayers' input from touch-tone (keypad) telephones.	AQT SIT	Sufficient Support
40.0031: The Modernized System shall accept taxpayers' input from callers using rotary dial telephones for Front-end Screening and for Refund Status Inquirers.	AQT SIT SAT	Sufficient Support
40.0160: The Modernized System shall provide the capability to play ad hoc broadcast messages to callers.	AQT SIT SAT	Sufficient Support
40.0260: The Modernized System shall provide the capability for an assistor to generate a request to get a hostile caller's Automated Number Identification (ANI) during the telephone conversation.	None – requirement moved to a later release without management approval.	No Evidence of Testing
40.0310: The Modernized System shall provide the capability to deliver and concurrently display call transfer data when the call is delivered to an assistor.	AQT SIT SAT	Sufficient Support
40.0370: The Modernized System shall provide the capability to assign and maintain priority call processing by service as determined by business rules.	None – requirement moved to a later release without management approval.	No Evidence of Testing
40.0420: The Modernized System shall provide the capability to monitor calls locally and remotely by type of service or employee.	Deployment	No Evidence of Testing
40.0460: The Modernized System shall select a next action to take if a caller makes a designated number of erroneous responses based on business rules.	AQT SIT SAT	Sufficient Support

System Requirement	Planned Testing*	Test Support
40.0490: The Modernized System shall provide the capability to schedule and administer closures or outages at call sites.	Deployment	No Evidence of Testing
40.0590: The Modernized System shall provide a call routing and rerouting capability to and from the following resources and services for incoming and outgoing calls: - A designated legacy system application. - The designated site for the required service. - A skill group with a designated skill. - The designated specialty service. - The Public Telephone Network interface.	AQT SIT SAT Deployment	AQT: Support only partially satisfied requirement SIT: Sufficient Support SAT: Sufficient Support Deployment: No Evidence of Testing
40.0610: The Modernized System shall provide the capability to route and reroute calls one or more times across and within all product lines and services: - Callers selecting a service from a menu or script. - Callers transferred from one assistor to another. - Callers transferred from an assistor to a legacy Telephone Routing Interactive System (TRIS) application.	AQT SIT SAT Deployment	AQT: Sufficient Support SIT: Sufficient Support SAT: Sufficient Support Deployment: No Evidence of Testing
40.0641: The Modernized System shall provide the capability to route calls using the following business rules: - Caller input/request/topic. - ANI. - Traffic load balancing. - Location/network capacity. - Location availability. - Location specialty including Business Operating Division. - Location use. - Application availability. - Assistor availability. - Assistor skills/qualifications. - Minimum expected delay. - Dialed Number Identification Service.	AQT SIT SAT Deployment	AQT: Support only partially satisfied requirement SIT: Support only partially satisfied requirement SAT: Support only partially satisfied requirement Deployment: No Evidence of Testing
40.0671: The Modernized System shall provide the capability to manage, route, and/or reroute telephone traffic throughout the modernized Internal Revenue Service system-wide telecommunication network to balance traffic across sites and within each service in accordance with business rules.	AQT Deployment	No Evidence of Testing

System Requirement	Planned Testing*	Test Support
40.0730: The Modernized System shall provide the capability to route a Spanish-speaking caller to a Spanish-speaking assistor.	SIT SAT	No Evidence of Testing
40.0780: The Modernized System shall adjust call routing so that the number of calls connected to a resource will decrease to approximately zero by the scheduled time of non-availability.	AQT Deployment	No Evidence of Testing
40.0810: The Modernized System shall receive calls and data from the Public Telephone Network needed to process the call.	AQT SIT SAT	Sufficient Support
40.0860: The Modernized System shall provide the capacity to service 165.5 million nationwide incoming call attempts at the specified level of access during a fiscal year.	AQT Deployment	No Evidence of Testing
40.0860.01.03: The Modernized System shall provide the capacity to service 16 million Voice Refund Status Inquiry calls during a fiscal year, with an average call duration of 4 minutes and with the caller selecting 1 inquiry per call.	AQT	No Evidence of Testing
50.0010: The interface from the front-end screening Modernized System application via the Intelligent Call Manager (i.e., Geotel) and via the Automated Call Distributor to the Legacy TRIS System shall transfer data that include the following information: - Language Types (e.g., English, Spanish). - Media Types (e.g., Touch Tone, Rotary [Voice]). - Applications Types (e.g., Non-Account services, Accounts services, etc.).	SIT	No Evidence of Testing
50.0050: The interface from the Public Telephone Network to the Modernized System shall transfer taxpayer menu selections.	AQT SIT SAT	Sufficient Support
50.0090: The interface from the Modernized System to the Public Telephone Network shall transfer Refund and Fact-of-Filing data input prompts.	AQT SIT SAT	Sufficient Support
50.0110: The interface from the Modernized System to the Public Telephone Network shall transfer rerouting requests.	AQT SIT SAT Deployment	No Evidence of Testing

