



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving
Daily Processing, but Improvements
Are Warranted to Ensure Full Functionality*

September 28, 2011

Reference Number: 2011-20-109

This report has cleared the Treasury Inspector General for Tax Administration disclosure review process and information determined to be restricted from public release has been redacted from this document.

Phone Number | 202-622-6500

Email Address | TIGTACommunications@tigta.treas.gov

Web Site | <http://www.tigta.gov>



HIGHLIGHTS

THE CUSTOMER ACCOUNT DATA ENGINE 2 IS MAKING PROGRESS TOWARD ACHIEVING DAILY PROCESSING, BUT IMPROVEMENTS ARE WARRANTED TO ENSURE FULL FUNCTIONALITY

Highlights

Final Report issued on September 28, 2011

Highlights of Reference Number: 2011-20-109 to the Internal Revenue Service Chief Technology Officer.

IMPACT ON TAXPAYERS

The mission of the Customer Account Data Engine (CADE) 2 Program is to provide state-of-the-art individual taxpayer account processing and technologies to improve service to taxpayers and enhance Internal Revenue Service (IRS) tax administration. Once completed, the new modernization environment should allow the IRS to more effectively and efficiently update taxpayer accounts, support account settlement and maintenance, and process refunds on a daily basis, all of which will contribute to improved taxpayer services.

WHY TIGTA DID THE AUDIT

The overall objective of this review was to assess the logical and physical design of the CADE 2 Daily Processing activities and ensure the Daily Processing design is secure, the design satisfies the documented approved requirements, and the project management practices adhere to the Enterprise Life Cycle (ELC) standards and processes for the related milestones (through Milestone 4a).

WHAT TIGTA FOUND

The IRS is closer to achieving one of its modernization goals, daily processing of taxpayer accounts. In addition, TIGTA determined the IRS has taken steps to address security requirements during the Daily Processing Project. The IRS prepared a System Security Plan and documented 171 security

controls, of which 65 were classified as planned controls (i.e., the control is not in place and there is an activity planned to implement the control).

However, additional improvements and adherence to all criteria will help ensure that the CADE 2 functions as intended and that the January 2012 release date is met. The CADE 2 Daily Processing Project did not ensure business rules and requirements were always fully or timely developed, the Electronic Fraud Detection System was properly recorded in the Item Tracking Reporting and Control System, and open issues were properly addressed and closed prior to milestone exits. Further, the Daily Processing Project did not follow a consistent ELC path, and the Work Breakdown Schedule was incomplete.

WHAT TIGTA RECOMMENDED

TIGTA recommended that the Chief Technology Officer ensure a risk mitigation plan is formally developed and documented and all open issues are addressed and closed prior to approving milestone exits. TIGTA also recommended several other system development process improvements.

In its response, the IRS agreed with two of TIGTA's recommendations and plans to take appropriate corrective action. The IRS disagreed with TIGTA's recommendation to ensure that all open issues are addressed and closed prior to exiting a milestone. The IRS stated its guidance does not list specifics around what constitutes an open issue, leaving some flexibility to make risk-based decisions on whether a given open issue will impact efforts in the following milestones or undermine the success of the project. However, the design meeting documentation (dated 10 days prior to the milestone exit) indicated the design impact of the open issues was not known. Exiting a milestone without properly addressing critical open issues could result in rework, potentially impact the logical or physical design, and result in unnecessary costs.



TREASURY INSPECTOR GENERAL
FOR TAX ADMINISTRATION

DEPARTMENT OF THE TREASURY
WASHINGTON, D.C. 20220

September 28, 2011

MEMORANDUM FOR CHIEF TECHNOLOGY OFFICER

Michael R. Phillips

FROM:

Michael R. Phillips
Deputy Inspector General for Audit

SUBJECT:

Final Audit Report – The Customer Account Data Engine 2 Is Making Progress Toward Achieving Daily Processing, but Improvements Are Warranted to Ensure Full Functionality (Audit # 201120001)

This report presents the results of our review of the Customer Account Data Engine 2 Daily Processing. The overall objective of this review was to assess the logical and physical design of the Customer Account Data Engine 2 Daily Processing activities and ensure the Daily Processing design is secure, the design satisfies the stated documented approved requirements, and the project management practices adhere to the Enterprise Life Cycle standards and processes for the related milestones (thru Milestone 4a). This review was requested by the Chief Technology Officer and is included in our Fiscal Year 2011 Annual Audit Plan. It addresses the major management challenge of Modernization of the Internal Revenue Service.

Management's complete response to the draft report is included as Appendix VII.

Copies of this report are also being sent to the Internal Revenue Service managers affected by the report recommendations. Please contact me at (202) 622-6510 if you have questions or Alan Duncan, Assistant Inspector General for Audit (Security and Information Technology Services), at (202) 622-5894.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Table of Contents

Background	Page 1
Results of Review	Page 3
The Internal Revenue Service Is Nearing Its Modernization Goal to Achieve Daily Processing of Taxpayer Accounts	Page 3
Improvements Are Warranted in Several Management Areas	Page 5
<u>Recommendations 1 and 2:</u>	Page 8
The Daily Processing Project Is Not Following a Consistent Enterprise Life Cycle Path, and the Work Breakdown Schedule Is Incomplete	Page 9
<u>Recommendation 3:</u>	Page 12
Appendices	
Appendix I – Detailed Objective, Scope, and Methodology	Page 13
Appendix II – Major Contributors to This Report	Page 15
Appendix III – Report Distribution List	Page 16
Appendix IV – Enterprise Life Cycle Overview	Page 17
Appendix V – Transition State 1 Integration Reviews	Page 18
Appendix VI – Glossary of Terms	Page 20
Appendix VII – Management’s Response to the Draft Report	Page 23



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Abbreviations

CADE	Customer Account Data Engine
EFDS	Electronic Fraud Detection System
ELC	Enterprise Life Cycle
IMF	Individual Master File
IRS	Internal Revenue Service
ITRAC	Item Tracking Reporting and Control



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Background

In August 2008, the Internal Revenue Service (IRS) Commissioner established the Modernized Taxpayer Account Program Integration Office to manage the transition of current individual income tax processing, which consists of multiple computer systems for processing tax returns, payments, and other transactions affecting individual taxpayer accounts, into a more consolidated system. Working in conjunction with IRS business owners, the Modernized Taxpayer Account Program Integration Office decided to integrate elements from both the existing Individual Master File (IMF)¹ and current Customer Account Data Engine (CADE) processes into a new CADE 2 Program. The proposed plan incrementally transfers taxpayer accounts from the current IMF and CADE processing systems to a new CADE 2 relational database.

The Customer Account Data Engine 2 Program is the highest priority information technology modernization project in the Internal Revenue Service.

The CADE 2 Program is the top information technology modernization project in the IRS. The CADE 2 strategy involves three phases:

- **Transition State 1.** Modifies the IMF from a weekly cycle to daily processing, establishes a new relational database to store all individual taxpayer account information, and provides management tools to more effectively use data for compliance and customer service. The IRS plans to implement Transition State 1 in January 2012.²
- **Transition State 2.** Launches a single processing system where applications directly access and update the taxpayer account database. It will continue efforts toward addressing previously identified financial material weaknesses. The IRS plans to implement Transition State 2 in January 2014. We recently learned that lack of funding may put delivery of this phase at risk. The IRS is working to identify funding it could use to begin high-level planning efforts in an attempt to keep this on track.
- **Target State.** Consists of a single system using elements of the IMF and current CADE, eliminating all transitional applications used to link the current CADE, the IMF, and the Integrated Data Retrieval System. The complete solution also plans to address all the financial material weaknesses. As of April 28, 2011, the IRS had not established a Target State implementation date.

¹ See Appendix VI for a glossary of terms.

² See Appendix V Transition State 1 Integration Reviews.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

The CADE 2 Daily Processing Project is not a new application development project. Instead, it will enhance the existing IMF by processing taxpayer accounts on a daily schedule, rather than weekly schedule. To achieve high efficiency, the CADE 2 Program has decided to leverage existing systems and design artifacts.

The CADE 2 Daily Processing Project should improve processing and systems associated with managing individual taxpayer accounts on a daily basis. The Daily Processing Project charter defines the project purpose, scope, goals, and expected outcomes. The Daily Processing Project will address risk factors inherent in the current CADE approach, define target-state applications and processes used for managing the daily processing application over individual taxpayer accounts, and begin transition to the target state. The Daily Processing Project will be accountable for achieving the defined goals and managing and integrating all required components, to include four subprojects:

- 1) Daily updates to the Integrated Data Retrieval System.
- 2) Adjustments to notices.
- 3) Transaction processing.
- 4) Preparing daily loads to update the CADE 2 database.

By moving to daily processing, the CADE 2 Daily Processing Project will provide immediate and obvious benefits including faster refunds to taxpayers, faster posting of payments, and more efficient adjustments to taxpayer accounts.

This review is one of a series of audits for providing assessments of the CADE 2 Program as part of our Security and Information Technology Audit Strategy for Fiscal Years 2010 and 2011. The Treasury Inspector General for Tax Administration has recently completed audits of the CADE 2 Program Management Office and Database Implementation.³

This review was performed at the Modernization and Information Technology Services organization facility in New Carrollton, Maryland, during the period January through May 2011. We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objective. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective. Detailed information on our audit objective, scope, and methodology is presented in Appendix I. Major contributors to the report are listed in Appendix II.

³ *The Customer Account Data Engine 2 Program Management Office Implemented Systems Development Guidelines; However, Process Improvements Are Needed to Address Inconsistencies* (Audit Number 201020025, draft report issued August 11, 2011), and *The Customer Account Data Engine 2 Database Implementation Project Made Progress in Design Activities, but Improvements Are Needed* (Reference Number 2011-20-110, dated September 20, 2011).



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Results of Review

The Internal Revenue Service Is Nearing Its Modernization Goal to Achieve Daily Processing of Taxpayer Accounts

The CADE 2 Daily Processing Project has steadily progressed from project initiation (Milestone 1) through Physical Design (Milestone 4a). As a result, the IRS is closer to achieving one of its modernization goals, daily processing of taxpayer accounts. Each milestone presents new risks and challenges from which the Daily Processing Project team has gained invaluable information. For example, the IRS stated for daily processing to be successful, the processing start date needed to be changed from Friday to Thursday. Additionally, due to the critical nature of the system to the IRS mission, the IRS documented security requirements for Daily Processing and will use secure file transfer protocol to protect data from unauthorized access, modification, and corruption. As a result, the IRS gained a higher degree of confidence in achieving daily processing.

On January 29, 2010, the CADE 2 Daily Processing Project initiated efforts to accomplish objectives for Milestone 3, Logical Design. Specifically, these objectives establish:

- Context for CADE 2 Transition State 1, Logical Design.
- Current state and high-level relationships to systems affected by the CADE 2 solution.
- Scope of CADE 2 Transition State 1 and projects within the context of systems.
- Changes required to current processing cycles upon daily processing implementation.
- CADE 2 data model as a data-centric foundation for the future.
- Introduction of architectural components that are the foundation of the logical design.

On September 30, 2010, the CADE 2 Daily Processing Project initiated efforts to accomplish objectives for Milestone 4a, Physical Design. Specifically, these objectives:

- Build confidence and demonstrate achievement of a successful completion of CADE 2 Transition State 1, Physical Design.
- Walk through the physical design from end to end.
- Validate that key physical design components are in place, including data, applications, infrastructure, security, and performance.
- Validate that integration points were identified and incorporated into the physical design.
- Ensure the physical design is sound and consistent with design principles.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

- Discuss various scenarios associated with daily processing, weekly processing, and error conditions.
- Confirm that outstanding physical design issues have been addressed.
- Review and show confidence in the soundness of the physical design, using established Physical Design Soundness Criteria.

An independent firm reviewed and evaluated the success criteria for CADE 2 Daily Processing and validated the IRS’s conclusion that Daily Processing can be achieved. As a result of the progress achieved and the independent confidence assessment, the CADE 2 Daily Processing Project received a “go” decision.