The Customer Communications Project 2001 Release Was Deployed, But Testing Processes Did Not Ensure All Applications Were Working As Intended

System Requirement	Planned Testing*	Test Support
50.0110.01: The interface from the Modernized System to the Public Telephone Network shall transfer rerouting requests with a projected average frequency of 81,000 times per hour.	AQT	No Evidence of Testing
390.0250: The Modernized System shall include the following standard reports types: - Americans with Disabilities Act devices and Spanish users. - Telephone Infrastructure Report. - Weekly Internet Post-Filing Web Page Report.	Deployment	No Evidence of Testing

* AQT = Application Qualification Testing

SIT = System Integration Testing

SAT = System Acceptability Testing

Deployment = Deployment Site Readiness

Appendix VI

Management's Response to the Draft Report

DEPUTY COMMISSIONER

DEPARTMENT OF THE TREASURY
INTERNAL REVENUE SERVICE
WASHINGTON, D.C. 20224

February 12, 2002

RECEIVED
FEB 12 2002

MEMORANDUM FOR TREASURY INSPECTOR GENERAL FOR
TAX ADMINISTRATION

FROM: for John C. Reece Dennis Szymanski
Deputy Commissioner for Modernization &
Chief Information Officer

SUBJECT: Draft Audit Report – The Customer Communications Project 2001 Release Was Deployed, But Testing Processes Did Not Ensure All Applications Were Working As Intended (Audit No. 200120033)

The Customer Communications Project (CC01), implemented in August 2001, has upgraded the IRS' telephone system by improving customer call management. Implementation of CCO1 enables the IRS to receive, route, and respond more efficiently to 150 million taxpayer calls each year.

As the first Business Systems Modernization (BSM) project we deployed, the Customer Communications 2001 project (CC01) underwent rigorous hardware and software testing. We identified and corrected over 1100 defects during applications, integration, acceptance, and deployment testing.

The report highlights legitimate areas of concern. We worked closely with our PRIME Alliance partners on CC01 pre-deployment and deployment testing processes to ensure we corrected all hardware and software defects. In addition, we delayed the rollout of CC01 to ensure we tested the system thoroughly. We have updated many of our policies and procedures regarding traceability to business requirements and to address these issues.

If you have any questions, please contact me at (202) 622-6800, or Jim Williams, the Deputy Associate Commissioner for Program Management, at (202) 622-7458.

Attachment

Attachment

Business Systems Modernization Management Response

Draft Audit Report – The Customer Communications Project 2001 Release Was Deployed, But Testing Processes Did Not Ensure All Applications Were Working As Intended (Audit No. 200120033)

I. Testing Processes Did Not Ensure That All Capabilities Were Working As Intended

Recommendation 1. Ensure that requirements management meets established ELC practices. Specifically, the BSMO should perform reviews to ensure that documentation is received from the CSC showing that project system requirements are traced to use cases, test cases and test procedures.

Corrective Action 1: On July 13, 2001, PRIME issued its Program Validation and Verification Plan (PVVP). The PVVP requires all test plans to include a requirement traceability matrix that maps all requirements to the test case and test phase where we will verify those requirements. PRIME is using Rational Suite software for this mapping. The IRS Product Assurance area will conduct reviews of these requirement traceability matrices, and document non-compliance for all test plans received as part of a contract deliverable.

Implementation Date: July 13, 2001 (Completed)

Responsible Official: Jim Williams, Deputy Associate Commissioner for Program Management, Business Systems Modernization

Recommendation 2. Assign responsibility for configuration management inspections to monitor the adequacy of the implementation and execution of the configuration management procedures.