Figure 1: Approach for Conducting the Go/No-Go Readiness Review

	Identify Confidence Factors & Key Success Criteria	Prepare for Review	Conduct Assessment	Finalize Assessment & Present Results
Dates	1/3 – 1/14	1/17 – 1/28	1/31 – 2/4	2/7 – 3/1
Key Activities	<ul style="list-style-type: none"> • Identified Confidence Factors required to determine readiness • Determined Key Success Criteria for each Confidence Factor • Developed scoring methodology 	<ul style="list-style-type: none"> • Obtained extension of time and Governance Board Approval on approach • Validated Key Success Criteria and considerations with stakeholders • Aligned PMO sponsors and stakeholder teams to Key Success Criteria • Gathered stakeholder feedback on final set of Confidence Factors and Key Success Criteria • Prepared analysis material and templates for Confidence Assessment 	<ul style="list-style-type: none"> • Developed, vetted, and gained alignment on a revised approach for execution of the Go/No-Go Confidence Assessment • Finalized set of Confidence Factors, Key Success Criteria, and supporting considerations • Executed Confidence Assessment: <ul style="list-style-type: none"> - Performed assessment of Key Success Criteria and assigned score to each - Documented score rationale and any associated challenges/issues 	<ul style="list-style-type: none"> • Compiled analysis from Confidence Assessment • Conduct Readiness Review to discuss results of Confidence Assessment • Capture issues/action items that need to be addressed immediately versus those that need to be addressed before Milestone4A Exit

Source: CADE 2 Program, Road to Transition State 1 Go No-Go Confidence Assessment Result, dated February 11, 2011. CTO = Chief Technology Officer. MS4A Exit = Milestone 4a exit.

Security during the Daily Processing Project was planned

According to the CADE 2 Security Framework document, because the IMF will not undergo any major changes to its architecture, the security controls will largely remain as they exist. However, we determined that the IRS has taken steps to address security during the Daily Processing Project. During the early phases of development, the IRS prepared a System Security Plan, which documents the planned controls for the application and addresses the security concerns that may affect the system’s operating environment. The System Security Plan



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

highlights 171 security controls, representing 19 control families, and differentiates between those that are planned controls (i.e., the control is not in place and there is an activity planned to implement the control) versus those that are inherited as part of the IRS organizational level. The CADE 2 Daily Processing Project's Controls Requirements Matrix identified 65 planned controls and 106 inherited controls.

In addition, the IRS contracted with an independent firm to complete a threat susceptibility analysis on CADE 2 Transition State 1. The contractor's report concluded that threats to CADE 2 Transition State 1 by external interfaces and databases appear to be minimal. Attacking through an external partner by corrupting the data imported through the air would be difficult and could primarily be avoided by proper validity checks during daily processing. The other attacks will likely be reasonably mitigated by existing security mechanisms already in place at the IRS, though conclusions about the Integrated Production Model are conditional upon database configuration and implementation, and these details were not known during the time period of this audit.

The Daily Processing team identified and documented additional security controls for CADE 2. For example, Daily Processing will encrypt data moving between systems that are not located in the same data center. Data moving between systems within the same data center will not be encrypted. Further, upon reviewing the Design Specification Report, officials from the Cybersecurity organization presented a list of about 17 different security concerns for consideration. These concerns were addressed in the final Design Specification Report.

Given the timing of our review and the life cycle phase of the CADE 2 Daily Processing Project, we could not test whether the identified security controls were operating as designed. We plan to evaluate the adequacy of these security controls during a future audit of the CADE 2 system.

Improvements Are Warranted in Several Management Areas

Overall, the CADE 2 Daily Processing team is managing the project successfully. However, the CADE 2 Daily Processing Project did not ensure: 1) business rules and requirements were always fully and timely developed in adherence to governing criteria; 2) the Electronic Fraud Detection System (EFDS) was properly recorded in the Item Tracking Reporting and Control (ITRAC) System for proper tracking, managing, and completion of a risk mitigation strategy; and 3) open issues were properly addressed and closed prior to milestone exits.

Efficient management and development over business rules are needed

The Enterprise Life Cycle (ELC)⁴ requires that business rules be gathered and completed during the Logical Design Phase (or in this case, Milestone 3). The CADE 2 Requirement Management Plan is the primary source for information on the activities, responsibilities, and resources used

⁴ Refer to Appendix IV for an overview of the ELC.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

to manage, monitor, and control requirements for CADE 2. The Requirement Management Plan states that requirements traceability is a key component of requirements management. Traceability describes the life of a requirement from its source through development and actual deployment into operations. Traceability also enables requirements change management by helping to more clearly identify the impacts of changing a requirement.

However, the CADE 2 Daily Processing business rules were not gathered and completed as required and were still being developed after the December 2010, Milestone 3 exit. For example, when the Milestone 3 exit occurred, the business rule that determines eligibility of accounts for daily processing was not developed. Additionally, prior to the Milestone 4a exit, 16 business rules were not written as required by the ELC. These business rules related to incomplete operational scenarios such as:

- Elongated day: The completion of a daily cycle in a day other than when it was initiated could affect the IRS's ability to meet scheduled completion dates for dependent processes (e.g., refund reviews/payment dates, notice mailings, Integrated Data Retrieval System updates).
- Elongated week: When the weekly processing cycle cannot be completed in time for the Integrated Data Retrieval System weekend update (completed by Monday 6 a.m.), Tax Examiners will not get posted account information from the last day of the week or from the weekly cycle, the weekend Taxpayer Information File analysis will not be run timely, and the availability of the Integrated Data Retrieval System may be affected.
- Electronic Fraud Detection System: The timing of the daily EFDS inputs is different for the filing of electronic returns (which is from the prior day) than for the filing of paper returns (which is from the current day).

Originally, both CADE 2 Milestone 3 and 4a exits were combined into an April 2011 exit, with all activities being structured around one single exit. However, due to budget issues, Milestone 3 was subsequently separated into an exit date of December 2010. Although the CADE 2 Daily Processing ensured key activities and products were identified, business rules were not completed prior to this new Milestone 3 exit. Additionally, new business rules developed after the milestone exit could also require development of additional customer requirements. For example, after the Milestone 3 exit, 225 new business requirements were added (55 exclusive to Daily Processing). Without business rules, customer requirements may not effectively function, thereby impinging CADE 2 system performance. The risk of incomplete business rules could contribute to untraced requirements, which may adversely impact systems design and testing activities. We previously reported on this condition in our review of the CADE 2 Program



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Management Office⁵ and recommended that the Chief Technology Officer ensure all requirements and business rules (including those for the Daily Processing Project) are identified and sufficiently traced, controlled, and managed.

A risk mitigation plan for the EFDS needs development

The EFDS is a critical upstream system used to detect potentially fraudulent tax returns and is considered an impacted system that requires the shift from weekly to daily processing. The CADE 2 Daily Processing Project utilizes the ITRAC System to document and monitor project risks. The Performance Monitoring and Program Reporting Process states project risks should be documented and monitored in the ITRAC System. Although the EFDS is an open operating scenario and a known risk, it is not documented in the ITRAC System. Therefore, a risk mitigation plan has not been formally developed to mitigate the risk in the timing difference identified for paper returns (as discussed previously, the timing of the daily EFDS inputs is different for paper returns than for electronic returns).

From Processing Years 2008 through 2010, the EFDS identified, on average, 603,179 fraudulent refund returns totaling about \$4 billion and intercepted 518,896 returns totaling about \$3.7 billion in fraudulent refunds. Without a proper EFDS risk mitigation plan to address the timing issue of paper returns, some fraudulent returns could go undetected, resulting in a monetary loss for the IRS. Figure 2 presents aggregated (i.e., both paper and electronic) fraudulent refund return statistics for Processing Years 2008–2010.

**Figure 2: Fraudulent Returns and Refunds Identified and Stopped
Processing Years 2008–2010**

Processing Year	Number of Fraudulent Refunds Identified	Number of Fraudulent Refunds Stopped	Amount of Fraudulent Refunds Identified	Amount of Fraudulent Refunds Stopped
2008	380,656	306,128	\$1,959,992,377	\$1,683,912,973
2009	457,369	369,257	\$2,988,945,590	\$2,517,094,116
2010	971,511	881,303	\$7,300,996,194	\$6,931,931,314
Average	603,179	518,896	\$4,083,311,387	\$3,710,979,467

Source: IRS fraudulent tax return statistics for Processing Years 2008–2010.

⁵ *The Customer Account Data Engine 2 Program Management Office Implemented Systems Development Guidelines; However, Process Improvements Are Needed to Address Inconsistencies* (Audit Number 201020025, draft report issued August 11, 2011).



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Milestone exit should have been a conditional exit

The purpose of the Milestone Readiness Review is to determine whether a project is in compliance with ELC requirements and ready to begin the milestone exit process. The Milestone Readiness Review eliminates last minute project delays and rework, and helps streamline decisions made by the project's governance organization. The Milestone Readiness Review looks for the process artifacts that were identified for that phase of development in the CADE 2 Project Tailoring Plan. The CADE 2 Program Executive Steering Committee performed the Milestone Readiness Reviews and gave them "Unconditional" exits.⁶ However, during the Physical Design Review on April 7 and 8, 2011, there were open issues at the Milestone 3 exit which the Daily Processing Project team stated would be closed prior to the formal Milestone 4a exit. The CADE 2 Daily Processing Project team ensured the open issues were tracked. Exiting a milestone without properly addressing critical open issues could result in rework, potentially impact the logical and/or physical design, and result in unnecessary costs.

Recommendations

The Chief Technology Officer should ensure:

Recommendation 1: A risk mitigation plan is formally developed and documented in the ITRAC System for any impacted systems, such as the EFDS.

Management's Response: IRS management agreed with this recommendation. A risk (ITRAC #15137) was opened on May 10, 2011, for Timely Processing of Potential Fraud Data for Paper Returns in the EFDS. A mitigation plan was documented and successfully executed.

Recommendation 2: All open issues are properly addressed and closed during the Milestone Readiness Review prior to approving an unconditional exit.

Management's Response: IRS management disagreed with this recommendation. The IRS guidance does not list specifics around what constitutes an "open issue" at milestone exit, leaving some flexibility for the Executive Steering Committee to make risk-based decisions on whether or not a given open issue is at a stage where it will impact efforts in the following milestones or undermine the success of the project. In the case of CADE 2 Daily Processing, there was full understanding by the CADE 2 Executive Steering Committee at the milestone exit that the open issues had been adequately addressed and were near resolution. Each issue had a viable solution and only needed full alignment by all stakeholders and/or a fully documented solution. While it is clearly optimal for all open issues to be properly addressed and fully closed during the Milestone Readiness Review, the IRS has chosen to leave some flexibility in the hands of

⁶ This means the project has addressed all known risks or conditions.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

its Executive Steering Committees in this area, based on the status of the open issues at milestone exit and the impacts the status will have on the outcome of the project. Currently, all Daily Processing design issues have been resolved and closed.

Office of Audit Comment: Documentation of the April 7 and 8, 2011, design meetings defined the open issues as follows, “technical narrative not completed/design impact still being determined.” Yet, on April 18, 2011, an unconditional exit was approved for the project to proceed to the next milestone. We agree there might need to be some flexibility for the IRS to make risk-based decisions on open issues before proceeding to another milestone. However, in this instance, the design meeting documentation indicated the design impact of the open issues was not known. Exiting a milestone without properly addressing critical open issues could result in rework, potentially impact the logical or physical design, and result in unnecessary costs.

The Daily Processing Project Is Not Following a Consistent Enterprise Life Cycle Path, and the Work Breakdown Schedule Is Incomplete

The CADE 2 Daily Processing Project Tailoring Plan states the project selected will follow the ELC *Iterative Path* (Figure 3). In the *Iterative Path* development life cycle (also called an iterative development model), projects start with initial planning and end with deployment, with repeated cycles of requirement discovery, development, and testing. In the ELC *Iterative Path*, the components are developed through a series of constrained iterations as the first iteration focuses on the initial requirements and the subsequent iterations build on the previous iterations by adding to the functionality. Characteristics of the *Iterative Path* include:

- Fixed Length Iterations (Milestone 1, 2, 3, 4a, 4b, and 5). Time boxing⁷ introduces a near-term milestone that forces all stakeholders to converge and actually deliver working software at regular intervals.
- Just-In-Time Requirements Elaboration. Project planning depends on identifying the most important capabilities and characteristics of the system.
- Early and Continuous Testing. Early and continuous testing will deliver cohesive, valuable increments of functionality.
- Continuous Learning and Adaption. All stakeholders are to reflect on the results of the process often, learn from the examination, and then adapt the process to produce results in the next iteration.