Corrective Action 2: The Office of Configuration Management (OCM) within the Business Systems Modernization Office has responsibility for conducting configuration management audits of IRS modernization projects. In September 2001, we tasked the MITRE Corporation to assist in defining processes and procedures. OCM

Attachment

Business Systems Modernization Management Response

Draft Audit Report – The Customer Communications Project 2001 Release Was Deployed, But Testing Processes Did Not Ensure All Applications Were Working As Intended (Audit No. 200120033)

began requesting information from selected projects in early January 2002.

Implementation Date: September 26, 2001 (Completed)

Responsible Official: Bob Albicker, Deputy Associate Commissioner for Systems Integration, Business Systems Modernization

II. The Resolution of Problems Identified During Testing Was Not Clearly Documented

Recommendation 3: Develop details for the procedures to manage the defect identification, evaluation, reporting, and resolution processes.

Corrective Action 3: PRIME's July 31, 2001 Configuration Management Plan now documents the Defect Report (DR) process flow and requires each project's PRIME DR Coordinator to ensure that all DRs submitted for closure contain a complete list of actions taken to address and close a DR. PRIME's July 13, 2001 Program Validation & Verification Plan also documents the DR process and requires that tests results folders contain copies of DRs, with problem descriptions and resolutions. These procedures were not available in time for CC01 implementation.

Implementation Date: July 31, 2001 (Completed)

Responsible Official: Bob Albicker, Deputy Associate Commissioner for Systems Integration, Business Systems Modernization

Recommendation 4: Assign responsibility for ensuring that the *ClearQuest* database includes accurate and complete information to document identified defects, the defect resolutions and approval of closures.

Attachment

Business Systems Modernization Management Response

Draft Audit Report – The Customer Communications Project 2001 Release Was Deployed, But Testing Processes Did Not Ensure All Applications Were Working As Intended (Audit No. 200120033)

Corrective Action 4:	The PRIME Configuration Management Plan, dated July 31, 2001, refined the function of PRIME Defect Report (DR) Coordinator to include responsibility for ensuring that all DRs entered into the *ClearQuest* database for his or her project contains complete and accurate information.
Implementation Date:	July 31, 2001 (Completed)
Responsible Official:	Bob Albicker, Deputy Associate Commissioner for Systems Integration, Business Systems Modernization
Recommendation 5:	Develop procedures for the IRS to review and approve resolution and closure of all defect reports.
Corrective Action 5:	We reject this recommendation. PRIME identified over 1100 defects during Application Qualification Testing (AQT) and Systems Integration Testing (SIT). No organization within the IRS has the resources to review such a large number of defect reports. It is not feasible for the IRS to manage the PRIME at this recommended level. The System Acceptability Testing (SAT) provided by the IRS Product Assurance area provides an independent assessment of how well the system meets the business requirements and, as such, provides an independent judgement of whether or not defects still exit in the system after AQT and SIT. Due to limitations that may exist in the SAT test bed, we have identified some requirements for deferred testing in the enterprise environment before full deployment and for defects identified during this phase, BSMO, as a member of the Defect Review Board, provides oversight to ensure adequate resolution.
Implementation Date:	N/A
Responsible Official:	N/A

Attachment

Business Systems Modernization Management Response

Draft Audit Report – The Customer Communications Project 2001 Release Was Deployed, But Testing Processes Did Not Ensure All Applications Were Working As Intended (Audit No. 200120033)

III. The Project Deployment Decision Process Did Not Consider All Relevant Information

Recommendation 6: Develop specific procedures for use by the Deployment Executive Board that includes:

- Identifying issues or conditions that are raised by the various groups involved in the project deployment activities for inclusion as a criteria to be met and reviewed by the Deployment Executive Board prior to making the go/no-go decision.
- Maintaining documentation about the satisfaction of go/no-go criteria for the Deployment Executive Board's go/no-go review.

Corrective Action 6: PRIME is currently drafting a Program Deployment Plan that will establish the policies and procedures each PRIME project team will follow in all deployment activities and calls for the Deployment Site Acceptance Review Plan to detail specific review items and pass/fail criteria. It will also include mandatory signoff/concurrence from all review parties that we have met the criteria prior to proceeding to deployment.

Implementation Date: July 1, 2002

Responsible Official: Jim Williams, Deputy Associate Commissioner for Program Management, Business Systems Modernization