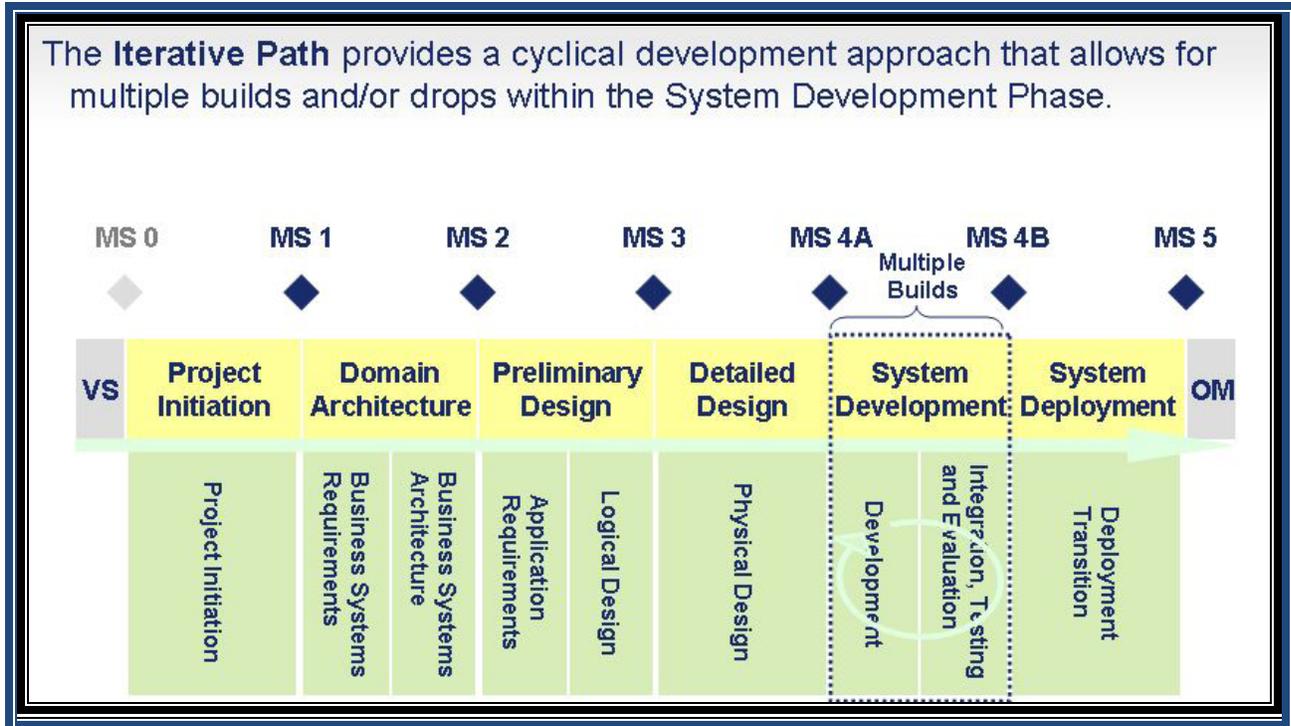
⁷ Architecture development is often time-boxed with an agreement to pass the architecture to the development team after a set period of time as opposed to leaving completion unbounded.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

- Dedicated Stakeholder Involvement. All stakeholders should be dedicated to the project and should provide timely feedback in developing functionality of the product.

Figure 3: Illustration of the Iterative Path



Source: CADE 2 Program Management Office, Database Implementation team.

IRS Executives stated the Daily Processing Project is following the ELC *Waterfall Path*, contradicting the Daily Processing Tailoring Plan document which uses the ELC *Iterative Path*. The *Waterfall Path* development model is a sequential design process which flows steadily downward through phases. The Daily Processing Project team has successfully utilized the *Iterative Path* methodology through the Business System Requirements Report and the Lessons Learned document. Early and continuous testing is another key characteristic of the *Iterative Path*; however, development and testing for Daily Processing were not accomplished throughout the project or through Milestone 4a. The Integrated Master Schedule reflects CADE 2 Daily Processing testing and development as starting in Milestone 4b. Testing at this stage is consistent with the *Waterfall Path*. As a result, the CADE 2 Daily Processing Project is being managed using a combination of both the *Waterfall* and *Iterative Paths*. An ELC path should be selected and documented to fully realize intended benefits.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

The Work Breakdown Schedule does not comply with all ELC criteria

The CADE 2 Daily Processing Project Tailoring Plan identified project deliverables through Milestone 5 (System Deployment Phase) which were not reflected in the Work Breakdown Schedule or subsequent iterations through Milestone 4a. The Work Breakdown Schedule is a deliverable-oriented grouping (deliverables) of project elements that organize and define the total work scope of the project. The Work Breakdown Schedule must incorporate the entire life cycle, tailored to represent the scope of the project/release from beginning to end, to the best of the team's ability at the time of creation. The ELC guidance requires the Work Breakdown Schedule to be updated and baselined for each upcoming milestone phase, prior to exiting the previous milestone. In contrast, the CADE 2 Daily Processing Project Tailoring Plan states the project will follow the ELC *Iterative Path*, whereby system requirements and functionality continually evolve. Therefore, the Work Breakdown Schedule is not consistent with the Project Tailoring. However, to ensure consistency with the ELC, the CADE 2 Daily Processing Project team has performed a baseline of the Work Breakdown Schedule at the end of each milestone.

Throughout project duration, all non-milestone Work Breakdown Schedule activities require a resource owner to provide activity input. However, there were 32 (of approximately 700) CADE 2 Daily Processing related non-milestone activities included in the November 24, 2010, Work Breakdown Schedule that did not identify a resource owner. Although the 32 activities were not listed on the November 24, 2010, critical path, if completion of an activity is excessively delayed, it can become part of the critical path.

The CADE 2 Daily Processing Project team should ensure all deliverables identified in the CADE 2 Daily Processing Project Tailoring Plan are detailed in the Work Breakdown Schedule and all activities are appropriately traced and monitored by a resource owner. Identifying an activity resource owner helps mitigate the risk of incomplete or delayed work. Further, delays in completing activities on the critical path can impede the January 2012 scheduled deployment date. We previously reported on this condition in our review of the CADE 2 Program Management Office⁸ and recommended that the Chief Technology Officer ensure all key activities associated with the development and deployment of the CADE 2 system are included in the Work Breakdown Schedule, including those for the Daily Processing Project.

⁸ *The Customer Account Data Engine 2 Program Management Office Implemented Systems Development Guidelines; However, Process Improvements Are Needed to Address Inconsistencies* (Audit Number 201020025, draft report issued August 11, 2011).



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Recommendation

The Chief Technology Officer should:

Recommendation 3: Require a documented and chosen ELC path for CADE 2 Daily Processing to ensure project consistency and full realization of the benefits of the selected ELC path.

Management's Response: IRS management agreed with this recommendation for future projects. The ELC is intended for projects, not programs. There is clear guidance and structure in place at the IRS to guide information technology investments in choosing and following an appropriate ELC path. For Transition State 1, the IRS made a business decision to leverage the iterative approach for the Database Implementation project.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Appendix I

Detailed Objective, Scope, and Methodology

The overall objective of this review was to assess the logical and physical design of the CADE 2 Daily Processing activities and ensure the Daily Processing design is secure, the design satisfies the stated documented approved requirements, and the project management practices adhere to the ELC¹ standards and processes for the related milestones (thru Milestone 4a).² To accomplish this objective, we:

- I. Determined whether the Daily Processing Project management team follows the ELC system development process to achieve daily processing and replace the current IMF applications and current CADE applications with a single, state-of-the art solution.
 - A. Reviewed the project charter to verify whether it contained key information (e.g., impacted systems, identification of stakeholders). We also compared the project charter with the CADE 2 program charter to identify any gaps.
 - B. Reviewed the CADE 2 Daily Processing ELC Tailoring Plan to validate whether the plan includes all of the required phases of project development per the ELC. We also determined whether the Work Breakdown Schedule contained key deliverables.
 - C. Reviewed the CADE 2 Daily Processing Business Systems Requirements Report to determine whether requirements and any subsequent changes were documented and approved.
 - D. Reviewed the CADE 2 Daily Processing Requirements Traceability Matrix to identify any ongoing or open issues that should be addressed before exiting certain project milestones. In addition, we traced any open issues to the ITRAC System to determine whether risks were identified and tracked.
- II. Reviewed the Program Test Plan, Project Design Specification Reports, and Program Interface Inventory, to evaluate whether controls are operating as designed to mitigate risks with modifying the current processing from weekly to daily.
- III. Determined whether applications, operating system, and hardware for daily processing meet the requirements of the National Institute of Standards and Technology security

¹ See Appendix VI for a glossary of terms.

² See Appendix IV for an overview of the ELC.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

standards, Federal Information Security Management Act,³ Office of Management and Budget Memos, Internal Revenue Manuals, and applicable Federal regulations and laws.

- A. Evaluated the Daily Processing System Security Plan against the National Institute of Standards and Technology and Federal Information Security Management Act requirements.
- B. Reviewed the results from an independent contractor's Threat Susceptibility Assessment.
- C. Reviewed the data encryption plan to ensure data is secured from outside threats.

Internal controls methodology

Internal controls relate to management's plans, methods, and procedures used to meet their mission, goals, and objectives. Internal controls include the processes and procedures for planning, organizing, directing, and controlling program operations. They include the systems for measuring, reporting, and monitoring program performance. We determined the following internal controls were relevant to our audit objective: the ELC and related IRS guidelines and the processes followed in the development of information technology projects. We evaluated these controls by conducting interviews with management and staff, attending CADE 2 meetings of the Program and project teams, and reviewing project documentation such as the project charter, various project plans, and other documents that provided evidence of whether ELC systems development processes were followed.

³ 44 U.S.C. §§ 3541–3549.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Appendix II

Major Contributors to This Report

Alan R. Duncan, Assistant Inspector General for Audit (Security and Information Technology Services)
Diana Tengesdal, Acting Director
Kimberly R. Parmley, Audit Manager
K. Kevin Liu, Lead Auditor
Ryan M. Perry, Senior Auditor
Frank O'Connor, Program Analyst
Michael T. Mohrman, Information Technology Specialist



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Appendix III

Report Distribution List

Commissioner C
Office of the Commissioner – Attn: Chief of Staff C
Deputy Commissioner for Operations Support OS
Deputy Commissioner for Services and Enforcement SE
Chief, Agency-Wide Shared Services OS:A
Commissioner, Wage and Investment Division SE:W
Deputy Chief Information Officer for Strategy/Modernization OS:CTO
Associate Chief Information Officer, Modernization – Program Management Office
OS:CTO:MP
Chief Counsel CC
National Taxpayer Advocate TA
Director, Office of Legislative Affairs CL:LA
Director, Office of Program Evaluation and Risk Analysis RAS:O
Director, Procurement OS:A:P
Director, Risk Management Division OS:CTO:SP:RM
Office of Internal Control OS:CFO:CPIC:IC
Audit Liaisons:
 Commissioner, Wage and Investment Division SE:W:S
 Director, Risk Management Division OS:CTO:SP:RM



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Appendix IV

Enterprise Life Cycle Overview

The ELC is the IRS’s standard approach to business change and information systems initiatives. It is a collection of program and project management best practices designed to manage business change in a successful and repeatable manner. The ELC addresses large and small projects developed internally and by contractors. The ELC includes such requirements as:

- Development of and conformance to enterprise architecture.
- Improving business processes prior to automation.
- Use of prototyping and commercial software, where possible.
- Obtaining early benefit by implementing solutions in multiple releases.
- Financial justification, budgeting, and reporting of project status.

In addition, the ELC improves the IRS’s ability to manage changes to the enterprise, estimate the cost of changes, and engineer, develop, and maintain systems effectively. Figure 1 provides an overview of the phases and milestones within the ELC. A phase is a broad segment of work encompassing activities of similar scope, nature, and detail and providing a natural breakpoint in the life cycle. Each phase begins with a kickoff meeting and ends with an executive management decision point (milestone) at which IRS executives make “go/no-go” decisions for continuation of a project. Project funding decisions are often associated with milestones.

Figure 1: Enterprise Life Cycle Phases and Milestones

Phase	General Nature of Work	Milestone
Vision and Strategy/ Enterprise Architecture Phase	High-level direction setting. This is the only phase for enterprise planning projects.	0
Project Initiation Phase	Startup of development projects.	1
Domain Architecture Phase	Specification of the operating concept, requirements, and structure of the solution.	2
Preliminary Design Phase	Preliminary design of all solution components.	3
Detailed Design Phase	Detailed design of solution components.	4a
System Development Phase	Coding, integration, testing, and certification of solutions.	4b
System Deployment Phase	Expanding availability of the solution to all target users. This is usually the last phase for development projects.	5
Operations and Maintenance Phase	Ongoing management of operational systems.	System Retirement

Source: *The Enterprise Life Cycle Guide*.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Appendix V

Transition State 1 Integration Reviews

Integration Review	Outcomes
Integrated Management Planning Review	Validates that relationships and integration expectations between the Program and its projects are appropriately defined and well understood.
Integrated Requirements Reviews	Validates that the Program-level requirements allocated to projects are in alignment with the Program solution; that Program-level requirements have been appropriately fulfilled through decomposition to project-level requirements; and that all requirements dependencies are identified, supported, and fulfilled.
Integrated Solution Planning Review	Validates that Program strategies for solution design are aligned for the Transition State solution.
Integrated Logical Design Review	Validates that the project-level designs support the solution’s logical implementation as defined in the Program Roadmap and that the projects collectively will deliver an integrated and cohesive solution.
Integrated Physical Design Review	Validates that the project-level designs support the solution’s physical implementation as defined in the Program Roadmap and that the projects collectively will deliver an integrated and cohesive solution.
Integrated Test Planning Review	Validates that the Program and project plans for testing the solution components individually and the integrated Program solutions collectively are in alignment and comprehensive.
Integrated Test Readiness Review	Validates that solution components have been accurately and comprehensively tested at the Unit and Developer level and that the Program is ready to begin testing of the Integrated Transition State Solution.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Integration Review	Outcomes
Integrated Organizational Readiness Review	Validates that the Program understands the impact the solution has on the business, and validates organizational readiness to adopt the new solution.
Integrated Deployment Readiness Review	Validates that the solution components, production environment, and plans for deployment are assessed against defined readiness criteria. The Program will make a “go/no-go” decision based on the results of the Deployment Readiness Review.

Source: IRS Customer Account Data Engine 2, 2nd Quarter Briefing to the Treasury Inspector General for Tax Administration officials, dated July 14, 2010.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Appendix VI

Glossary of Terms

Term	Definition
Business Rule	A statement that defines or constrains some aspect of the business (see Business Rule Sets).
Business Rule Sets	A group of business rules related to a common topic or business decision.
Customer Account Data Engine	A major component of the IRS modernization program. The system consists of current and planned databases and related applications that work with the IRS Master File system.
Daily Processing Project	A project under the CADE 2 Program that, when completed, will change weekly individual taxpayer account processing to daily processing.
Database Implementation Project	A project under the CADE 2 Program intended to implement the newest version of the relational database.
Enterprise Architecture	A unifying overall design or structure for an enterprise that includes business and organizational aspects as well as technology aspects. It divides the enterprise into its component parts and relationships and provides the principles, constraints, and standards to help align business area development efforts in a common direction. Additionally, it ensures subordinate architectures, business system components, and multiple projects fit together into a consistent, integrated whole.
Enterprise Life Cycle	A structured business systems development method that requires the preparation of specific work products during different phases of the development process.
Executive Steering Committee	Committee with oversight responsibilities for investments, including validating major investment business requirements and ensuring enabling technologies are defined, developed, and implemented.
Individual Master File	The IRS database that maintains transactions or records of all individual tax accounts.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Term	Definition
Infrastructure	The fundamental structure of a system or organization. The basic, fundamental architecture of any system (e.g., electronic, mechanical, social, political) determines how it functions and how flexible it is to meet future requirements.
Integrated Data Retrieval System	The IRS computer system capable of retrieving or updating stored information; it works in conjunction with a taxpayer's account records.
Integrated Production Model	Intended to be a data store to meet IRS needs for data analytics and long-term reporting and a source for other types of analytic data that supplement the transactional core data store.
Item Tracking Reporting and Control System	An information system used to track and report on issues, risks, and action items in the modernization effort.
Master File	The IRS database that stores various types of taxpayer account information. This database includes individual, business, and employee plans and exempt organizations data.
Milestone	Scheduled time period for providing a go/no-go decision point in a program or project. It can be associated with funding approval to proceed.
National Institute of Standards and Technology	A nonregulatory Federal agency, within the Department of Commerce, responsible for developing standards and guidelines, including minimum requirements for providing adequate information security for all Federal Government agency operations and assets.
Phase	Broad segment of work encompassing activities of similar scope, nature, and detail and providing a natural breakpoint in the life cycle.
Processing Year	The calendar year in which the tax return or document is processed by the IRS.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Term	Definition
Project Tailoring Plan	ELC Guidance 2.16.1 (pages 66-67) states ELC tailoring must be documented and approved in a Project Tailoring Plan. This plan must identify all tailoring decisions and explain the rationale and impact of each decision. Impact should include a discussion of any risk associated with the change. The approved tailoring decisions must be reflected in the project Work Breakdown Structure and the project schedule. All approved waivers and deferrals for tailoring decisions must be maintained in the projects repository.
Relational Database	A collection of data items organized as a set of formally described tables from which data can be accessed or reassembled in many different ways without having to reorganize the database tables.
Requirement	A formalization of a need and statement of a capability or condition that a system must have or meet to satisfy a contract, standard, or specification.
Stakeholders	An individual or organization that is materially affected by the outcome of the system. Key stakeholders represent both business and technical functions that fully participate in the architecture development effort to ensure that directional guidance is both accurate and sufficient. They are empowered to make project and architectural decisions. Examples of project stakeholders include the customer, the user group, the project manager, the development team, and the testers.
Work Breakdown Schedule	A deliverable-oriented grouping of project elements that organize and define total work scope of the project.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Appendix VII

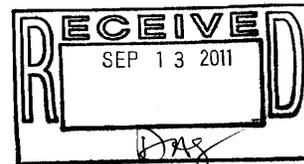
Management's Response to the Draft Report



CHIEF TECHNOLOGY OFFICER

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

SEP 13 2011



MEMORANDUM FOR DEPUTY INSPECTOR GENERAL FOR AUDIT

FROM: Terence V. Milholland *Terence V. Milholland*
Chief Technology Officer

SUBJECT: The Customer Account Data Engine 2 Is Making
Progress Toward Achieving Daily Processing, but
Improvements Are Warranted to Ensure Full
Functionality (201120001) (e-trak 2011-24369)

Thank you for the opportunity to review your draft audit report and to discuss earlier draft report observations with the audit team.

I was pleased to read your comments and observations acknowledging steady progress on the CADE 2 Daily Processing Project from project initiation (Milestone 1) through Physical Design (Milestone 4a). The report also recognizes that the IRS has documented security requirements for Daily Processing and will use several types of secure file transfer protocols to protect data from unauthorized access, modification, and corruption. However, based on performance considerations, we have made a risk based decision not to encrypt a small number of machine to machine data transfers within our Tier 5 Enterprise Computing Centers given that the risk is minimal.

I agree with recommendations 1 and 3, and the attachment details our planned actions to implement. I do not, however, agree with your recommendation around open issues as it relates to unconditional milestone exits. IRS guidance does not list specifics around what constitutes an "open issue" at milestone exit, leaving some flexibility for the Executive Steering Committees (ESCs) to make risk-based decisions on whether or not a given "open issue" is at a stage where it will impact efforts in the following milestones or undermine the success of the project. In the case of CADE 2 Daily Processing, there was full understanding by the CADE 2 ESC at the milestone exit that the "open issues" had been adequately addressed and were near resolution. Each issue had a viable solution and only needed full alignment by all stakeholders and/or a fully documented solution. While it is clearly optimal for all "open issues" to be properly addressed and fully closed during the Milestone Readiness Review, I have chosen to leave some flexibility in the hands of its ESCs to make risk based choices, based on the status of the "open issues" at milestone exit and the impacts the status will have on the outcome of the Program.



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

2

We are committed to continuously improving our information technology systems and processes. We value your continued support and the assistance and guidance your team provides. If you have any questions, please contact me at (202) 622-6800 or Karen Mayr at (202) 283-0015.

Attachment



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Draft Audit Report – The Customer Account Data Engine 2 Is Making Progress toward Achieving Daily Processing, but Improvements Are Warranted to Ensure Full Functionality (Audit # 201120001) (i-trak # 2011-24369)

RECOMMENDATION #1: The Chief Technology Officer should ensure, a risk mitigation plan is formally developed and documented in the ITRAC System for any impacted systems, such as the EFDS.

CORRECTIVE ACTION #1: The IRS agrees with this recommendation. A risk (ITRAC #15137) was opened on 5/10/2011 for Timely Processing of Potential Fraud Data for Paper Returns (EFDS). A mitigation plan was documented and successfully executed.

IMPLEMENTATION DATE: Completed August 4, 2011

RESPONSIBLE OFFICIAL: Associate Chief Information Officer, Modernization and CADE 2 PMO

CORRECTIVE ACTION MONITORING PLAN: We enter accepted Corrective Actions into the Joint Audit Management Enterprise System (JAMES). These Corrective Actions are monitored on a monthly basis until completion

RECOMMENDATION #2: The Chief Technology Officer should ensure all open issues are properly addressed and closed during the Milestone Readiness Review prior to approving an unconditional exit.

CORRECTIVE ACTION #2: The IRS does not agree with this recommendation. IRS guidance does not list specifics around what constitutes an “open issue” at milestone exit, leaving some flexibility for the Executive Steering Committees (ESC) to make risk-based decisions on whether or not a given “open issue” is at a stage where it will impact efforts in the following milestones or undermine the success of the project. In the case of CADE 2 Daily Processing, there was full understanding by the CADE 2 ESC at the milestone exit that the “open issues” had been adequately addressed and were near resolution. Each issue had a viable solution and only needed full alignment by all stakeholders and/or a fully documented solution. While it is clearly optimal for all “open issues” to be properly addressed and fully closed during the Milestone Readiness Review, the IRS has chosen to leave some flexibility in the hands of its ESCs in this area, based on the status of the “open issues” at milestone exit and the impacts the status will have on the outcome of the project. Currently, all DP design issues have been resolved and closed.

IMPLEMENTATION DATE: Closed August 24, 2011

RESPONSIBLE OFFICIAL: Associate Chief Information Officer, Modernization and CADE 2 PMO

CORRECTIVE ACTION MONITORING PLAN: We enter accepted Corrective Actions into the Joint Audit Management Enterprise System (JAMES). These Corrective Actions are monitored on a monthly basis until completion



*The Customer Account Data Engine 2
Is Making Progress Toward Achieving Daily Processing,
but Improvements Are Warranted to Ensure Full Functionality*

Draft Audit Report – The Customer Account Data Engine 2 Is Making Progress toward Achieving Daily Processing, but Improvements Are Warranted to Ensure Full Functionality (Audit # 201120001) (i-trak # 2011-24369)

RECOMMENDATION #3: The Chief Technology Officer should require a documented and chosen ELC path for CADE 2 Daily Processing to ensure project consistency and full realization of the benefits of the selected ELC path.

CORRECTIVE ACTION #3: The IRS agrees with this recommendation for future projects. The ELC is intended for projects, not programs. There is clear guidance and structure in place at the IRS to guide IT investments in choosing and following an appropriate ELC path. However, for TS-1 the IRS made a business decision to leverage an iterative approach for the Database Implementation project.

IMPLEMENTATION DATE: Not Applicable.

RESPONSIBLE OFFICIAL: Associate Chief Information Officer, Modernization and CADE 2 PMO

CORRECTIVE ACTION MONITORING PLAN: We enter accepted Corrective Actions into the Joint Audit Management Enterprise System (JAMES). These Corrective Actions are monitored on a monthly basis until completion